**Seasonality in the Yield of Municipal Bonds: An Update**

M.A. program in Economics

Andrew Young School of Policy Studies

Georgia State University

***Abstract****: Municipal bonds have been found to have higher than usual returns in January when compared to other months in the year. However, some research has found this effect to have declined over the past few decades. Hence, this paper attempts to assess as to whether this effect declined for both investment and non-investment grade municipal bonds over the past few decades. In addition, high yield bonds have been found to have a stronger January effect than investment grade bonds, especially within the corporate universe. Thus, this paper also researches as to whether this phenomenon occurs within the municipal bond universe. To study these questions, regression with ARIMA error specifications are utilized (transfer function models) on index data from Bloomberg Barclays Indices, which provides data up to 2017. The results indicate that the January effect has declined for investment grade municipal bonds, but has increased for non-investment grade municipal bonds. In addition, the January effect is found to increase in magnitude as the credit quality of municipal bonds decline.*

**Introduction**

Municipal bonds have been found to have higher than usual returns in January when compared to other months in the year, which many refer to as the “January effect” (Greer, 2015). However, according to Cusatis and Tawatnuntachai (2011) this effect may have declined over the past few decades due to shifting trends in the ownership concentration of municipal bonds. Hence, this research paper attempts to assess if there has been a decline in the January effect for both investment grade and non-investment grade municipal bonds.

Maxwell (1998) and Fama & French (1993) studied the January effect in corporate bonds and found it to increase in magnitude as credit quality declined. Reasons for this included seasonal demand for non-investment grade fixed income securities (relatively higher demand in January) and institutional investor behavior (window dressing). Since the research on seasonality within high yield municipal debt is scarce, this research paper also attempts to assess if the January effect increases in magnitude as the credit quality of municipal bonds decline.

The results indicate that the January effect has declined over the past few decades for investment grade municipal debt but has increased for non-investment grade municipal bonds. In addition, the findings also imply that the January effect increases as the credit quality of municipal bonds declines. This information has the potential to assist issuers and investors in the timing of debt issuance/investment, especially of that which is non-investment grade which, of course, is more expensive.

The paper is structured as follows: It begins with a survey of the pertinent literature. Then, it describes the data and methodology that is utilized to answer the research questions and displays the results. Finally, it concludes with the result’s potential explanations, implications and suggestions for future research.

**Literature Review**

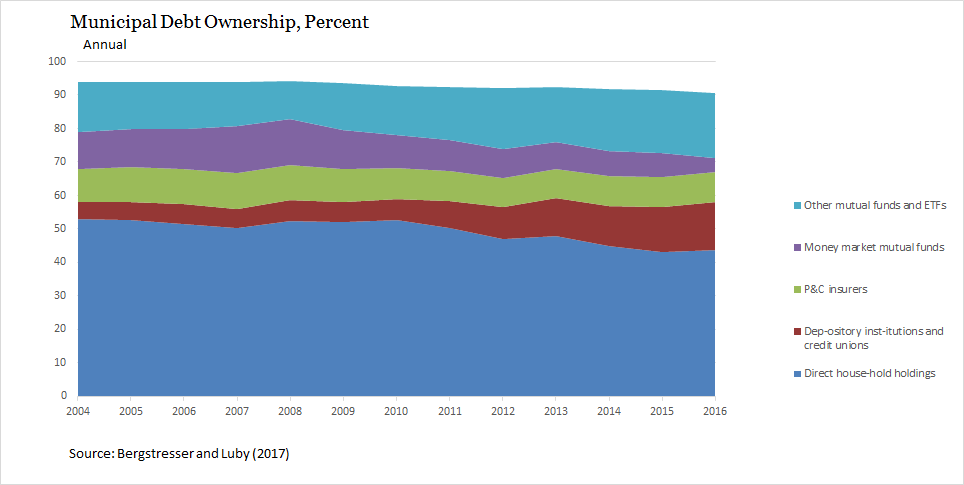
Several financial instruments exhibit seasonality patterns in their yields, which are periodic fluctuations that occur with similar intensity from one year to the next (Hillmer & Tiao, 1982). For example, instruments like municipal bonds and corporate bonds have been found to have higher returns in January when compared to that of other months in the year (Maxwell, 1998; Greer, 2015). This is typically referred to as the ‘January effect’.

While the January effect appears to have been declining in recent years for equities, it appears to persist for the bond market (Gu, 2003; Reid, 2017; Albano, 2018). For example, Jordan and Jordan (1991), studied the Dow Jones Composite Bond Average from 1963-1986 and found corporate bonds to possess the January effect. With regards to municipal bonds, the literature provides mixed results. Greer (2015) examined seasonal trends in the municipal bond market by studying the 20-Bond General Obligation Index, from 1998 to 2008, with time-series methods and found higher than average yields in the spring months. However, Starks, Yong, and Zheng (2006) study data on 168 municipal bond closed-ended funds from the Center for Research in Security Prices (CRSP) from 1990-2000 and find the January effect for closed-ended funds but not for the underlying individual municipal bonds. In addition, Cusatis and Tawatnuntachai (2011) find evidence of the January effect from 1980-1993, but not after 1993.

The January effect for the municipal bond market has been attributed towards the tax loss selling and window dressing hypotheses. Starks, Yong and Zheng (2006) find evidence of the tax loss selling hypothesis which posits that individuals tend to sell their investments at a loss at the end of the calendar year for tax purposes and re-invest those funds in January. This results in lower returns in December, and higher returns in January. The alternative explanation for the January effect is the window dressing hypothesis which posits that institutional investors sell securities that are performing poorly or are of relatively poor quality towards the end of the year to make their portfolios look or “dress” better. Maxwell (1998) and Meier and Schaumburg (2004) provide evidence that is consistent with the window dressing hypothesis. Since the essential prediction of both hypotheses are the same, it can be difficult to disentangle as to which effect has a larger or any effect, on the January phenomenon. However, several studies find more evidence for the tax loss selling hypothesis (Sias and Starks, 1997; Poterba and Weisbenner, 2001).

As per Cusatis and Tawatnuntachai (2011), who did not find evidence of the January effect post 1993, this effect could have declined for the municipal bond market due to trends in the ownership of municipal bonds. Figure 1 below displays this trend which indicates that a significant percentage of municipal bond ownership has transferred from households and individuals to banks, mutual funds and exchange-traded funds (Belz, and Sheiner, 2017).

**Figure 1**



Other mutual funds and ETFs

Money Market mutual funds

P&C insurers

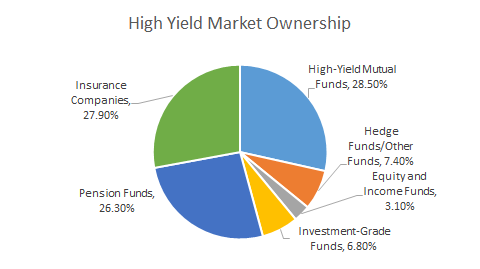
Depository institutions & credit unions

Direct house-hold holdings

The share of bonds held by depository institutions rose from 5 percent in 2005 to almost 15 percent in 2016. Over that same period, household ownership fell by a similar amount, from 53 percent to 44 percent. Such a trend is pertinent to the January effect since it has the potential to affect the magnitude of the tax loss selling hypothesis. Typically, individuals engage in such behavior. If they own a relatively smaller share of the municipal bond market, then their impact upon it via tax loss selling behavior would be smaller, which is a potential explanation that is offered by Cusatis and Tawatnuntachai (2011) for a decline in the January effect for municipal bonds.

Another interesting phenomenon with regards to the January effect is that it tends to be more severe for bonds that are riskier. For instance, Maxwell (1998), studied monthly returns on corporate bonds from 1986 to 1997 and found bonds that were rated below investment grade had a relatively higher January effect. Fama & French (1993) also find the January effect to increase monotically as the corporate bond credit rating declines. Al-Khazali (2001) confirms such a finding of the January effect for the U.S. high yield bond market by analyzing data from 1926 to 1993. Maxwell (1998) found that investors had a significantly higher demand for non-investment grade debt in January than other months of the year. He also found evidence of the window dressing hypothesis for such non-investment grade corporate bonds. As mentioned earlier, the window dressing hypothesis is more relevant to institutional investors who may want the quality of their portfolios to look or “dress” better towards the end of the year. An important characteristic with regards to high yield fixed income products is that most of its ownership lies amongst institutional investors such as pension funds, insurance companies and retail mutual funds (Acciavatti et al., 2016). Figure 2 displays the ownership of high yield fixed income products in 2016.

**Figure 2**



Source: Acciavatti et al. (2016)

About 10% of the high yield bond market is comprised of high yield municipal debt (Rupp, 2017). It is possible that the findings of Maxwell (1998) and Fama and French (1993) might repeat themselves for high yield municipal debt as well if the institutions that hold them exhibit such window dressing behavior and/or seasonal demand. The research on seasonality for high yield municipal debt is scarce, if not non-existent.

Knowing or predicting seasonality patterns in the yield of municipal debt can be important for both issuers and investors. Issuers can use this information to time their issuance of debt, and investors can utilize this information to shape their investment strategies. Therefore, this study attempts to answer two research questions to add to the discussion: 1) Is there a decline in the January effect for municipal bonds? and 2) Is the January effect more pronounced for non-investment grade municipal bonds than for investment grade municipal bonds? To answer these questions index data on municipal bonds is gathered from Bloomberg Barclays Indices[[1]](#footnote-1) and analyzed via regression with ARIMA error models (a special case of transfer function models).

**Data and Methodology**

Index data on three categories of municipal bonds is gathered from Bloomberg Barclays Indices (2017). As of March 7, 2018, the index on investment grade municipal bonds from Bloomberg is a market value weighted index that covers the U.S. long-term tax exempt muni bond market and spans from 1980-2017. According to Federated Investors, Inc. (2018), this index only includes bonds that have a minimum credit rating of Baa, as per Moody’s ratings, and an outstanding par value of at least $7 million. In addition, the bonds must have been issued as part of a transaction of at least $75 million, have a fixed rate, be dated after December 31, 1990, and be at least one year from their maturity date. Index data on high yield municipal bonds is also gathered from Bloomberg which only covers municipal bonds that are non-investment grade, unrated, or rated below Ba1, as per Moody’s ratings, with a remaining maturity of at least one year. This index spans from 1995 to 2017. Data on high yield municipal bonds with the exclusion of Puerto Rico is also available from Bloomberg from 2009 to 2017 and is included in the analysis.

From these indexes, the one month holding period return is estimated[[2]](#footnote-2) and prepared for the time-series regression analysis. These indexes from Bloomberg Barclays Indices (2017) have not been extensively utilized in previous studies in the pertinent literature. However, since these indexes have data that is more recent, they are well suited for this study. It is important to note that many of the prior studies with regards to seasonality in municipal and corporate bonds did not analyze data beyond 1995. All the indexes from Bloomberg have data from 2009-2017.

To analyze these indexes, regression with ARIMA error models are utilized via the *auto.arima* function within thealgorithmic package, *forecast,* in R (Hyndman and Khandakar, 2008; Hyndman, et al., 2017). Constructing a typical time-series model with covariates can be useful for forecasting but not for interpretative purposes with regards to the co-efficients on the covariates included in the model (Hyndman, 2010). This is because the co-efficients in such models can only be interpreted conditionally on previous values of the dependent variable (if AR terms are required and are included). Therefore, a special case of transfer function models, also called regression with ARIMA error or dynamic regression models, is suggested by Hyndman (2010) and Pankratz (2012).

Regression with ARIMA error models have a generalized form that is provided below,

**yt = β0 + β1x1,t +⋯+ βkxk,t +** **nt**

The model above is similar to that of a regression equation with a dependent variable on the left-hand side, and independent variables on the right-hand side. However, in this equation, nt is assumed to possess an ARIMA process, and not to be mere white noise. For instance, if nt possessed an ARIMA(1,1,1) process it would have this form,

**(1 − ϕ1B)(1 − B)nt = (1 + θ1B)et**

In order to estimate accurate parameters for the model, one would need to minimize the sum of squared et values, and not the sum of squared nt values. The algorithm provided by Hyndman et al. (2017) uses a step-wise process to identify the most appropriate autoregressive, differencing, moving average, and seasonal parameters for the error term in the regression model based on which specification has the lowest Akaike’s Information Criterion (AIC).

A preliminary step in this process is ensuring that all variables that are included in the model are stationary. The dependent variable, one month holding period return of the index, is estimated as follows,

**LN(Pt/Pt-1) where t is in months, and P is price of the index**

This is equivalent to LN(Pt) – LN(Pt-1) which is the first difference of the natural logarithm of the price values in the index. This results in stationary dependent variables for all the estimated models as per results from Augmented Dickey Fuller tests for unit roots (Ruppert, 2011).

Then, regression with ARIMA error models are utilized to estimate the co-efficients on monthly dummy variables that are included into the models that are used to answer the aforementioned research questions. With regards to the variables specified in the model above, yt refers to the one month holding period return at month t of the municipal bond index that is being analyzed, β1…….. βk refer to the co-efficients on the monthly dummy variables (January is the base month dummy), and nt refers to the error term that possesses an ARIMA process.

**Results**

***Decline in the January Effect?***

To assess if there has been a decline in the January effect, appropriate regression with ARIMA error specifications are applied to the index on municipal bonds (rated at or above Baa) from 1980-1999 and 2000-2017, and the index on high yield municipal bonds (rated at or below Ba1 or unrated) from 1996-2006 and 2007-2017.

The results for investment grade municipal bonds are presented in Table 1, along with the p-value from the Ljung-Box test on the residuals of the models. As per Hyndman (2014), the lags utilized in the Ljung-Box tests is the minimum of the length of the time-series divided by five or twice the seasonal period, which would be 24. Also, a dummy for the recession period (2008-2010) is added in the model that covers data beyond 2000 (in all subsequent models as well).

**Table 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Municipal Bonds** | **1982-1999: M(1)** | | **2000-2017: M(2)** | | **|M(1)| - |M(2)|** |
| **(Baa or above)** | **Co-efficients** | **Std. Error** | **Co-efficients** | **Std. Error** | **Difference** |
|  |  |  |  |  |  |
| *February* | -1.25%\*\* | 0.01 | -0.54% | 0.003 | **0.71%** |
| *March* | -2.52%\*\*\* | 0.01 | -0.86%\*\*\* | 0.003 | **1.66%** |
| *April* | -1.14%\* | 0.01 | -0.31% | 0.003 | **0.83%** |
| *May* | -1.79%\*\*\* | 0.01 | -0.35% | 0.003 | **1.45%** |
| *June* | -1.50%\*\*\* | 0.01 | -0.91%\*\*\* | 0.003 | **0.59%** |
| *July* | -0.43% | 0.01 | -0.37% | 0.003 | **0.06%** |
| *August* | -1.20%\*\* | 0.01 | 0.02% | 0.003 | **1.18%** |
| *September* | -1.46%\*\*\* | 0.01 | -0.44% | 0.003 | **1.02%** |
| *October* | -1.38%\*\* | 0.01 | -0.99%\*\*\* | 0.003 | **0.39%** |
| *November* | -1.02% | 0.01 | -0.98%\*\*\* | 0.003 | **0.04%** |
| *December* | -0.82% | 0.01 | -0.38% | 0.003 | **0.44%** |
| *Recession* |  |  | -0.05% | 0.00 |  |
|  |  |  |  |  |  |
| *ar1* | -26.74% | 0.17 |  |  |  |
| *ar2* | -38.39%\*\*\* | 0.15 |  |  |  |
| *ar3* | -31.57%\*\* | 0.15 |  |  |  |
| *ar4* | -25.10%\* | 0.14 |  |  |  |
| *ar5* | -10.20% | 0.12 |  |  |  |
| *ar6* | -14.06% | 0.10 |  |  |  |
| *ma1* | -64.52%\*\*\* | 0.16 |  |  |  |
| *sar1* |  |  | -13.71%\*\* | 0.07 |  |
| *intercept* |  |  | 0.93%\*\*\* | 0.002 |  |
|  |  |  |  |  |  |
| Observations | 216 | | 216 | |  |
| Order | (6,1,1) | | (0,0,0)(1,0,0)[12] | |  |
| Ljung Box-test (h=24) | .54 | | .97 | |  |
| AIC | -1091.37 | | -1282.35 | |  |

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

The fourth column titled “|M(1)| - |M(2)|” displays the value of the absolute value of the coefficients on the month dummies in M(2) subtracted from the absolute value of the coefficients on the month dummies in M(1). The resulting values in this column indicate that the magnitude of the January effect appears to have declined for investment grade municipal bonds. For instance, during 1982-1999, the return in the month of January, on average, was 2.52% higher than that of March. During 2000-2017, the return in the month of January, on average, was only 0.86% higher than that of March. Such an effect, at a statistically significant level, is observed for the months of June, October and November in both models. At non-statistically significant levels, the co-efficients in both models on the monthly dummies follow the same pattern. The result from Table 1 is line with the findings of Cusatis and Tawatnuntachai (2011) who found no evidence of the January effect in municipal bonds post 1993. However, as per Table 2, the opposite effect appears to have occurred for high yield municipal debt.

**Table 2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Municipal Bonds** | **1996-2006: M(3)** | | **2007-2017: M(4)** | | **|M(3)| - |M(4)|** |
| **(Ba1 or below)** | **Co-efficients** | **Std. Error** | **Co-efficients** | **Std. Error** | **Difference** |
|  |  |  |  |  |  |
| *February* | -0.05% | 0.004 | -1.41%\*\* | 0.01 | **-1.35%** |
| *March* | -0.76%\*\* | 0.004 | -1.55%\*\* | 0.01 | **-0.79%** |
| *April* | -0.34% | 0.004 | -0.65% | 0.01 | **-0.31%** |
| *May* | 0.03% | 0.004 | -0.47% | 0.01 | **-0.43%** |
| *June* | 0.15% | 0.004 | -2.42%\*\*\* | 0.01 | **-2.27%** |
| *July* | -0.22% | 0.004 | -1.52%\*\* | 0.01 | **-1.30%** |
| *August* | -0.24% | 0.004 | -1.45%\* | 0.01 | **-1.20%** |
| *September* | -0.70%\* | 0.004 | -0.79% | 0.01 | **-0.09%** |
| *October* | -0.84%\*\* | 0.004 | -2.63%\*\*\* | 0.01 | **-1.79%** |
| *November* | 0.10% | 0.004 | -3.14%\*\*\* | 0.01 | **-3.04%** |
| *December* | 0.07% | 0.004 | -2.44%\*\*\* | 0.01 | **-2.37%** |
| *Recession* |  |  | -0.19% | 0.01 |  |
|  |  |  |  |  |  |
| *ar1* | -18.17% | 0.229 | 27.06%\*\*\* | 0.08 |  |
| *ar2* | 4.65% | 0.102 |  |  |  |
| *ar3* | -8.20% | 0.088 |  |  |  |
| *ar4* | 0.05% | 0.087 |  |  |  |
| *ar5* | 24.37%\*\*\* | 0.085 |  |  |  |
| *ma1* | 45.69%\*\* | 0.228 |  |  |  |
| *sma1* | -19.09% | 0.127 |  |  |  |
| *intercept* | 0.77%\*\*\* | 0.003 | 2.00%\*\*\* | 0.01 |  |
| *sar1* |  |  | -15.84%\* | 0.09 |  |
|  |  |  |  |  |  |
| Observations | 132 | | 132 | |  |
| Order | (5,0,1),(0,0,1)[12] | | (1,0,0)(1,0,0)[12] | |  |
| Ljung Box-test (h=24) | .36 | | .67 | |  |
| AIC | -772.9 | | -627.16 | |  |

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

As per column four, all of the co-efficients in M(4) on the month dummies appear to be larger than that of M(3). This indicates that the January effect of seasonality has increased from 1996-2006 to 2007-2017 for high yield municipal bonds.

**Credit Quality and January Effect:**

To assess if the prominence of the January effect increases as the credit rating of municipal bonds decline, as observed for corporate bonds (Maxwell, 1998), appropriate regression with ARIMA error specifications are applied on both the index on investment grade and high yield municipal bonds from 2000-2017. The results are presented in Table 3.

**Table 3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Municipal Bonds** | **Investment Grade: M(2)[[3]](#footnote-3)** | | **Non-investment grade: M(5)** | | **|M(2)| - |M(5)|** |
| **2000-2017** | **Co-efficients** | **Std. Error** | **Co-efficients** | **Std. Error** | **Difference** |
|  |  |  |  |  |  |
| *February* | -0.54% | 0.003 | -0.76% | 0.006 | **-0.22%** |
| *March* | -0.86%\*\*\* | 0.003 | -1.15%\* | 0.006 | **-0.29%** |
| *April* | -0.31% | 0.003 | -0.45% | 0.006 | **-0.14%** |
| *May* | -0.35% | 0.003 | -0.19% | 0.006 | **0.16%** |
| *June* | -0.91%\*\*\* | 0.003 | -1.30%\*\* | 0.006 | **-0.39%** |
| *July* | -0.37% | 0.003 | -1.03% | 0.006 | **-0.67%** |
| *August* | 0.02% | 0.003 | -0.84% | 0.006 | **-0.82%** |
| *September* | -0.44% | 0.003 | -0.83% | 0.006 | **-0.39%** |
| *October* | -0.99%\*\*\* | 0.003 | -1.87%\*\*\* | 0.006 | **-0.88%** |
| *November* | -0.98%\*\*\* | 0.003 | -1.78%\*\*\* | 0.006 | **-0.80%** |
| *December* | -0.38% | 0.003 | -1.30%\*\* | 0.006 | **-0.92%** |
| *Recession* | -0.05% | 0.002 | -0.40% | 0.004 |  |
|  |  |  |  |  |  |
| sar1 | -13.71%\*\* | 0.069 |  |  |  |
| intercept | 0.93%\*\*\* | 0.002 | 1.52%\*\*\* | 0.005 |  |
| ma1 |  |  | 22.88%\*\*\* | 0.062 |  |
|  |  |  |  |  |  |
| Observations | 216 | | 216 | |  |
| Order | (0,0,0),(1,0,0)[12] | | (0,0,1) | |  |
| Ljung Box-test (h=24) | .97 | | .47 | |  |
| AIC | -1282.35 | | -1077.51 | |  |

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

As a robustness check, Table 4 provides the results of appropriate regression with ARIMA error specifications after being applied to an index on investment grade municipal bonds and high yield municipal bonds with the exclusion of Puerto Rico from 2010-2017[[4]](#footnote-4), due to Puerto Rico’s potential of being an outlier (DePersio, 2017).

**Table 4**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Municipal Bonds** | **Investment Grade: M(6)** | | **Non-investment grade: M(7)** | | **|M(6)| - |M(7)|** |
| **2000-2017** | **Co-efficients** | **Std. Error** | **Co-efficients** | **Std. Error** | **Difference** |
|  |  |  |  |  |  |
| *February* | -0.53% | 0.004 | -0.81%\*\* | 0.004 | **-0.28%** |
| *March* | -1.11%\*\* | 0.005 | -1.03%\*\* | 0.004 | **0.08%** |
| *April* | -0.10% | 0.005 | -0.39% | 0.005 | **-0.29%** |
| *May* | -0.41% | 0.005 | -0.67% | 0.004 | **-0.26%** |
| *June* | -1.19%\*\*\* | 0.005 | -2.03%\*\*\* | 0.005 | **-0.84%** |
| *July* | -0.43% | 0.005 | -1.11%\* | 0.004 | **-0.68%** |
| *August* | -0.41% | 0.005 | -1.45%\*\* | 0.005 | **-1.04%** |
| *September* | -0.60% | 0.005 | -0.74%\* | 0.004 | **-0.15%** |
| *October* | -0.94%\*\* | 0.005 | -1.17%\*\* | 0.005 | **-0.24%** |
| *November* | -1.50%\*\*\* | 0.005 | -2.40%\*\*\* | 0.004 | **-0.90%** |
| *December* | -0.80%\* | 0.004 | -1.22%\*\*\* | 0.004 | **-0.42%** |
| *Recession* | -0.20% | 0.004 | 0.11% | 0.005 |  |
|  |  |  |  |  |  |
| *ar1* | 21.05%\*\* | 0.100 | 23.79%\*\* | 0.098 |  |
| *intercept* | 1.05%\*\*\* | 0.003 | 1.76%\*\*\* | 0.003 |  |
| "ar2" |  |  | 28.74%\*\* | 0.101 |  |
| "ar3" |  |  | -28.38%\* | 0.104 |  |
| "sar1" |  |  | -34.44%\*\* | 0.112 |  |
| "sar2" |  |  | -25.82%\*\* | 0.124 |  |
|  |  |  |  |  |  |
| Observations | 96 | | 96 | |  |
| Order | (1,0,0) | | (3,0,0)(2,0,0)[12] | |  |
| Ljung Box-test (h=24) | .73 | | .77 | |  |
| AIC | -596.16 | | -539.44 | |  |

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

As seen in Table 3 within the difference column, the January effect appears to be larger for high yield municipal bonds. This is re-confirmed by the results of Table 4. This implies that the January effect increases in magnitude as the credit quality of municipal bonds declines, which is in line with what Maxwell (1998) found for corporate bonds. It is likely that seasonal demand for high yield debt and/or window dressing institutional investor behavior is a factor in the relatively higher January effect for non-investment grade municipal debt.

**Conclusion**

***Findings***

This study attempted to research if there was a decline in the January effect for both investment and non-investment grade municipal bonds, and if the January effect became more pronounced as credit quality declined. The results for the first research question indicated that the January effect declined for investment grade municipal bonds from 1982-1999 to 2000-2017 but increased for non-investment grade municipal bonds from 1996-2006 to 2007-2017. The former result is in line with that of Cusatis and Tawatnuntachai (2011). It could be that the shift in ownership trends in municipal debt is playing a role in the decrease of the tax-loss selling effect amongst individual municipal bond investors. With regards to the result observed for high yield debt, it is possible that window dressing behavior or seasonal demand, as described by Maxwell (1998) has inclined amongst institutional investors who hold high yield municipal and other fixed income securities, over the past two decades. This could have also led to the results observed for the second research question in this study where the January effect was found to increase in magnitude as the credit quality of municipal bonds declined. Of course, factors not related to either the window dressing or tax loss selling hypothesis could have led to the observed results. Nonetheless, moving forward, these findings shed useful light on future research directions, and issuance/investment strategies within the public finance arena.

***Implications***

1. Issuers may not be able to gain as much as they could from the January effect with regards to investment grade municipal bonds due to the decline in the effect over the past few decades.
2. However, issuers who need to issue high yield municipal debt should take the January effect into consideration since the effect is significantly more prominent for high yield debt. Efficient timing could be useful since the cost of issuance of such type of debt is significantly larger than that of investment grade municipal debt.

***Future Research***

It might be worthwhile to assess as to why the January effect declined for municipal bonds over the past few decades. Insight with regards to this question can provide a more coherent understanding of seasonality in the municipal bond market. In addition, it could be useful to further research the window dressing hypothesis. While the scale of evidence with regards to the driver of the January effect leans towards the tax loss selling hypothesis, the window dressing hypothesis appears to be more relevant for the January effect within the high yield debt market.

**References**

Acciavatti, P., Linares, T., Jantzen, N., Sharma, R., and Li, C. (2016). 2016 High-Yield Annual Review. *J.P. Morgan North American High Yield Research*. Retrieved from <https://markets.jpmorgan.com>.

Albano, C. (2018). How this year's 'Super January effect' is pressuring the buy side. *The Bond Buyer.* Retrieved from <https://www.bondbuyer.com/news/extraordinary-supply-challenges-facing-muni-investors>

Al-Khazali, O. M. (2001). Does the January effect exist in high‐yield bond market? *Review of Financial Economics*, 10(1), 71-80.

Belz, S. & Sheiner, L. (2017). Key changes in the municipal bond market since 2007. *Brookings.* Retrieved from <https://www.brookings.edu/blog/up-front/2017/07/14/key-changes-in-the-municipal-bond-market-since-2007/>

Bloomberg Barclays Indices (2017). Bloomberg Barclays Index Methodology. *Bloomberg.* Retrieved from <https://www.bbhub.io/indices/sites/2/2017/03/Index-Methodology-2017-03-17-FINAL-FINAL.pdf>

Cusatis, P. J., & Tawatnuntachai, O. (2011). Seasonality in the Municipal Bond Market. *Municipal Finance Journal*, 31(4), 1.

DePersio, G. (2017). The Origins of the Puerto Rican Debt Crisis. *Investopedia.* Retrieved from <https://www.investopedia.com/articles/investing/090915/origins-puerto-rican-debt-crisis.asp>

Gu, A. Y. (2003). The declining January effect: evidences from the U.S. equity markets. *The Quarterly Review of Economics and Finance,* (43), 2. Retrieved from <https://www.sciencedirect.com/science/article/pii/S1062976902001606>

Federated Investors, Inc. (2018). Benchmark Index Glossary. Retrieved from <http://www.federatedinvestors.com/FII/leaf/display.do?category=Benchmark_Glossary>

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, 33(1), 3-56.

Greer, R. A. (2015). A Time Series Model of Seasonality in the Municipal Bond Market. *Municipal Finance Journal,* (36),2.

Hillmer, S. C., & George C.T. (1982). An ARIMA-Model-Based Approach to Seasonal Adjustment. *Journal of the American Statistical Association*, 77, 63–70.

Hyndman, R. J., & Khandakar, Y. (2008). Automatic Time Series Forecasting: The forecast Package for R. *Journal of Statistical Software, 27(3).* Retrieved from <https://www.jstatsoft.org/article/view/v027i03>

Hyndman, R. J. (2010). The ARIMAX model muddle. *Hyndsight blog.* Retrieved from <https://robjhyndman.com/hyndsight/arimax/>

Hyndman, R. J. (2014). Thoughts on the Ljung-Box test. *Hyndsight Blog.* Retrieved from <https://robjhyndman.com/hyndsight/ljung-box-test/>

Hyndman, R. J., O’Hara, M., Bergmeir, C., Razbash, S., & Wang, E. (2017). Package ‘forecast’. *R topics documented:.* Retrieved from <https://cran.r-project.org/web/packages/forecast/forecast.pdf>

Jordan, S. D., & Jordan, B. D. (1991). Seasonality in Daily Bond Returns. *Journal of Financial and Quantitative Analysis*, 26, 269-285.

Maxwell, W. F. (1998). The January effect in the corporate bond market: A systematic examination. *Financial Management*, 18-30.

Meier, I., & Schaumberg, E. (2004). Do Funds Window Dress? Evidence for US Domestic Equity Mutual Funds, *HEC Montreal*, Working Paper.

Pankratz, A. (2012). Forecasting with dynamic regression models (Vol. 935). John Wiley & Sons.

Poterba, J. M., & Weisbenner, S. J. (2001). Capital gains tax rules, tax‐loss trading, and turn‐of‐the‐year returns. *The Journal of Finance*, *56*(1), 353-368.

Reid, H. (2017). The 'January effect' for stock markets is fading: Goldman. *Thomson Reuters.* Retrieved from <https://www.reuters.com/article/us-stocks-goldman/the-january-effect-for-stock-markets-is-fading-goldman-idUSKBN14Q15P>

Rupp, H. (2017). The High Yield Market: Market Size, Ownership, Funds, and Opportunities. *PERITUS Asset Management, LLC.* Retrieved from <http://www.peritusasset.com/2017/06/the-high-yield-market-market-size-ownership-funds-and-opportunities-3/>

Ruppert, D. (2011). *Statistics and data analysis for financial engineering.* Vol. 13. New York: Springer, 2011.

Sias, R. W., & Starks, L. T. (1997). Institutions and individuals at the turn‐of‐the‐year. *The Journal of Finance*, 52(4), 1543-1562.

Starks, L. T., Yong, L., & Zheng, L. (2006). Tax‐Loss Selling and the January Effect: Evidence from Municipal Bond Closed‐End Funds. *The Journal of Finance*, 61(6), 3049-3067.

1. Municipal Bonds (LMBITR Index); High Yield Municipal Bonds (LMEHTR Index); High Yield Municipal Bonds ex Puerto Rico (I32444US Index) which is retrieved from <https://www.bloomberg.com/markets/rates-bonds/bloomberg-barclays-indices> [↑](#footnote-ref-1)
2. LN(Pt/Pt-1) where t is in months. [↑](#footnote-ref-2)
3. Same as M(2) in Table 1. [↑](#footnote-ref-3)
4. Index data on High Yield Municipal Bonds excluding Puerto Rico was only available from 2009-2017. [↑](#footnote-ref-4)