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Linguistic Tone of Management Discussion and Analysis Disclosures and the Municipal Debt Market

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# Abstract

## Purpose

As the management discussion and analysis (MD&A) section contains discretionary narrative disclosures regarding a government's yearly financial changes and status, the authors investigate several municipal debt market consequences of linguistic tone within these disclosures.

## Design/methodology/approach

The authors textually analyze municipal MD&As with Linguistic Inquiry and Word Count (LIWC) software and develop narrative tone measures based on existing financial-specific dictionaries. Using a final sample of 446 municipal bond issuances from 2012 to 2016, the authors modify the current bond regression models to examine the association between MD&A disclosure tone and future bond interest costs or rating disagreements.

## Findings

This study’s empirical analysis suggests that more negative MD&A tone is associated with higher future debt costs and greater future disagreements among bond rating agencies.

## Practical implications

Overall, the evidence implies that municipal bond stakeholders use the information in narrative disclosures when evaluating risk, but that the qualitative nature can introduce differences in interpretation between users. Furthermore, additional training in MD&A writing and further standard guidance in MD&A disclosures could improve the MD&A's informativeness for bond market decision-making and state-level monitoring.

## Originality/value

This study is first to incorporate narrative tone measures into bond models in a governmental context.

# Keywords

Municipal MD&A, Municipal bonds, GASB 34, Narrative disclosure

# Citation

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# Introduction

The municipal bond market in the United States is significant, with over $3.6 tn owed to investors by state and local governments and new issues in excess of $80 bn per quarter (SIFMA, 2018). While the Municipal Securities Rulemaking Board (MSRB) provides oversight over municipal securities professionals, issuers are largely exempt from most components of federal securities laws, including the reporting requirements of the Securities Act of 1933 and the Exchange Act of 1934 (Cuny, 2016). As a result, information about municipal issues is likely less salient relative to other capital markets (Cuny, 2018).

One source of information available to municipal bond investors is the qualitative information provided in yearly financial disclosures. Governmental Accounting Standards Board Statement No. 34 (GASB 34) requires state and local governments to provide a management discussion and analysis (MD&A) section in their financial reports (GASB, 1999). MD&A disclosures provide government finance officers with the discretion to narratively highlight significant financial performance measures and changes that occurred during the fiscal year (Patton *et al.*, 2001). These textual disclosures can provide incremental information explaining significant financial and operational information in a way that increases the financial statements' usefulness to external parties (Loughran and McDonald, 2011; Brown and Tucker, 2011) and are likely the most useful component of GASB 34 disclosures for municipal bond analysts (Bloch, 2016). The purpose of this study is to extend governmental accounting studies noting bond associations with quantitative information (e.g. Plummer *et al.*, 2007; Benson and Marks, 2014; Reck and Wilson, 2014) and reporting characteristics (e.g. Baber and Gore, 2008; Baber *et al.*, 2013) by examining the relationship between linguistic tone (one qualitative measure of MD&A content) and bond characteristics.

Linguistic tone is a textual analysis measure designed to capture the fraction of “positive” and/or “negative” words within narrative disclosures based on established word dictionaries (e.g. Loughran and McDonald, 2011). In the corporate sector, the prior literature suggests that linguistic tone within discretionary disclosures is predictive of future firm performance (e.g. Feldman *et al.*, 2010; Li, 2010), accounting measures (e.g. Davis *et al.*, 2012), cost of capital (Kothari *et al.*, 2009) and bankruptcy probability (Mayew *et al.*, 2015). While the study of linguistic tone is less prevalent in the municipal sector, the prior literature does suggest that more positive municipal MD&A tone is associated with less future report delay (Rich *et al.*, 2016) and fewer future internal control exceptions (Rich *et al.*, 2018). These results imply that the positivity (negativity) of tone is associated with favorable (unfavorable) future outcomes. Thus, it is plausible that municipal bond analysts will consider linguistic tone when making evaluations about the riskiness of a particular issuance.

Using a sample of municipal bond issues from 2012 to 2016, we find that more negative MD&A disclosure tone is associated with higher future debt costs, suggesting that investors infer a higher likelihood of default when managers disclose less optimistic commentary about municipal operations. In addition, we find that negative tone is associated with increased likelihood of disagreement among bond analysts, indicating that while MD&A disclosure sentiment provides new information to stakeholders, there may still be different perceptions of risk among bond analysts. Overall, our findings suggest that linguistic tone in municipal MD&A information is relevant to the municipal debt market.

Our study contributes to the municipal debt literature by providing evidence that suggests qualitative information in MD&A disclosures is informative in terms of both municipal interest costs and bond rating disagreements. This is important to many stakeholders involved in the municipal debt market. Moreover, our study should help municipalities to understand the importance of narrative disclosures within the MD&A on debt financing, thereby encouraging municipalities to prepare high-quality narrative disclosures regarding their yearly financial changes. Furthermore, our findings are important to bond rating agencies looking to gain better insight into municipal narrative disclosures, as well as investors evaluating the riskiness of municipal bonds. Each of these stakeholders plays a role in supporting the informational efficiency of the municipal bond market. Lastly, our finding that the MD&A section has information content is important to standard setters looking to evaluate the informativeness of disclosures under GASB 34 (GASB, 2020).

The remainder of this paper is organized as follows. We first present a literature review that includes an exploration of the governmental debt market and textual analysis literature, followed by a discussion of our hypotheses. Our sample selection procedures and methodology are presented next, followed by a discussion of the results. The last section provides concluding remarks.

# Literature review and hypotheses

## Governmental debt market

The proceeds from long-term debt (such as bonds) can represent a substantial funding source for governments (Pierson *et al.*, 2015). A significant proportion of the local government bond literature focuses on relationships with quantitative disclosures. Research points to information from the government-wide financial statements and GASB 34-based financial ratios being relevant to bond ratings, interest costs, bond insurance premiums and secondary market pricing and efficiency (Plummer *et al.*, 2007; Marlowe, 2010; Kioko *et al.*, 2013; Benson and Marks, 2014; Reck and Wilson, 2014). Additionally, governments having general fund revenues approximately equal to general fund expenditures (Apostolou *et al.*, 2014), maintaining favorable budget-to-actual expenditure variances (Callahan and Waymire, 2015) and holding budgetary slack (Marlowe, 2011) are shown to be associated with favorable bond outcomes (e.g. higher ratings, lower interest costs).

In addition to quantitative information, reporting characteristics are often associated with bond outcomes. Higher quality disclosures can decrease borrowing costs for municipalities (Cuny, 2018). As GAAP is often associated with higher reporting quality, Baber and Gore (2008) find that municipalities in GAAP-mandated states experience lower bond interest costs. Proxies for poor reporting quality, such as accounting restatements (Baber *et al.*, 2013), material weaknesses in internal control (Gore *et al.*, 2016) and reporting delay (Henke and Maher, 2016; Edmonds *et al.*, 2017), are also shown as leading to unfavorable bond outcomes. Municipalities also face higher bond yield premiums and agency fees when bond ratings are more pessimistic than expected, suggesting investors and rating agencies price as unobservable negative information (Beck *et al.*, 2019).

## Governmental MD&A

Even though quantitative disclosures and reporting characteristics can be related to future bond outcomes, qualitative disclosures could also be informative. In the governmental context, an MD&A represents a crucial section for financial officers to narratively disclose their entity's financial information. GASB 34 requires state and local governments to include an MD&A within their annual financial report. Since governmental financial managers are considered “knowledgeable about the transactions, events and conditions that are reflected in the government's financial report and of the fiscal policies that govern its operations,” the MD&A should provide readers “an objective and easily readable analysis of the government's financial performance for the year” (GASB, 1999).

Even though government finance managers have discretion to describe financial aspects they deem important for reader understanding, GASB 34 maintains minimum MD&A requirements (e.g. financial statement descriptions, financial position analysis and significant budgetary variations) (GASB, 1999). GASB 34 also recommends that the MD&A should avoid “boilerplate” (i.e. nonchanging and noninformative) language that obfuscates the intended message. Patton *et al.* (2001) suggest that “financial managers should focus on “significant” amounts, changes and variances” [1].

Managers' financial narrative within the MD&A should allow decision-makers to assess whether a given government's finances have been improved or declined (Wilson and Kattelus, 2001). GASB 34 also specifically identifies the need for analysis of budget variances, capital asset changes and long-term debt activity during the year (GASB, 1999). Bloch's (2016) survey demonstrates that municipal analysts consider the MD&A to be the most beneficial required component of GASB 34's financial reporting model improvements (except when the MD&A contains boilerplate information). As the Dodd–Frank Act of 2010 increased the registration and transparency requirements regarding municipal bond advisors, Ivonchyk (2019) notes a decrease in interest costs postimplementation. As well, underwriting fees can increase when a bond issuance does not engage a financial manager (Luby and Moldogaziev, 2013). These findings suggest that financial and textual characteristics in recent reporting could further influence debt outcomes.

## Textual analysis

One measure to analyze the content of qualitative disclosures is tone, which is the proportion of positive and/or negative words. Loughran and McDonald (2011) develop a word list to calculate tone within financial reporting contexts to analyze corporate 10-K and MD&A disclosures. They find market reactions to different compositions of tone suggesting that financial statement users identify signals within companies' narrative disclosures and make decisions accordingly. Henry and Leone (2016) suggest that financial-specific word lists (such as Loughran and McDonald's (2011) list) are better at explaining the market reaction than more generic word lists. The literature notes that positive and negative tone in disclosures can influence the cost of capital (Kothari *et al.*, 2009), the amount of accruals (Li, 2010), future return on assets (Davis *et al.*, 2012), abnormal returns (e.g. Feldman *et al.*, 2010; Chen *et al.*, 2018), bond rating downgrades (Agarwal *et al.*, 2016) and the likelihood of missing analyst expectations (Allee and Deangelis, 2015). MD&A tone can also help to predict the likelihood of an auditor's going concern opinion and the probability of subsequent bankruptcy (Mayew *et al.*, 2015).

Similar to corporate research, there is some evidence suggesting that MD&A tone is informative for assessing a government's financial reporting quality and organizational performance. Municipality MD&A tone is found to be negatively associated with both future reporting delay (Rich *et al.*, 2016) and future internal control weaknesses (Rich *et al.*, 2018). The analyses within Rich *et al.* (2018) also show that MD&A tone is negatively associated with general fund deficits and positively associated with general fund intergovernmental revenues. As governments are expected to provide services instead of being profit driven, these findings suggest that finance officers display concern when expenditures exceed revenues but express confidence when additional funding bolsters financial condition. Unlike some of the corporate studies investigating associations tone and external outcomes, Rich *et al.* (2016, 2018) only analyze internal associations with tone. Since research has not addressed stakeholders' reactions to linguistic tone in a governmental reporting context, this study is relevant to determine how discretionary narrative disclosures are associated with several bond characteristics.

## Hypotheses

Narrative disclosures are intended to help financial statement users understand the entity's finances and operations over the fiscal period and subsequently assist users' decision-making. Corporate sector research suggests that the linguistic tone is associated with future debt-related factors such as cost of capital (Kothari *et al.*, 2009) and bond ratings (Agarwal *et al.*, 2016). Compared to the financial markets for publicly traded companies, the bond market for municipalities offers substantially less disclosure (Cuny, 2018), which may inhibit investment decisions. Additionally, bond assessments from the private sector may not be generalized to the governmental sector because of differences in financial reporting and service orientation (GASB, 2006). To limit the degree of information asymmetry in the municipal context, one possibility is that bond analysts rely on qualitative information in MD&A disclosures when making assessments of risk (Bloch, 2016).

Following evidence that favorable (unfavorable) quantitative financial performance (e.g. Marlowe, 2011; Callahan and Waymire, 2015) and higher (lower) disclosure quality (e.g. Baber and Gore, 2008; Baber *et al.*, 2013; Henke and Maher, 2016; Park *et al.*, 2017) are associated with better (worse) bond outcomes, municipal analysts could perceive tone within the municipal MD&A to be informative. Additionally, Beck *et al.* (2019) highlight that unobservable negative information can infer higher risk and can influence bonds with more pessimistic ratings, higher bond yield premiums and higher agency fees. If municipal bond analysts perceive that positive (negative) tone provides useful information about future performance and the likelihood of default, then we expect lower (higher) debt costs for municipalities with positive (negative) disclosure tone. Therefore, our first hypotheses state the following:

*H1a.* True interest costs (TICs) are inversely associated with positive municipal MD&A disclosure tone.

*H1b.* TICs are directly associated with negative municipal MD&A disclosure tone.

Even though municipal MD&A tone could provide information content toward inferring bond interest costs, the impact of tone may have different interpretations among various users. Since evaluating creditworthiness is somewhat subjective (Ederington, 1986), and agencies can have differences in their weighting of objective rating measures (Walker and Krueger, 2009), rating analysis judgments may show variation. Corporate firms having more obfuscated asset classes (Livingston *et al.*, 2007), disclosing less comparable financial information (Kim *et al.*, 2013) and being in more opaque industries (Morgan, 2002) have been shown to relate to more bond rating disagreements or splits (i.e. rating differences between Moody's and Standard and Poor's systems on a given bond issuance). Governmental research finds that uncertainty over the assumed discount rate for pensions (Hallman and Khurana, 2015) can be influential in forming rating splits.

It is unclear from the limited governmental research how tone could be interpreted by municipal bond analysts. As uncertainty over financial information can lead to variability in bond ratings (Morgan, 2002), the positivity of tone within qualitative disclosures could reduce or enhance the uncertainty. If linguistic tone characteristics help investors to arrive at a consensus regarding bond issue default risk, one consequence would be a reduced likelihood of bond rating disagreement. However, if linguistic tone introduces the need for additional subjective interpretation of qualitative information, this would likely result in more bond rating disagreement. Therefore, we state our second hypothesis in the null as follows:

*H2.* Bond rating disagreements are independent of municipal MD&A disclosure tone.

# Research design and results

## Sample and descriptive statistics

Similar to Rich *et al.* (2016), we download Comprehensive Annual Financial Reports (CAFRs) from municipality websites from 2011 to 2015 and extract the MD&A section for textual analysis [2]. Following prior studies (Mayew *et al.*, 2015; Rich *et al.*, 2016; Allee *et al.*, 2020), we import the Loughran and McDonald (2011) dictionary into the Linguistic Inquiry and Word Count (LIWC) software because of its applicability to a financial context [3]. Given the importance of a dictionary with the proper context (Grimmer and Stewart, 2013), we augment the Loughran and McDonald (2011) list with the government-specific words suggested in Appendix B of Rich *et al.* (2018). Then, we identified the positive and negative words that appear in more than five percent of the sample and evaluated each for the governmental context. This resulted in the removal of seven words from the negative word list (absences, bridge, claims, encumbrances, fines, refuse and unemployment) and three words from the positive word list (accountable, benefit and stabilization) [4].

We provide two excerpts of MD&A disclosures in the Appendix to illustrate construction of our tone measures, which we calculate as the percentage of *positive* or *negative* words to total words, respectively, based on the Loughran and McDonald (2011) dictionary with modifications from Rich *et al.* (2018) and our evaluation [5]. The Iowa City, Iowa excerpt exemplifies the power of linguistic tone, as it provides qualitative explanation of conditions that are not available from examination of financial statements alone.

Data on the municipal form of government and council election cycles are from the 2011 International City/County Management Association (ICMA) Municipal Form of Government Survey and other financial data are manually collected from CAFRs. Population and median income information are obtained from the US census, and details on the recipients of the Certificate of Excellence in Financial Reporting are obtained from the Government Finance Officers Association (GFOA).

Table 1 provides a detailed breakdown of our sample selection procedures. Our research is based on the 362 municipalities from Rich *et al.* (2016), including the jurisdictions with more than 25,000 citizens those responded to the 2011 ICMA survey and other data availability filters. Using Thomson Reuters (SDC), we find 2,048 bond issuances by these 362 municipalities from 2012 to 2016. To ensure that a municipality's bond issuances follow their CAFR release (thereby allowing the bond market to react to the information therein), we keep issues with a bond sale date beyond the CAFR's CPA signing date (a proxy for CAFR release date to the public). Thus, our municipal MD&A disclosures are from 2011 to 2015, while our bond issues are from 2012 to 2016 [6]. After deleting municipalities with missing TIC details, MD&A disclosures, bond market data and other control variable data, our final sample consists of 446 bond issues from 107 unique municipalities in 37 states during the years 2012–2016 [7]. Since our dependent variables are not available for every bond issuance in our sample, the number of observations varies for each of our models.

## Debt costs

Our primary goal is to test whether MD&A linguistic tone in municipal MD&A disclosures contains valuable information in terms of debt costs. We propose the following model to investigate our Hypotheses 1a and 1b.

The dependent variable is *TIC*, which is defined as the interest rate that sets the present value of the principal and interest payments equal to the issue proceeds received by the issuer. Note that *TIC* is measured at time (*t+1*), which indicates that the respective bond issuance follows the CAFR release at time (*t*). The variables of interest are *Positive* and *Negative* tone*,* where a negative coefficient on *Positive* (Hypothesis 1a) and/or a positive coefficient on *Negative* (Hypothesis 1b) would suggest perceptions of higher (lower) default risk by bond investors.

Our model includes several control variables that capture bond characteristics shown by prior research to reflect bond default risk. *GO bond* is an indicator set to one for general obligation issues and zero for revenue issues. *Amount* is the natural log of the face value of the issue. *Maturity* is the natural log of the years to maturity for a given bond. *Competitive bid* is an indicator set to one for sales through a competitive bidding process (zero otherwise). We anticipate a negative relationship between *TIC* and bonds sold through competitive bidding (Baber and Gore, 2008; Apostolou *et al.*, 2014; Henke and Maher, 2016). *Insured* is an indicator set to one for insured issues (zero otherwise). Several pieces of literature (e.g. Plummer *et al.*, 2007; Baber and Gore, 2008; Baber *et al.*, 2013; Bonsall and Miller, 2017) use an ordinal measure for analyzing bond ratings. As such, *bond rating* indicates Moody's ratings, where Aaa = 1, and the numerical rating increases by 1 as the bond rating declines [8]. We also include *bond buyer index* of market yields for municipal bond issuances to control for overall market interest rates.

We capture the following municipality specific characteristics in our analysis. We control for municipal size (*Population*) as the log of citizens in a given municipality. We measure municipal wealth (*Median income*) as the log of county-level median income. We predict a negative coefficient for *median income* due to reduced default risk for the municipality stemming from greater access to resources.

*GFOA certificate* is an indicator variable equal to one for municipalities receiving the GFOA Certificate of Excellence in Financial Reporting (zero otherwise). Given that the *GFOA certificate* indicates greater overall disclosure quality, this should result in a negative coefficient. Additionally, *staggered council* is an indicator variable equal to one for municipalities with staggered council elections (zero otherwise) and proxies for municipal manager entrenchment. Baber *et al.* (2013) find that municipalities with staggered council elections are more likely to experience restatements. However, Rich and Zhang (2014) and Peterson (2018) show that staggered council elections are associated with fewer internal control weaknesses. Thus, we do not make a prediction with regard to *staggered council. Council manager* is an indicator variable equal to one for municipalities that employ a professional chief executive (zero otherwise). We predict lower debt costs for municipalities organized based on the council-manager model given prior findings of greater financial reporting quality (Evans and Patton, 1987; Baber *et al.*, 2013).

Next, we control for the financial health of the municipality by including *govt funds surplus* denoting a surplus from governmental funds (i.e. governmental funds revenue–expenditures). In addition, we include governmental fund expenses (*Govt funds expenses*) and the change in fund balance in governmental funds (*Chg fund bal govt funds*). We predict that municipalities with better financial health have lower default risk, and therefore will have lower debt costs. We also control for infrastructure spending (*Capital outlay*) and predict a positive association with debt costs because greater spending levels may place the municipality at a higher default risk.

We also include an internal control weakness index (*ICW index*) designed to consider the impact of disclosed internal control issues, where a material weakness is coded as 2, a significant deficiency not designated a material weakness is 1 and no internal control weakness is 0 (López and Peters, 2010; Rich and Zhang, 2014). This variable allows us to control for the risk and severity of potential material misstatements within financial reporting. Furthermore, we include an indicator variable equal to one (zero otherwise) for municipalities located in a state with GAAP requirements (*GAAP state*). We predict a negative coefficient given findings of lower debt costs in GAAP states from Baber and Gore (2008). Lastly, we include year-fixed effects and cluster by municipality (e.g. Baber *et al.*, 2013; Callahan and Waymire, 2015; Beck *et al.*, 2019) to control for other regulatory differences that could impact disclosure decisions. Values for independent continuous variables are winsorized at the one percent (99 %) tails of the distribution to minimize the effect of influential observations (e.g. Mayew *et al.*, 2015; Henry and Leone, 2016). Table 2 provides detailed variable definitions.

Bond rating disagreements

To analyze Hypothesis 2, we model the probability of bond rating disagreements as a function of MD&A disclosure tone and other controls following the approach described in Hallman and Khurana (2015) as follows:

*Rating split* is an indicator variable that takes the value of one when Moody's, Fitch and Standard and Poor's issue conflicting ratings and zero otherwise. We make no predictions for associations between either *Positive* or *Negative* tone and *Rating split*, but note that positive (negative) values suggest more (less) disagreement among bond rating agencies. All other variables are defined previously, except for *unemployment*, which is the unemployment rate in a given municipality.

## Primary results

Table 2 provides the descriptive statistics for our sample. The mean (median) *TIC* is 2.596 (2.656)%. We find that financial managers use more positive words than negative words (means of 0.544 vs. 0.363 % of MD&A words, respectively). The Pearson correlations for all variables are presented in Table 3. Noteworthy is the fact that *positive* (*negative*) is inversely (directly) correlated with *bond rating*, [9] while directly (inversely) correlated with *chg fund bal govt funds*. Each of these results corroborates the assertion that positive (negative) linguistic tone communicates favorable (unfavorable) information about municipality conditions and supports the use of our measures [10].

Table 4, Column 1 presents the regression results for Equation (1) using *TIC* as the dependent variable. The coefficient on *negative* is positive and significant (coefficient = 0.53; *t*-statistic = 3.21), indicating that municipalities with more negative tone in MD&A disclosures pay higher future bond interest costs on average. Specifically, our findings suggest an increase of about nine basis points for one standard deviation change in *negative* tone [11]. Our results are consistent with current research in the corporate setting that shows market reaction to bad news is significantly larger than the reaction to good news (Kothari *et al.*, 2009). One interpretation of this finding is that investors perceive disclosures containing negative tone as reflecting concern about the municipality's future prospects, which results in higher default risk. Therefore, we assert our evidence supports Hypothesis 1b that investors can interpret negative MD&A disclosure tone when pricing municipal bond issues.

We do not find support for Hypothesis 1a, since the coefficient for *positive* is not significant in our primary analysis. One possible interpretation involves concerns with positive tone because of the potential for positive words to frame a negative statement (such as “not good”) (Loughran and McDonald, 2016). For our control variables, our findings are consistent with the prior literature (Baber *et al.*, 2013; Reck and Wilson, 2014; Henke and Maher, 2016) in that we find that debt costs are higher for general obligation bonds, bonds with high maturity and those with lower bond ratings. *TIC* is also positively associated with the bond buyer index and capital expenditures. However, our results do not show a significant negative association between *TIC* and *competitive bid*. Since our sample has almost 98% of bonds with competitive bidding, the lack of variable variation could obscure the relationship with *TIC* as found in the prior literature (e.g. Baber and Gore, 2008; and Henke and Maher, 2016). Lastly, we find that *TIC* is lower for municipalities with more surplus, larger amount bonds and those with staggered council elections.

Loughran and McDonald (2016) express that management rarely negates a negative word to make a positive statement. Nevertheless, as a validity check, we utilize an alternative measure of linguistic tone that considers the “*net positive tone*” calculated as *positive*–*negative* (Agrawal *et al.*, 2016). Results with this alternative measure as an explanatory variable (untabulated) are consistent with those presented in Table 4. In addition, we tested the validity of our results using both the base Loughran and McDonald (2011) dictionary and the Rich *et al.* (2018) adjustments. We note our results are very similar to the tables presented.

Next, we examine the idea of language communicating information about future municipal prospects. We ran our TIC model separately for bonds maturing in greater/less than 15 years, with the results presented in Columns 2 and 3 of Table 4. This further analysis suggests that our findings are driven by the “high” maturity subsample (approximately 60% of observations), with a negative coefficient on *positive* tone (*t*-statistic = −1.92), and a positive coefficient on *negative* (*t*-statistic = 3.29). Alternatively, we find no statistically significant results on *positive* or *negative* for the lower maturity subsample. We take these findings to further support the conclusion that bond investors use tone to make inferences regarding long-term risk fundamentals.

Table 5 shows the descriptive statistics for our bond rating differences sample. We have a total of 221 observations, which represent a reduction in sample size due to missing Moody's, Fitch and Standard and Poor bond ratings within the SDC Platinum dataset. The mean *rating split* is 0.530, suggesting a slight majority of sample bond issuances had conflicting ratings. Consistent with Table 2, we also find that on average managers use more positive words than negative words (0.563 vs 0.359%).

Table 6 presents the regression results for Equation (2) using *rating split* as the dependent variable. The coefficient on *negative* is positive and significant (coefficient = 4.61; t-statistic = 2.37), suggesting that negatively framed MD&A language is associated with greater subjective interpretation by bond analysts, prompting disagreement among the three rating agencies regarding future prospects. Therefore, we reject the null form of Hypothesis 2 in favor of the alternative that bond analysts interpret negative tone information differently in terms of the impact on future default risk [12]. This is consistent with finding that bond yield premium reactions are greater for pessimistic unobservable information than for optimistic unobservable information (Beck *et al.*, 2019). In addition, we find that the likelihood of a *rating split* is negatively associated with general obligation bonds (*GO bond*), *median income* and *capital outlay*. Overall, our evidence shows the textual tone in municipal MD&A disclosure provides information content to the debt holders and rating agencies.

## Robustness tests and other analyses

One possibility is that our results are driven by differences in financial circumstances at a given municipality. Bond analysts could perceive an increase (decrease) in revenues as decreased (increased) credit risk. To explore this matter further, we divide our sample into two groups based on whether the municipality had an increase or decrease in revenue from governmental funds in the given year. Our findings (untabulated) suggest that *negative* tone is associated with higher future interest costs for municipalities with revenue increases but not for revenue decreases.

To further consider underlying municipal conditions, we follow Baginski *et al.* (2018) and model “expected” value for our tone measures (e.g. *positive* and *negative*) [13]. Then, we calculated a “residual” tone based on the reported amount minus the residual from these additional specifications. Substitution of these residual tone proxies for our original tone proxies resulted in extremely similar results (untabulated), which lend credence to the argument that our results are not driven by opportunistic tone choices by municipal managers.

Next, we considered the possibility that disagreements among rating agencies biases our *TIC* results by performing a Heckman (1979) two-stage procedure where the first stage reflects the choice to obtain ratings from multiple agencies. Specifically, we employ a probit model with the dependent variable as an indicator equal to one (zero otherwise) for municipality years with bond issues rated by all three agencies (Standard and Poor's, Moody's and Fitch) and *GO bond*, *population*, *amount* and *govt funds surplus* as explanatory variables. The second stage includes the inverse Mills ratio from the first stage, as well as *rating split*. Our results for the second stage (untabulated) are similar to those presented in Table 4. We also note insignificant coefficients on both the inverse Mills ratio and *rating split*, suggesting that disagreements do not moderate our *TIC* and tone analysis.

We also examine our findings by different credit rating subsets, since it is possible that qualitative commentary will matter more for issues perceived to carry higher risk (untabulated). We divide our sample by using the median rating as the cutoff point and find that only *negative* tone has a positive, significant coefficient in the low rating subsample, while both *positive* and *negative* tones are not significant in the high rating subsample. This suggests that linguistic tone is more important for municipalities with low credit ratings possibly because of fewer alternative sources of information about municipality prospects.

We also use several alternate specifications for variables. We created indicator variables for each different bond rating and included them in our model *in lieu* of *bond rating*. Our findings (untabulated) are very similar to those shown in Table 4. Next, we employ alternative definitions for surplus, including revenue-scaled amounts and measurement exclusively at the general fund level. Results (untabulated) using these alternative measures are virtually identical to those presented in Tables 4 and 6. We also employed alternative measurements of *capital outlay* on a revenue-scaled basis and noted similar results. Lastly, we note similar results without clustering standard errors and using unwinsorized data.

# Conclusion

Current research in the corporate sector suggests that there is information content in managers' narrative disclosures, including the language choices wherein. However, whether the results apply to the governmental setting is an empirical question. In this study, we provide an exploratory step toward understanding the capital market effects of language choices within the narrative disclosures of municipal managers.

Using a sample of 446 municipal bond issuances between 2012 and 2016, our results show that more negative tone in municipal MD&A disclosures is associated with greater future interest costs and more frequent rating disagreements among bond rating agencies. This suggests that bond market participants value qualitative information in government financial reporting, but its interpretation can be subjective. Our findings should be of value to a variety of stakeholders, including municipalities making disclosure decisions, bond analysts supporting the informational efficiency of the bond market, investors assessing the riskiness of bond issues and regulators looking to evaluate the informativeness of disclosures under GASB 34. Our study is particularly important in the current economy of rising indebtedness due to coronavirus disease 2019 (COVID-19) (de Jong and Ho, 2020; Grossi *et al.*, 2020; Joyce and Suryo, 2020).

Our research provides an important step for future research, where researchers could investigate clustering algorithms that discover the main clusters of words in the documents and convey more information about the content of the sections. Additionally, while our results suggest associations between disclosure tone and interest costs, the underlying reasons driving specific word choices could provide useful insight into market participants. Another interesting research area is to study the informational value of other linguistic characteristics, such as readability, in the municipal bond market. Finally, future research can examine the disclosure and transparency of the municipal advisors and underwriters under the Dodd–Frank Act.

Our research has the following policy implications. Given that our results show qualitative information in MD&A disclosures is informative in the municipal bond market, our research can be used as a tool for state governments to assess the informativeness of their municipalities' MD&A disclosures regarding debt. Evidence from our paper also stresses to municipalities the importance of narrative disclosures within the MD&A on debt financing. This could encourage municipalities to properly train finance staff on best disclosure practices, possibly through organizations such as ICMA and GFOA.

As the GASB evaluates the informativeness of disclosures under GASB 34 (GASB, 2020), it can utilize our models to assess municipalities' disclosure quality in informing the debt market. To encourage more transparency, the GASB can potentially place more emphasis on the discussion of risks and conditions that the governments are facing in the MD&A disclosure. Bond rating agencies and investors can utilize our models to understand the importance of discretionary disclosure in evaluating the riskiness of municipal bonds.

One limitation of our results is that these only reflect associations between disclosure tone and interest costs and resultantly do not imply a causal relationship. Furthermore, our relatively small sample size implies that our findings may not generalize to the overall population of municipalities raising funds through debt financing. Additionally, dictionary-based analyses might ignore context that is only available from a detailed review of disclosure. Nevertheless, our study provides an important step toward understanding the relationship between linguistic tone and municipal bond characteristics.

Table 1 Sample selection

|  |  |
| --- | --- |
| Cities and towns from Rich *et al.* (2016) | 362 |
| Bond issuances for the 362 municipalities in Thomson Reuters from 2012–2016 | 2,048 |
| Less those with missing TIC data from Thomson Reuters | (1,323) |
| Less those with missing bond controls from Thomson Reuters | (215) |
| Less those with missing governance controls from ICMA | (39) |
| Less those with missing financial controls from CAFRs | (10) |
| Less those with missing other control variables | (15) |
| Final sample | 446 |

Table 2 Descriptive statistics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mean** | **Median** | **Std. dev** | **Min** | **Max** |
| TIC | 2.596 | 2.656 | 0.852 | 0.762 | 4.848 |
| Positive | 0.544 | 0.550 | 0.153 | 0.220 | 0.940 |
| Negative | 0.363 | 0.330 | 0.151 | 0.110 | 0.810 |
| Go bond | 0.848 | 1.000 | 0.360 | 0.000 | 1.000 |
| Amount | 2.380 | 2.300 | 1.069 | −0.942 | 5.850 |
| Maturity | 2.700 | 2.948 | 0.499 | −0.074 | 3.404 |
| Competitive bid | 0.978 | 1.000 | 0.148 | 0.000 | 1.000 |
| Insured | 0.036 | 0.000 | 0.186 | 0.000 | 1.000 |
| Bond rating | 2.576 | 3.000 | 1.366 | 1.000 | 9.000 |
| Bond buyer index | 4.136 | 4.005 | 0.495 | 3.290 | 5.510 |
| Population (000) | 156.175 | 89.941 | 197.423 | 25.239 | 885.343 |
| Median income (000) | 48.443 | 45.479 | 12.375 | 28.131 | 90.900 |
| GFOA certificate | 0.854 | 1.000 | 0.353 | 0.000 | 1.000 |
| Staggered council | 0.251 | 0.000 | 0.434 | 0.000 | 1.000 |
| Council manager | 0.713 | 1.000 | 0.453 | 0.000 | 1.000 |
| Govt fund surplus | −0.169 | −0.090 | 0.267 | −1.763 | 0.412 |
| Govt fund expenses | 2.031 | 1.480 | 1.281 | 0.618 | 7.421 |
| Capital outlay | 0.304 | 0.197 | 0.271 | 0.021 | 1.810 |
| Chg fund bal govt funds | 0.085 | 0.054 | 0.214 | −0.863 | 0.968 |
| ICW index | 0.605 | 0.00 | 0.827 | 0.000 | 2.000 |
| GAAP state | 0.200 | 0.000 | 0.400 | 0.000 | 1.000 |

**Note(s):** This table provides summary statistics for the key variables in our interest cost analysis, with variable descriptions as follows: *TIC* is true interest cost, which is computed as the discount rate that equates the present value of the bond principal and interest payments with proceeds; *positive* is the percentage of positive to total words in MD&A disclosure based on the adjusted Loughran and McDonald (2011) dictionary; *negative* is the percentage of negative to total words in MD&A disclosure based on the adjusted Loughran and McDonald (2011) dictionary; *GO bond* is an indicator set to one for general obligation issues (zero otherwise); *amount* is the natural log of the face value of the issue; *maturity* is the natural log of the years of maturity for a given issue; *competitive bid* is an indicator set to one for sales through a competitive bidding process (zero otherwise); *insured* is an indicator set to one for insured issues (zero otherwise); *bond rating* is a numerical code representing Moody's credit rating for a debt issue. The scale codes Aaa as 1 and increases for lower quality ratings (Aa1 = 2, Aa2 = 3, etc.); *bond buyer index* is the market yield for municipal general obligation or revenue bonds; *population* is the number of citizens in thousands in a given municipality; *median income* is the median income in thousands at the county level; *GFOA certificate* is an indicator variable equal to one for municipalities receiving the Government Finance Officers Association Certificate of Excellence in Financial Reporting (zero otherwise); *staggered council* is an indicator variable equal to one for municipalities with staggered council elections (zero otherwise); *council manager* is an indicator variable equal to one for municipalities that employ a professional chief executive (zero otherwise); The financial variables (*govt fund surplus, govt fund expenses, capital outlay* and *chg fund bal govt funds)* are in thousands and scaled by population; *GAAP state* is an indicator variable equal to one if a municipality is located within a GAAP mandated state (zero otherwise) based on Baber and Gore (2008) and *ICW index* is an index measuring the severity of internal control weaknesses that takes on a value of 2 for material weaknesses, 1 for significant deficiencies and 0 for no disclosed internal control weaknesses (López and Peters, 2010)

Table 3 Pairwise correlations

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **[1]** | **[2]** | **[3]** | **[4]** | **[5]** | **[6]** | **[7]** | **[8]** | **[9]** | **[10]** | **[11]** | **[12]** | **[13]** | **[14]** | **[15]** | **[16]** | **[17]** | **[18]** | **[19]** | **[20]** | **[21]** |
| 1 TIC | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 Positive | 0.01 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 Negative | 0.05 | 0.23\* | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 GO bond | −0.15\* | 0.14\* | 0.09 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 Amount | 0.28\* | −0.05 | 0.04 | −0.08 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 Maturity | −0.57\* | 0.03 | −0.02 | −0.07 | −0.41\* | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 Competitive bid | −0.02 | −0.01 | −0.19\* | 0.02 | −0.07 | 0.03 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 Insured | 0.04 | −0.01 | 0.11\* | −0.02 | 0.05 | 0.01 | −0.05 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 Bond rating | 0.16\* | −0.15\* | 0.13\* | −0.27\* | −0.04 | 0.06 | −0.12 | 0.39\* | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 Bond buyer index | 0.41\* | −0.02 | −0.16\* | −0.45\* | 0.04 | 0.05 | 0.02\* | −0.02 | 0.06 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |
| 11 Population | 0.14\* | −0.04 | 0.04 | −0.08 | 0.50\* | 0.08 | −0.01\* | −0.03 | −0.19 | 0.08 | 1.00 |  |  |  |  |  |  |  |  |  |  |
| 12 Median income | 0.06 | 0.14\* | 0.17\* | 0.16\* | 0.14\* | 0.16\* | 0.04\* | 0.09 | −0.22\* | −0.12\* | −0.02 | 1.00 |  |  |  |  |  |  |  |  |  |
| 13 GFOA | −0.09 | 0.04 | 0.01 | −0.03 | −0.05 | −0.09 | 0.02 | −0.06 | −0.26\* | −0.03 | −0.01 | −0.21\* | 1.00 |  |  |  |  |  |  |  |  |
| 14 Staggered council | −0.04 | −0.18\* | 0.18\* | 0.12\* | 0.21\* | 0.03 | −0.05 | 0.08 | 0.04 | −0.08 | 0.19\* | 0.21\* | −0.30\* | 1.00 |  |  |  |  |  |  |  |
| 15 Council manager | −0.09 | 0.10\* | −0.16\* | −0.10\* | −0.14\* | −0.09 | 0.07 | −0.17\* | −0.23\* | 0.06 | −0.01 | −0.29\* | 0.50\* | −0.43\* | 1.00 |  |  |  |  |  |  |
| 16 Govt fund surplus | −0.24\* | 0.02 | −0.10\* | −0.13 | −0.24\* | −0.18 | 0.10 | −0.01 | −0.03 | 0.03 | −0.08 | −0.07 | 0.13\* | −0.07 | 0.29\* | 1.00 |  |  |  |  |  |
| 17 Govt funds exp | 0.16\* | −0.10\* | 0.21\* | 0.14 | 0.18\* | 0.19\* | −0.12\* | 0.16\* | 0.03 | −0.10 | −0.10 | 0.45\* | −0.21\* | −0.38\* | −0.40\* | −0.40\* | 1.00 |  |  |  |  |
| 18 Capital outlay | 0.23\* | −0.10\* | −0.09 | 0.00 | 0.03 | 0.20 | 0.03 | −0.06\* | −0.06 | −0.04 | −0.13 | 0.17\* | 0.11\* | −0.08\* | −0.07 | −0.55\* | 0.54\* | 1.00 |  |  |  |
| 19 Chg fund bal GF | 0.03 | 0.09\* | −0.12\* | −0.06 | −0.01 | 0.07 | 0.22\* | −0.17\* | −0.12\* | −0.04 | −0.13\* | 0.09 | 0.11\* | −0.07 | 0.01 | 0.09 | −0.07 | 0.22 | 1.00 |  |  |
| 20 ICW index | 0.03 | 0.10\* | 0.02 | 0.03 | 0.02 | −0.05 | 0.07 | 0.11\* | 0.14\* | 0.05 | 0.09\* | −0.05 | −0.16\* | −0.04 | −0.12\* | −0.03 | −0.05 | −0.07 | 0.04 | 1.00 |  |
| 21 GAAP state | −0.06 | −0.08 | 0.16\* | −0.04 | 0.02 | 0.03 | −0.08 | 0.11\* | 0.08 | −0.08 | 0.02 | −0.17\* | 0.06 | 0.19\* | 0.04 | 0.12 | −0.05 | −0.20 | −0.08 | −0.16\* | 1.00 |

**Note(s):** This table provides pairwise correlations for the variables in our study. \* denotes significance at the 5% level. Variable descriptions are included in Table 2

Table 4 OLS regression results using TIC as the dependent variable

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Full sample [1]** | **Maturity > 15 Years [2]** | **Maturity < 15 Years [3]** |
| Positive | −0.03 (−0.16) | −0.34\* (−1.92) | 0.32 (1.41) |
| Negative | 0.53\*\*\* (3.21) | 0.71\*\*\* (3.29) | −0.23 (−0.75) |
| GO bond | 0.32\*\*\* (3.25) | 0.41\*\*\* (4.47) | 0.36\*\*\* (3.07) |
| Amount | −0.06\*\* (−2.24) | −0.09\*\*\* (−2.89) | −0.07 (−1.53) |
| Maturity | 1.07\*\*\* (8.90) | 1.57\*\*\* (5.33) | 0.67\*\*\* (5.06) |
| Competitive bid | −0.16 (−0.29) | 0.64\*\*\* (3.23) | −1.35 (−1.35) |
| Insured | 0.03 (0.23) | 0.01 (0.02) | 0.37 (1.11) |
| Bond rating | 0.09\*\* (2.26) | 0.14\*\*\* (4.27) | 0.04 (0.75) |
| Bond buyer index | 0.74\*\*\* (10.84) | 0.74\*\*\* (11.87) | 0.74\*\*\* (6.35) |
| Population | 0.14\*\*\* (3.84) | 0.14\*\*\* (4.41) | 0.12 (1.32) |
| Median income | 0.07 (0.54) | 0.19\* (1.68) | −0.06 (−0.36) |
| GFOA certificate | −0.03 (−0.40) | 0.09 (1.03) | 0.05 (0.46) |
| Staggered council | −0.13\*\* (−2.22) | −0.20\*\*\* (−2.64) | −0.12 (−1.22) |
| Council manager | 0.03 (0.47) | 0.11 (1.27) | −0.13 (−1.32) |
| Govt fund surplus | −0.20\* (−1.88) | −0.09 (−0.90) | −0.52\*\* (−2.52) |
| Govt fund expenses | −0.01 (−0.41) | −0.01 (−0.29) | 0.01 (0.22) |
| Capital outlay | 0.32\*\* (2.21) | 0.28\* (1.68) | 0.15 (0.70) |
| Chg fund balance govt funds | 0.16 (1.36) | 0.03 (0.26) | 0.32 (1.32) |
| ICW index | 0.01 (0.58) | 0.04 (1.61) | −0.05 (−1.13) |
| GAAP | 0.02 (0.40) | 0.05 (0.65) | −0.08 (−0.84) |
| Intercept | −6.18\*\*\* (−3.39) | −9.77\*\*\* (−5.90) | −2.29 (−0.90) |
| Number of observations | 446 | 267 | 179 |
| Adjusted *R*-squared | 0.66 | 0.53 | 0.52 |

**Note(s):** \*, \*\* and \*\*\* indicate significance at *p* < 0.10, 0.05 and 01; robust t-statistics are reported in parentheses, with standard errors clustered by municipality following procedures outlined by Rogers (1993). Year-fixed effects are included but not reported

This table presents OLS regression estimates based on Equation (1), where the dependent variable is true interest cost (*TIC*), which is computed as the discount rate that equates the present value of the bond principal and interest payments with proceeds. All variables are defined in Table 2, except for *population* and *median income*, which are included at logged values

Table 5 Descriptive statistics for bond rating difference analysis

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mean** | **Median** | **Std. dev** | **Min** | **Max** |
| Rating split | 0.530 | 1.000 | 0.500 | 0.000 | 1.000 |
| Positive | 0.563 | 0.580 | 0.152 | 0.220 | 0.990 |
| Negative | 0.359 | 0.330 | 0.149 | 0.110 | 0.950 |
| Go bond | 0.571 | 1.000 | 0.495 | 0.000 | 1.000 |
| Amount | 3.368 | 3.373 | 1.136 | 0.375 | 6.235 |
| Maturity | 2.817 | 2.986 | 0.472 | 1.328 | 3.417 |
| Competitive bid | 0.346 | 0.000 | 0.476 | 0.000 | 1.000 |
| Insured | 0.16 | 0.000 | 0.367 | 0.000 | 1.000 |
| Population (000) | 327.636 | 236.171 | 274.874 | 39.456 | 900.152 |
| Median income (000) | 45.637 | 42.859 | 9.831 | 28.068 | 70.114 |
| Unemployment | 6.702 | 6.500 | 1.953 | 3.3 | 11.3 |
| Govt fund surplus | −0.161 | −0.159 | 0.150 | −0.617 | 0.329 |
| Govt fund expense | 1.763 | 1.260 | 1.091 | 0.683 | 6.005 |
| Capital outlay | 0.203 | 0.168 | 0.153 | 0.013 | 1.142 |
| Chg fund bal govt funds | 0.039 | 0.004 | 0.165 | −0.273 | 1.125 |
| GAAP | 0.348 | 0.000 | 0.477 | 0.000 | 1.000 |

**Note(s):** This table provides summary statistics for the key variables in our bond rating disagreement analysis, with variable descriptions in Table 2 except as follows: *Rating split* is an indicator variable that takes the value of one when Moody's, Fitch and Standard and Poor's issue conflicting ratings and zero otherwise; *unemployment* is the unemployment rate in a given municipality

Table 6 Logit regression results using bond ratings differences as the dependent variable

|  |  |
| --- | --- |
| Positive | −1.54 (−0.52) |
| Negative | 4.61\*\* (2.37) |
| GO bond | −1.80\*\* (−2.06) |
| Amount | 0.20 (0.68) |
| Maturity | −0.38 (−0.91) |
| Competitive bid | −0.55 (−0.78) |
| Insure | −0.32 (−0.35) |
| Population | −0.51 (−1.19) |
| Median income | −3.89\*\* (−2.18) |
| Unemployment | −0.63 (−1.55) |
| Governmental fund surplus | −1.71 (−0.54) |
| Governmental fund expenses | 0.52 (0.95) |
| Capital outlay | −10.77\*\* (−2.46) |
| Change in fund balance in governmental funds | −0.37 (−0.20) |
| GAAP | 0.51 (0.45) |
| Intercept | 55.09\*\* (2.56) |
| Number of observations | 221 |
| Adjusted *R*-squared | 0.33 |

**Note(s):** \*, \*\* and \*\*\* indicate significance at *p* < 0.10, 0.05 and 01; robust t-statistics are reported in parentheses, with standard errors clustered by municipality following procedures outlined by Rogers (1993). Year-fixed effects are included but not reported

This table presents logit regression estimates based on Equation (2), where the dependent variable, *rating split*, is an indicator variable that takes the value of one when Moody's, Fitch and Standard and Poor' issue conflicting ratings and zero otherwise. Variables are described in Table 2, except for *unemployment*, which is the unemployment rate in a given municipality. *Population* and *median income*, which are included at logged values

# Notes

1. Rich *et al.* (2021) determine that municipal MD&A content changes vary directly with relevant financial and organizational events, such as changes in fund balance from governmental funds, auditor turnover and changes in unemployment.

2. These MD&A sections can be quite lengthy. Our sample average is approximately 5,000 words for each MD&A. The minimum (maximum) MD&A word count is 2,652 (8,286). The mean (median) is 4,979 (4,803), while the standard deviation is 1,226.

3. We also made sure that each file was “machine readable” and used optical character recognition (OCR) capabilities in Adobe Acrobat Professional as necessary. A further description of the LIWC methodology is available at https://liwc.wpengine.com/how-it-works/.

4. For reference, our sample's top five positive words are “improvements”, “progress”, “improving”, “better” and “positive”, while the top five negative words are “questions”, “deteriorating”, “liquidate”, “uncollected” and “poor”.

5. These measures come directly from the LIWC software, which reads words one at a time and compares to a specified dictionary while also accumulating other statistics such as word counts. Further details are available at http://liwc.wpengine.com/wp-content/uploads/2015/11/LIWC2015\_LanguageManual.pdf.

6. For example, if a municipality has a CPA signing date of December 1, 2013 for its fiscal year 2013 CAFR and a CPA signing date of December 15, 2014 for its fiscal year 2014 CAFR, then all bond issuances between December 1, 2013 and December 15, 2014 would be matched with the municipality's fiscal year 2013 CAFR information. Thus, CAFR information is from year (*t*) and bond characteristics are from year (*t+1*).

7. The final sample's 446 bond issues (21.8% of the 2,048 issues initially gathered from our sample of municipalities) are distributed as follows (number of issues): 2012 (95), 2013 (128), 2014 (74), 2015 (78) and 2016 (71). While we realize that our sample size is small, it is consistent with the current literature (e.g. Reck and Wilson, 2014; Callahan and Waymire, 2015).

8. The complete set of specific bond rating ordinal measures (number of issues in our sample) is as follows: Aaa = 1(121), Aa1 = 2(92), Aa2 = 3(141), Aa3 = 4(64), *A*1 = 5(14), *A*2 = 6(7), *A*3 = 7(5), Baa1 = 8(0), Baa2 = 9(2), Baa3 = 10(0), Ba1 = 11(0), Ba2 = 12(0), Ba3 = 13(0), *B*1 = 14(0), *B*2 = 15(0), *B*3 = 16(0), Caa1 = 17(0), Caa2 = 18(0), Caa3 = 19(0), Ca = 20(0) and C = 21(0).

9. Note that values for *bond rating* increase as creditworthiness decreases.

10. We also read through a sample of 20 random MD&A sections to validate that there is coverage of key items such as changes in net position, budget variances, capital assets and debt. Each of these MD&As included such coverage, which supports the conclusion that useful information is included.

11. The standardized coefficient for *negative* is calculated by multiplying the unstandardized *negative* coefficient by the ratio of the *negative* standard deviation to the *TIC* standard deviation. In our case, 0.53 x (0.151 / 0.852) = 0.094. For comparison to other research findings regarding factors affecting *TIC*, our nine-basis point increase to *TIC* per 1 standard deviation increase in *negative* tone is similar in magnitude to factors such as a bond issue from a municipality in a state with above-median gross product per capita (coefficient 0.12) (Baber and Gore, 2008) and a bond issue from a local government with a one percentage point increase in poverty rate (coefficients between 0.095 and 0.165) (Marlowe, 2010).

12. The overall correctly classified observations is 71.0%. This means our logit model can correctly classify our dependent variable, *rating split*, 71.0% of the time. The sensitivity (true positive rate) and specificity (true negative rate) is 83.7 and 55.1%, respectively, when the probability level is 0.38.

13. Our expectations models consist of *Positivei,t* *(Negativei,t) = γ0* *+ γ1populationi,t* *+ γ2population growthi,t* *+ γ3general fund deficiti,t* *+ εi,t*; where *population* is the log of population for a given city, *population growth* is the one-year percentage change in population and *general fund deficit* is an indicator variable equal to one for cities with a general fund deficit in the current year (zero otherwise).

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