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The Information Content of Municipal Financial Statements: Large-Sample Evidence

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Abstract

The usefulness of financial disclosures is a source of considerable debate in the municipal setting, given their lack of timeliness. This paper empirically examines the extent to which municipal financial disclosures have information content. Using the entire universe of annual financial disclosures from 2009 to 2020, we show that trading activity in the secondary market for municipal bonds increases after the disclosures are filed. Both institutional and retail trades increase around disclosure filings, but the effect is pronounced for retail traders, for whom the reports are more likely to provide new information. Moreover, the heightened trading is pronounced for timelier disclosures, consistent with regulators' views that untimely disclosures are less likely to provide new information. We also find a pronounced response when investors' risk is high and when the disclosures contain risk-related discussions. Our results contrast with earlier research and provide the first large-scale evidence that participants in the U.S. market for municipal bonds perceive financial disclosures to have informational value.

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1. Introduction

This paper provides large-scale evidence about the role of financial disclosures in the municipal bond market. A key objective of municipal financial reports is to provide useful information to the various stakeholders that use financial reports.[1] However, many municipal market participants dispute the usefulness of continuing disclosures, citing their lack of timeliness.[2] Therefore, we empirically examine the extent to which municipal financial reports have information content.

Specifically, we study trading activity in the secondary market for municipal bonds around the filing of annual financial reports. If individual investors update their prior beliefs about bond value based on financial disclosures, they will trade in the secondary market around the information release (e.g., Beaver, 1968; Bamber, 1986; Karpoff, 1986; Atiase and Bamber, 1994). Theoretically, trade arises because of differences across investors in the extent to which they update their beliefs due to the disclosure. These differences come from either differential pre-disclosure information (Kim and Verrecchia, 1991) or from differences in interpreting the disclosure (Harris and Raviv, 1993; Kandel and Pearson, 1995).

However, several features of the municipal bond market reduce the likelihood that disclosures change investors' priors. First, the disclosures are notoriously untimely. The average disclosure in our sample is filed more than nine months after period-end, which reduces the likelihood that the statements provide new information. Second, the cost to investors of processing financial disclosures can be prohibitive (Blankespoor, Dehaan, Wertz, and Zhu, 2019). Approximately 70 percent of municipal bonds are held by retail investors (either directly or indirectly), who have limited capacity to monitor for, acquire, and analyze financial information. Moreover, the historical default rate on municipal bonds is just 0.10 percent (Moody's, 2012). Thus, investors' incentives to incur the processing costs are limited by the minimal credit risk of the securities.

Consistent with these features of the municipal bond market precluding investors' responsiveness to disclosure, prior literature shows that municipal bond investors do not react to annual financial disclosures. Using a small hand-collected sample of cities' annual reports in the 1980s and 1990s, Ingram, Raman, and Wilson (1989) and Reck and Wilson (2006) find that municipal bond prices do not change around report dates.

However, much has changed in the municipal disclosure landscape in the last thirty years. Technological developments such as the Internet have made it easier for issuers to disseminate information broadly. These technological developments, along with the advent of the Municipal Securities Rulemaking Board (MSRB)'s Electronic Municipal Market Access (EMMA) web site (similar to the Securities and Exchange Commission [SEC]'s EDGAR system), have decreased information processing costs for market participants. Given these advances in the information that is now available to market participants, we reevaluate investors' responsiveness to financial disclosures.

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1. The objective comes from the Governmental Accounting Standards Board (GASB), which establishes accounting and financial reporting standards for U.S. state and local governments that follow Generally Accepted Accounting Principles (GAAP).

2. See https://www.gao.gov/assets/gao-12-698.pdf.

One may wonder why recent evidence about investors' reactions to municipal disclosure is scant, while much is known about the evolution of investors' reactions to corporate financial reports.[3] Part of the answer lies in data limitations. Disclosure data, including filing dates and contents, were not readily available previously and had to be hand-collected (Ingram et al., 1989; Reck and Wilson, 2006). However, the breadth of data available to researchers to study disclosure-related questions has dramatically increased recently.

We obtain all continuing disclosures filed with the MSRB through the EMMA system from July 2009 (when they began collecting these disclosures) to December 2020.[4] We focus on annual financial statements because these are the most common disclosure type and are contractually mandated. The data consist of 412,947 annual financial disclosures, which amount to 8,284,927 bond-disclosure observations when the disclosures are linked to the relevant bonds. Audited financial statements comprise 53 percent of disclosures and unaudited annual reports comprise the remaining 47 percent.

The disclosures are similar to those provided by corporations but are non-standardized, less frequent, and less timely. Unlike corporations, the majority of the disclosures in our sample (54%) come from issuers with June fiscal year-ends. The disclosure filings are relatively evenly distributed throughout calendar months, with spikes in December and March (six and nine months after a June fiscal year-end, respectively). Further illustrating the lack of timely disclosure, less than 10 percent of the disclosures are filed within 60 days of period-end, and less than half are filed within six months. Some of the topics discussed in the filings are commonly discussed in corporate 10-Ks. For example, the most frequently discussed topic in the text of the filings relates to the balance sheet (e.g., funds, assets, etc.). By contrast, other topics, such as tax sources, are unique to municipal financial disclosures.

To evaluate whether investors react when annual financial disclosures are filed with the MSRB, we study changes in volume and the number of trades in the months surrounding the filing (e.g., Dick-Nielsen, Feldhütter, and Lando, 2012; Schestag, Schuster, and Uhrig-Homburg, 2016; Bessembinder, Jacobsen, Maxwell, and Venkataraman, 2018). The number of trades captures the number of traders that update their prior beliefs and trading volume encompasses the magnitude of the update. We measure the market response to disclosures using trading activity (instead of returns) because the municipal bond market is illiquid. The median number of trades drops from five to zero within two months of bond issuance. Because bond returns require two trades in consecutive months, the illiquidity dramatically reduces the sample and limits the inferences we can draw. Therefore, we investigate the role of financial disclosures by examining trading activity, similar to Beaver (1968).

We find that trading activity increases in the month the financial disclosure is filed and the month after the filing. In contrast with research from the 1980s, our findings are consistent with the reports providing new information to market participants. In terms of economic magnitude, trading activity increases by 2–3 percent around the disclosure filing. Given the extreme illiquidity of the market, this seemingly small economic magnitude is meaningful.

We also provide some context about the nature of the investors, the bonds, and the content of the disclosures that generate a response. First, we compare the increase in trading activity by investor type,

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3. See, for example Beaver, 1968; Holthausen and Watts, 2001; Barth, Beaver, and Landsman, 2001; Landsman and Maydew, 2002; Francis, Schipper, and Vincent, 2002; Beaver, McNichols, and Wang, 2020 for evidence in the corporate equity setting, and Easton, Monahan, and Vasvari, 2009; Shivakumar, Urcan, Vasvari, and Zhang, 2011; Givoly, Hayn, and Katz, 2017 for evidence in the corporate bond market.

4. The MSRB is the self-regulatory organization that oversees municipal bond market participants.

based on trade size (e.g., Schwert, 2017). Retail investors likely have less capacity to process information than institutional investors, which can limit their responsiveness to disclosure filings (Cready, 1988).[5] However, institutional investors have access to various alternative sources for information, and thus the information in the financial statements is less likely to be new to them. We find that both retail and institutional investors trade around financial disclosure filings. However, the response is more pronounced for retail investors. The disparity suggests that the financial disclosures provide relatively more new information to retail investors. These findings also support the notion that retail investors use the information posted in EMMA.

Second, we consider variation in the timeliness of the disclosures. The less timely the disclosure, the greater the likelihood that investors are able to obtain relevant information prior to the report filing date, reducing the information content of the disclosure (DeFond, Hung, and Trezevant, 2007; Landsman, Maydew, and Thornock, 2012; Ivanov, Zimmermann, and Heinrich, 2022). In practice, many market participants believe that financial disclosures filed long after fiscal year end have diminished usefulness or lost relevance (U.S. Securities & Exchange Commission, 2012). Our evidence supports this view.

We find that timelier disclosures are associated with a stronger market reaction than less timely disclosures. On average, municipal disclosures filed within nine months of fiscal year end are timely enough to be associated with a market reaction in terms of volume and trading. However, after nine months, investors' response to annual disclosures is negligible, suggesting that either the information is stale, that other information sources preempt the disclosure filing, or that issuers that tend to file late have characteristics that preclude a trading response. These findings corroborate the longstanding concerns of regulators and market participants that untimely disclosures are less useful than timely disclosures.

Third, we consider variation in the riskiness of the bonds and issuers. A plausible explanation for the untimely and limited disclosure in the municipal bond market is that the securities are low risk. Thus, investors have little demand for financial information and limited incentives to incur the costs of processing it (e.g., Zimmerman, 1977). We identify two factors that impose risk on investors: low credit ratings and lack of bond insurance. We find that investors' responsiveness to disclosures is greater when either of these risk factors is present. Thus, investors are more responsive to disclosures when their risk of loss is higher.

Fourth, we study the content of the disclosures themselves. We find that investors are most responsive to disclosures that discuss risk, and words indicating the bond or issuer is high risk. For example, investors are most responsive to discussions of estimates, which are generally indications of uncertainty about future cash flows or impairments. By contrast, investors are least responsive to disclosures that contain terms that indicate the bond or issuer is low risk. For example, investors are least responsive to discussions about balance sheet items, which tend to come from relatively safe general obligation issuers.

Our interpretation of the evidence presented thus far is that municipal financial statements have information content. However, if financial disclosures are systematically filed around other events that lead to trading, the results are not attributable to the disclosures, per se. Therefore, we identify two types of concurrent events: (a) material events, such as rating changes, bond calls, and defaults, and (b) new bonds issued by the same issuer. We exclude disclosures that are filed in the same month as these

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5. Following the framework laid out in Blankespoor, deHaan, and Marinovic (2020), processing costs include the costs of monitoring for, acquiring, and analyzing information.

concurrent events. Our results remain statistically and economically meaningful, bolstering our attribution of the heightened trading activity to the disclosures themselves.

Our paper takes an important step toward understanding the role of financial disclosures in the municipal bond market—a question that has not been recently addressed in the relatively young municipal bond literature (Kim, Plumlee, and Stubben, 2021). Prior studies have shown that investors respond to credit events (e.g., Ivanov et al., 2022; Cornaggia, Cornaggia, and Israelsen, 2018), but not to financial disclosures, either because the reports are noisy signals or because the information is preempted by timelier signals (e.g., Ingram et al., 1989; Reck and Wilson, 2006). Our results, based on recent financial disclosures from various municipal issuer types, show that investors react to annual financial reports, particularly when they are filed on a timely basis. These findings illustrate the recent advances in the market.

Our findings also speak directly to individual investors' use of financial information. Even in the information-rich corporate equity and debt markets, evidence about the extent to which retail investors use financial information is mixed. For example, Blankespoor et al. (2019) shows that individual investors disregard accounting information in equities markets. deHaan, Li, and Watts (2021) provide evidence that retail investors neglect firm fundamentals in corporate bond markets. By contrast, Lawrence (2013) shows that individual equity investors are more likely to invest in firms whose financial disclosures are easy to understand. In the municipal bond market, in which retail participation is relatively high, regulatory efforts to protect retail investors and ensure their access to financial disclosures is ongoing. Our results confirm that individual investors consume annual financial information.

The paper proceeds as follows. Section 2 provides background information about the setting. Section 3 describes the extensive data cleaning and processing steps we undertake. Section 4 provides results and Section 5 concludes.

2. Setting

Municipal securities professionals (e.g., brokers, underwriters, etc.) are overseen by a self-regulatory organization, the MSRB. However, the MSRB does not have direct regulatory authority over municipal bond issuers themselves (i.e., state and local governments). The SEC also has limited regulatory authority over municipal bond issuers because municipal securities are exempt from the registration and reporting requirements of the Securities Act of 1933.[6] Therefore, the information that municipal bond issuers provide is limited compared to corporations.

In combination with increased participation by individual investors, high-profile municipal defaults in the 1970s and 1980s led to the development of Rule 15c2-12 of the Securities Exchange Act. Rule 15c2-12 requires that municipal bond issuers agree to provide continuing disclosures.[7] Continuing disclosures are post-issuance financial updates, including annual financial disclosures and material event notices. Since July of 2009, these continuing disclosures are filed in a centralized repository, the MSRB's EMMA system. Appendix B provides a snapshot of the continuing disclosures that are provided on EMMA. The stated objective of the website is to provide information "free of charge…presented in a manner

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6. Municipal securities issuers are subject to the anti-fraud provisions of the Securities Acts.

7. Rule 15c2-12 directly applies to underwriters and only indirectly applies to issuers. In particular, the underwriter is required to include the continuing disclosure agreement in the offering documents.

specifically tailored for retail, non-professional investors who may not be experts in financial or investing matters."

However, municipal bond issuers are not subject to direct regulatory enforcement of their continuing disclosure obligations. Indeed, prior research estimates that 30–40% of issuers every year fail to provide post-issuance disclosures (Schmitt, 2011). Even when financial statements are available, they are not standardized and can be costly to process. Highlighting investors' lack of access to pertinent information, Schmitt (2009) shows that in 2008, 667 trades occurred at (or above) par after a default notice was filed. This anecdote suggests that retail investors do not have access to information or find it costly to analyze.

Even institutional investors sometimes lack access to information they would like to have. Robbins and Simonsen (2010) surveyed members of the National Federation of Municipal Analysts in 2009 to determine which disclosure types are most useful, and how easy it is to access these disclosures. Eighty-one percent of respondents agreed with the statement "The entity-wide financial statements (with full accrual and net assets) provide information that is important when analyzing financial condition." In addition, respondents noted that the three most important disclosures are: (1) audited financial statements, (2) official statements, (3) unaudited year-end results. These documents are accessible 63.3%, 82.6%, and 24.2% of the time, respectively, when monitoring existing bond issues. Thus, sometimes market professionals cannot access important disclosures and have to use alternative sources of information. Our analyses condition on investors having access to financial disclosures through EMMA and evaluate their information content.

3. Data

We obtain the full universe of disclosures from the MSRB. Our sample covers disclosures submitted to the MSRB from July 2009 (when they began collecting these disclosures) to December 2020. The MSRB disclosure data contains (1) submission header files with the submission date, submission identifier, and filing type, and (2) the filings themselves. We first extract filing information from each submission header file.[8]

We then create bond-disclosure panel data. Specifically, when the submission is as-sociated with multiple CUSIPs (as is often the case), we create one observation for each CUSIP-submission combination.[9] We then convert the disclosures that are originally filed in a PDF format into text.[10]

Table 1 summarizes the sample selection and data cleaning steps that we undertake. Because we are interested in understanding the role of financial statements, we limit our primary sample to annual financial disclosures (audited and unaudited). The data include 602,015 annual financial disclosures, which gives us a potential sample of 60,334,474 disclosure-CUSIP observations.

We drop disclosures that are bundled with another type of disclosure (e.g., budgets) to eliminate confounding events and focus on annual financial disclosures. We drop disclosures that are missing CUSIP identifiers or disclosure filing date information. We also remove any duplicate disclosure submissions. We then supplement the bond-level disclosure data with bond-level characteristics from the Mergent Municipal database.

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8. For multiple submission header files that reference the same submission identifier, we keep the information from the latest available submission header on the first submission date.

9. CUSIPs identify unique bonds.

10. When a submission header references multiple files, we concatenate the text of the files into one text file.

We perform several data cleaning steps based on the variables available in Mergent Municipal. First, we drop observations that are likely clerical errors. Specifically, we remove disclosures that occur after the corresponding bond matures or is fully (or partially) redeemed. We also drop any securities which are pre-refunded or escrowed before their corresponding disclosure dates. Second, to ensure that the entire measurement period corresponds to secondary market transactions (as opposed to primary market transactions), we follow Green, Li, and Schürhoff (2010) and exclude disclosures that occur within 12 months of the bond's issuance.[11] Third, following Green et al. (2010), we remove bonds with variable rates to focus on fixed-rate securities (which make up most of the municipal market).

We then merge the bond-level disclosure data with municipal bond transaction data from the MSRB. Before merging the transaction data, we perform several data cleaning steps that are standard in municipal literature (Schwert, 2017; Green et al., 2010). To eliminate data errors, we first remove transactions that are missing coupon and maturity data. We also exclude trades recorded to occur on weekends or holidays. Next, we eliminate bonds with a listed coupon greater than 20% and bonds with a listed maturity over 100 years. We drop transactions with recorded dollar prices exceeding $150 for bonds with less than one year maturity and those that are recorded to occur after maturity. Finally, we limit our sample to bonds with more than one year to maturity and those with more than ten trades (Schwert, 2017). The final sample includes 412,947 distinct annual financial disclosures, or 8,284,927 disclosure-CUSIP observations.

Table 1, Panel B breaks the financial disclosures down by type. Issuers categorize financial disclosures when they are filed in EMMA.[12] *Audited Financial Statements* comprise 53 percent of disclosures and *Annual Financial Information* (typically unaudited financial statements) comprise the remaining 47 percent of disclosures.

3.1. Disclosure Descriptive Statistics

Municipal financial disclosures are dramatically less timely than corporate financial disclosures. Whereas large corporations are required to file 10-Ks within 60 days of period end, municipal entities are typically required to file six to nine months after period end. Figure 1 plots the cumulative probability of posting an annual financial disclosure in EMMA. The figure shows that fewer than 10 percent of disclosures are filed within 60 days of period end. By the time six months have passed, roughly half of financial disclosures are filed. A year after period end, 90 percent of disclosures are filed.

Figure 2(a) plots the fiscal period end for the annual financial disclosures in the sample, by month. The majority of municipal entities have June fiscal year-ends (54%), and many have December fiscal year-ends (28%). Figure 2(b) plots the number of annual financial disclosures in our sample, by filing month. The disclosures are filed relatively evenly throughout the calendar year. However, the most common months to file annual disclosures are December and March, which is six and nine months after the June fiscal year-end, respectively.

In Table 2, Panel A, we break down the sample by year, from 2009 to 2020. The EMMA disclosure repository was introduced in July of 2009, so 2009 comprises the smallest proportion of the sample (2.07 percent). The frequency of disclosure filings increases over time, and peaks in 2014, which comprises

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11. Newly issued municipal bonds exhibit unusually high markups, trading volume, and large intra-day price dispersion during the first six months after issuance (Green et al., 2010; Green, Hollifield, and Schürhoff, 2007a).

12. An individual disclosure can be categorized in multiple categories.

10.65 percent of the sample. There is not a notable trend in disclosure filings from 2015 to 2020, with each year comprising roughly 10 percent of the sample.

Table 2, Panel B categorizes the sample by the repayment source that backs the bonds. Approximately 41 percent of sample disclosures relate to bonds that are backed by the credit and taxing power of a municipality (i.e., unlimited general obligation bonds). Another 24 percent of the disclosures are linked to revenue bonds, which are repaid using project revenues. Lease Rental Bonds (comprising 15 percent of the sample) are issued to finance the building of a facility that will be rented out, such as a school, police station, or public office building. Another 15 percent of the sample disclosures relate to loan agreements, which are typically backed by revenue from a specific project.

Table 2, Panel C breaks down the sample by bond purpose. The length of the list illustrates the broad range of purposes that municipal bonds serve, ranging from airports to hospitals to toll roads. The most common bond purpose in the sample is primary or secondary education, comprising 32 percent of the sample of disclosures. Thirty percent of the sample disclosures relate to general purpose bonds, which serve an unspecified range of public purposes. Water and sewer revenue bonds are issued to finance the construction and improvement of sanitation or water utility facilities, and account for 15 percent of the sample. No other bond purpose individually accounts for more than 10 percent of the sample.

3.2. Disclosure Content

To get a sense for the topics that are discussed in municipal filings, we use Global Vectors (GloVe), a word embedding topic modeling approach (Pennington, Socher, and Manning, 2014).[13] GloVe groups words with similar meanings together, which is desirable because the vocabulary is expansive and different words, such as “pension” and “retirement,” “trust” and “bank,” and “court” and “judgment,” often have similar meanings. GloVe is based on the idea that words that co-occur with similar neighboring words have similar meanings. Intuitively, the two words “recognized” and “recorded” would be identified as similar if they both are commonly used in the context “We_____$X in expenses this year.”

Our GloVe approach entails six steps. First, we convert the PDF to text. Second, we tokenize the text into words, convert all words to lowercase, and remove English stopwords using the quanteda R package (Benoit, Watanabe, Wang, Nulty, Obeng, Müller, and Matsuo, 2018). Third, we compute GloVe vectors based on all words in a randomly selected set of 1,000 submissions using the text2vec R package (Selivanov and Wang, 2016). We ignore words that appear less than once per 10 submissions on average to manage vocabulary size. This step effectively converts each word to a vector in a 100-dimensional vector space, in which words with similar (different) meanings are close together (far apart). Fourth, we use K-means clustering to cluster the word vectors into 100 topics. Fifth, we label the topics based on our reading of the keywords for ease of discussion, following Dyer et al. (2017). Sixth, for each observation, we calculate the topic *Weight*, as the discussion of each topic as a proportion of words in the document.

Table 3 provides the top 20 topics identified by GloVe, in order of commonality. The most common topic, making up 15 percent of annual disclosures on average, relates to the “Balance Sheet,” consistent with the importance of the balance sheet to municipal managers (e.g., Costello, Petacchi, and Weber, 2017; Beck, 2018). The next most common topic is “Government Type,” followed by “Bonds.” Overall,

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13. We use machine learning to identify the topics discussed in the disclosures, similar to Dyer, Lang, and Stice-Lawrence (2017). Other studies use machine learning to extract information about a specific topic (e.g., Li, Mai, Shen, and Yan, 2021; Lu and Nakhmurina, 2022), to measure sentiment (e.g., Li, 2010), and to measure other variables of interest (e.g., Donovan, Jennings, Koharki, and Lee, 2021).

theses topics provide an indication of common discussions in the text of municipal financial disclosures. Some topics, such as "Financial Statements," "Balance Sheet," and "Expenditures," are also commonly discussed in corporate 10-Ks (e.g., Dyer et al., 2017). By contrast, other topics, such as "Tax Sources" and "Utilities," are unique to municipal financial disclosures.

3.3. Event Study Sample and Descriptive Statistics

To study investors' responsiveness to disclosures, we examine changes in trading activity. The event period for each bond-disclosure begins two months before and ends two months after the disclosure filing. We measure trading activity in two ways: $Volume_{b,m}$ and $N\ Trades_{b,m}$. $Volume_{b,m}$ is the total par traded in bond b in month m, in thousands of dollars. $N\ Trades_{b,m}$ is the total number of trades in bond b in month m. We elect to use trading activity measures instead of price-based measures such as returns because of the extreme illiquidity in the municipal bond market. Figure 3 plots $Volume_{b,m}$ (in Panel [a]) and $N\ Trades_{b,m}$ (in Panel [b]), over the first 24 months after bond issuance for the bonds in our sample. Both the mean and the median levels of trading dramatically decline in the first three months after a municipal bond is issued.

Corroborating this visual illustration, Panel A of Table 4 provides descriptive statistics for our full sample (after requiring observable control variables) of 39,098,098 bond-months. The median value for all of our trading activity measures is 0.000. The average *Volume* in the sample is 129.374. The average *N Trades* is 1.247.[14] Panel B shows the correlations between the variables. The Spearman correlations (in the upper triangular region) and Pearson correlations (in the lower triangular region) illustrate that the two variables are highly correlated.

We also present trading activity statistics separated into institutional and retail trades. Consistent with prior research (e.g., Schwert, 2017; Cuny, Even-Tov, and Watts, 2021), we identify institutional and retail trades based on trade size. Trades over $100,000 in par value are institutional and trades less than or equal to $100,000 are retail trades. Because *Volume* is based on par values traded, the average is higher for institutional trades than retail trades. For example, the average institutional *Volume* is 94.809 while the average for retail trades is 33.756. Although institutional trades are larger in terms of dollar value traded, they are less frequent than retail trades. Thus, the measure that focuses on the incidence of trade is larger for retail trades than institutional trades. Specifically, $N\ Trades_{b,m}$ for institutional trades is 0.149 and is 1.095 for retail trades.

Panel A of Table 4 also provides descriptive statistics for several characteristics of the bonds in our sample. We calculate each bond's average numerical credit rating across Moody's, S&P, and Fitch (where available), as of month m. *Rating* increases in risk, from 1 (AAA) to 22 (D).[15] The average bond in our sample is rated AA–, corresponding to a value of 3.940. The bonds in our sample have an average *Time to Maturity* and *Time from Issue* in month m of 7.804 and 5.233 years, respectively. The average issuance size of the individual bonds in our sample is $5.457 million, within an offering that averages $79.516 million.

Panel B of Table 4 illustrates the correlations between the trading activity measures and the bond characteristics. Higher *Rating*s (indicating more risk) and more time remaining to *Maturity* are

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14. To address potential data errors and the skew in the trading activity and textual variables, we Winsorize at the 0.1% and 99.9% level.

15. Unrated bonds are excluded from the sample.

correlated with more trading activity, in terms of both *Volume* and *N Trades*. Larger bonds, measured by *Bond Size* and *Offering Size* are also associated with more trading activity.

4. Results

We begin by providing a graphical representation of the mean of our two trading activity measures by month around the disclosure filing. Month zero is the month the financial disclosure is filed in EMMA. Figure 4 shows a statistically and economically meaningful increase in each of the measures in the month of the disclosure filing (month zero) and the month after (month one).

To formally study trading activity around disclosure filings, we use the following regression specification in the two months before and two months after annual financial disclosures are filed in EMMA:

$$TradingActivity_{b,m} = \beta_0 + \beta_1 DisclosureMonth_{b,m} + \sum \gamma\ Controls_{b,m} + FixedEffects_{b,m} + \epsilon_{b,m}. \quad (1)$$

Based on the heightened trading pattern shown in Figure 4, we create a $DisclosureMonth_{b,m}$ indicator that is equal to one if month m is in the month of or the month after the disclosure is posted in EMMA (i.e., month zero or one). We include three time-varying controls: *Rating*, *Maturity*, and *Time from Issue*.

Table 5 corroborates the observations from Figure 4 using a variety of fixed effect structures. Column (1) does not include fixed effects. Column (2) adds disclosure fixed effects that absorb the mean level of trading activity at the issuer level around the disclosure filing. Column (3) includes disclosure-CUSIP fixed effects that absorb the mean level of trading activity at the bond level around each disclosure filing. This is our primary specification in all subsequent analyses.

The coefficients on *Disclosure Month* are positive and statistically significant in all specifications. Consistent with Figure 4, we find that trading activity increases in the month of and the month following a disclosure filing. In terms of economic magnitude, the coefficient of 3.796 in Panel A, Column (3) indicates a 2.934 percent increase in *Volume* following a disclosure filing. Panel B shows that *N Trades* increase by 2.165 percent.[16]

While the economic magnitudes are substantially smaller than those documented in the equity market (e.g., Beaver, 1968), the municipal bond market is also much less liquid. The 75th percentile of our trading activity measures is zero. Moreover, the positive and significant coefficients are in contrast with the small sample evidence in Ingram et al. (1989). The disparity can be driven by either our larger sample or the technological advances in access to information in the last 30 years.

4.1. Investor Sophistication

To better understand which type of investor responds to disclosures, we re-run our analyses separately for retail and institutional trades. Ex ante, it is unclear which type of investor will be more responsive to disclosure filings. On the one hand, information processing costs can impede retail investors' responsiveness to disclosures. Information processing costs include the costs of monitoring for disclosures, acquiring information within the disclosures, and integrating the information (Blankespoor et al., 2020). In general, institutional investors have a greater capacity to incur the cost of monitoring for information than retail investors. On the other hand, institutional investors are more likely to monitor

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16. The economic magnitudes are calculated by dividing the coefficient by the mean of each trading activity measure.

alternative information sources before the disclosure is filed in EMMA. In this case, the financial statements provide less new information to institutional investors than retail investors.

Table 6 shows a significantly positive response from both institutional and retail investors. To allow for across trader-type comparisons and for presentation purposes, we standardize each measure to have a mean of zero and a standard deviation of one-hundred. In economic terms, Panel A shows a 0.005 standard deviation increase in retail trade volume and an 0.003 standard deviation increase in institutional trade volume in the month of and the month after the disclosure filing. The difference is statistically and economically meaningful. Panel B corroborates these results using *N Trades* as the dependent variable.

Although both types of investors (institutional and retail) respond to the disclosure filings, the response is pronounced for retail investors. This finding is meaningful for two reasons. First, it suggests that the disclosure filings provide relatively less new information to institutional investors. This finding is consistent with the long-standing notion that institutional investors have an informational advantage over retail investors in the municipal bond market (Green, Hollifield, and Schürhoff, 2007b). Second, it shows that retail investors use financial filings in EMMA. The EMMA system was originally conceived to level the playing field between sophisticated and unsophisticated investors. However, it is unclear whether retail investors actually use the system. Our results suggest that they use the financial disclosures posted in EMMA.

4.2. Disclosure Timeliness

A significant ongoing concern about municipal financial disclosures has been their lack of timeliness. Whereas large corporations typically make quarterly earnings announcements within 30 days of quarter-end, the average disclosure in our sample is filed more than nine months after period end. Therefore, we examine how investors' responsiveness to financial disclosures varies with their timeliness. In these analyses, we eliminate disclosures from the sample that have a negative *Reporting Lag*.[17]

We study timeliness in two ways. First, we create a continuous variable that measures the time between period end and the report filing date, in months. *Log(Reporting Lag, Months)* is the natural logarithm of the number of months between the report filing in EMMA and period end. We interact *Disclosure Month* with *Log(Reporting Lag, Months)*. Panel A of Table 7 presents the results. As expected, investors' responsiveness to the disclosure filing decreases as the *Log(Reporting Lag, Months)* increases. In economic terms, each 1-unit increase in *Log(Reporting Lag, Months)* (2.7 months) reduces investors' responsiveness by 34.1 percent.

Our second approach to studying timeliness is to quantify the point at which disclosures are too untimely to matter. We create an indicator, *Least Timely*, equal to one for all disclosures that are in the least timely quartile of the sample (those filed more than 261 days after period end). Panel B of Table 7 presents the results. The coefficient on *Disclosure Month* captures investors' responsiveness to the disclosures that are filed within 261 days of period end (i.e., those that are not *Least Timely*). The coefficients are positive and significant in all three columns. The coefficient of 3.806 in Column (1) indicates an increase in trading volume of 2.9 percent relative to the unconditional mean for these timely disclosures. Notably, the effect attenuates for the least timely disclosures. The p-value of the sum of the

. . .

17. Negative reporting lags are data errors. The posting dates in EMMA are system generated. However, the period end dates are entered by the issuer, and are sometimes entered incorrectly (e.g., year 3017 instead of 2017). In addition, some budgets (with period end dates in the future) are erroneously categorized as annual financial statements.

coefficients on *Disclosure Month* (3.806) and *Disclosure Month* × *Least Timely* (–2.698) is 0.40, indicating that the response to untimely disclosures is statistically and economically insignificant. Thus, investors' responsiveness to disclosure varies predictably with its timeliness.

4.3. Variation in Risk

Investors are more likely to demand information and incur the cost of processing disclosures from certain types of issuers than others. Specifically, disclosure is more important when investors' risk of loss is relatively high, and less important when the risk of loss is low (Gillette, Samuels, and Zhou, 2020; Basu, Naughton, and Wang, 2022). We identify two characteristics that indicate a bond is relatively high risk. First, bonds with credit ratings in the bottom quartile of the sample are relatively risky. Second, bonds that are uninsured are riskier than insured bonds.

Table 8 presents results in which we interact *Disclosure Month* with the risk metrics. Panel A shows that investors' response is more pronounced when the bonds have relatively low credit ratings. Panel B shows that investors react more to disclosures when the bond is uninsured. The evidence is consistent with the idea that investors' willingness to incur the cost of processing disclosures varies with the riskiness of the investment.

4.4. Disclosure Content

In this subsection, we study variation in investors' responsiveness to disclosure, based on the content of the disclosures themselves. Specifically, we interact *Disclosure Month* with an indicator for each of the 100 topics we identified using GloVe (refer to section 3 for more details). For each topic, we run our main specification with an additional interaction term between *Disclosure Month* and the topic *Weight*, and examine the coefficients on the interaction terms for each topic. In the regressions, *Weight* is scaled to have zero mean and unit variance to permit comparisons across different topics.

$$TradingActivity_{b,m} = \beta_0 + \beta_1 DisclosureMonth_{b,m} + \beta_2 DisclosureMonth_{b,m} \times Weight_{b,m} + \sum \gamma\, Controls_{b,m} + FixedEffects_{b,m} + \epsilon_{b,m}. \quad (2)$$

All topics that generate a statistically significant response in terms of *Volume* or *N Trades* (either positive or negative) are presented in Table 9, sorted from high to low by the coefficient on *Volume*. A topic with a positive (negative) coefficient on β_2 suggests a higher (lower) increase in trading activity in the disclosure month. In general, discussions of risk and those that indicate the bond is risky are associated with a pronounced response. The "Estimates" topic generates the most positive response (though the coefficient is only statistically significant for *N Trades*). The second highest response is for "Interest Rate" discussions, which are largely related to swap agreements and indicate a higher level of risk. The third highest response comes from "Transportation" discussions. Transportation issuers (such as airports) issue revenue bonds with a less certain stream of cash flows than general obligation issuers.

On the other end of the spectrum, the topics that generate the least response from investors are those that indicate the bond is low-risk. The "Balance Sheet," "Municipal Officials," and "Public Schools" are topics that general obligation issuers tend to discuss. Overall, the findings presented in Table 9 suggest that responses to filings vary as a function of the risks discussed in the filings.

4.5. Robustness

Our identification strategy is relatively straightforward: we study trading around disclosure filings. However, a threat to attributing the trading to the disclosures themselves is that other events happen around financial disclosure filings. We consider two types of confounding events. First, investors could be responding to credit rating changes that happen in the month of the disclosure filing. Second, a new bond issuance could affect the way that existing bonds from the same issuer trade. To eliminate potentially confounding events, we identify disclosure-months in which (a) an event notice is filed in EMMA,[18] or (b) the same issuer issues a new bond.[19] The sample period for these analyses is restricted to 2009 – 2018 because our Mergent Municipal data on bond offerings ends in 2018.

In Column (1) of Table 10, we exclude disclosures that are filed in the month of a con- founding event. Column (2) excludes disclosures that coincide with a new bond offering from the issuer. Column (3) excludes both types of confounding events. Our results remain economically and statistically meaningful in all three columns. However, the magnitude of the coefficients attenuates substantially in Column (1), compared to Table 5. The attenuation is consistent with the notion that investors respond strongly to events such as credit rating changes. Nonetheless, the results in Table 10 help to support our attribution of the heightened trading volume to the disclosures themselves.

5. Conclusion

Regulators tend to focus on transparency when retail investor participation is high. For this reason, significant regulatory resources are devoted to ensuring that municipal bond investors have access to ongoing financial disclosures. For example, the MSRB created a centralized repository for municipal disclosures in 2009 to ensure equal access to information.[20] However, it is unclear whether retail investors use financial disclosures when they make investment decisions.[21] While there is some indirect evidence that both sophisticated investors (e.g., Baber and Gore, 2008) and unsophisticated investors (e.g., Cuny, 2018) use financial information, evidence is scant that municipal bond investors with any level of sophistication perceive financial disclosures to have information content. Our study fills this gap in the literature and sheds light on whether and when investors use continuing disclosures.

. . .

18. Event notices must be filed in EMMA within 10 days of any of the following: rating change; bond call; tender offer; default; principal and interest payment delinquency; unscheduled draw on debt service reserves reflecting financial difficulty; unscheduled draw on credit enhancements reflecting financial difficulty; substitution of credit or liquidity provider; adverse tax opinion or event affecting the tax-exempt status of the security; modification to rights of security holders; defeasance; release, substitution or sale of property securing repayment of the security; bankruptcy, insolvency or receivership; merger, acquisition or sale of all issuer assets; appointment of successor trustee; financial obligation incurrence or agreement.

19. To identify new bond issuance, we use the issuers' 6-digit CUSIP number and search the Mergent database for bonds with a dated date that is within the disclosure month.

20. Other initiatives include the Municipalities Continuing Disclosure Cooperation (MCDC) Initiative of 2014, which allowed issuers to voluntarily disclose their noncompliance with continuing disclo- sure obligations to avoid monetary penalties. See https://www.sec.gov/divisions/enforce/municipalities-continuing-disclosure-cooperation-initiative.shtml. The light penalties that accompanied the initiative had an unintended consequence of reducing issuers' incentives to comply with their disclosure obligations (Maffett, Samuels, and Zhou, 2021). Further enhancements are often discussed by the SEC (https://www.sec.gov/news/public-statement/statement-clayton-olsen-2020-05-04) and MSRB (https://www.bakertilly.com/insights/more-continuing-disclosure-changes-on-the-way).

21. See https://www.gao.gov/assets/gao-12-698.pdf.

Using the entire universe of annual financial disclosures filed with the MSRB between 2009 and 2020, we find that investors react when financial disclosures are filed, particularly when they are filed on a timely basis. This evidence is pronounced among small investors, suggesting that retail investors are willing to incur the costs of processing financial disclosures in the secondary market for municipal bonds. These results contrast with prior studies that examine a time period when disclosures were more difficult to process (Ingram et al., 1989; Reck and Wilson, 2006). Collectively, our evidence shows that municipal financial disclosures are useful in the sense that investors perceive them to have informational value.

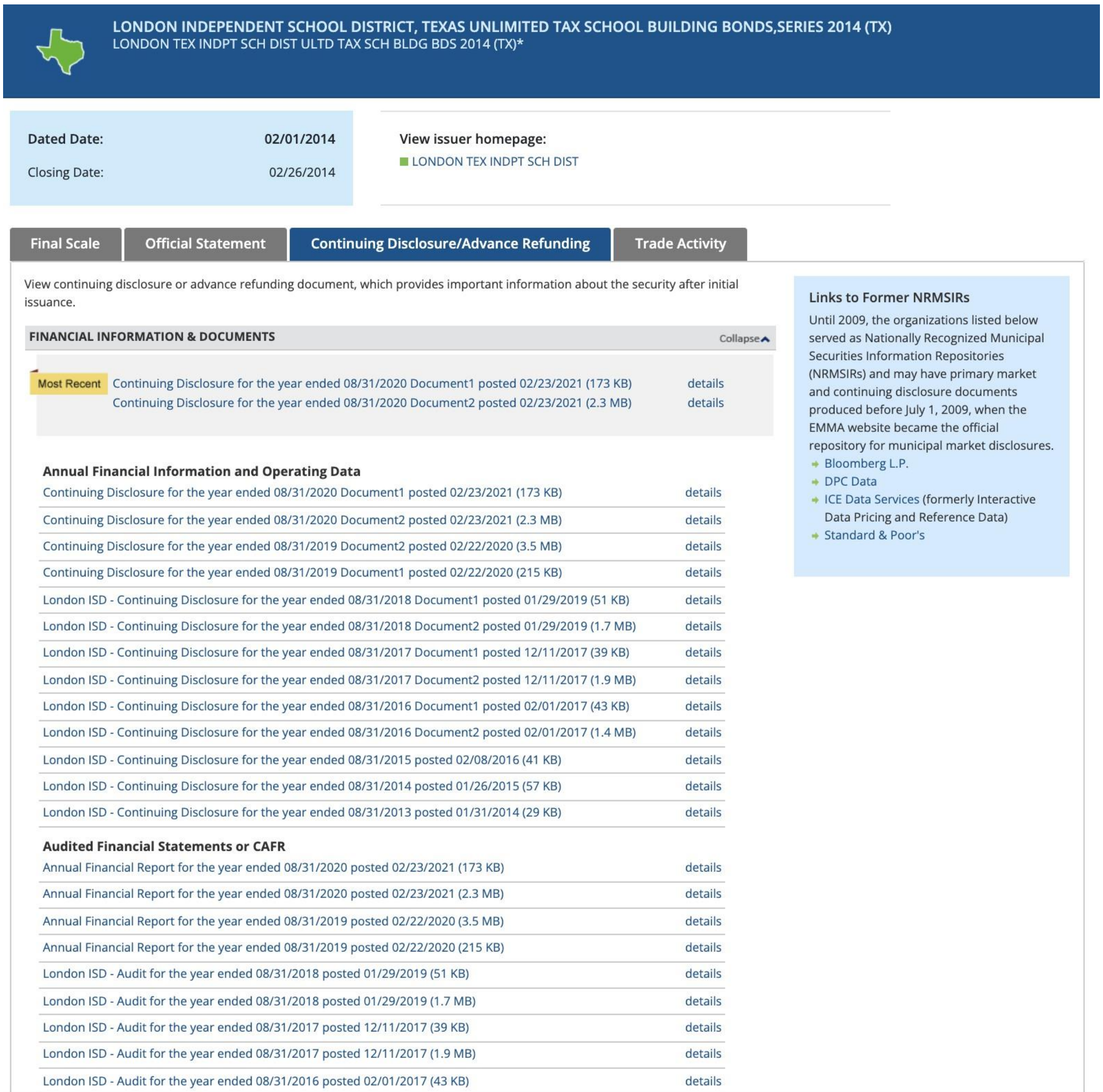
APPENDIX A. VARIABLE DEFINITIONS

This table contains descriptions of the primary variables used throughout this paper. These include municipal bond trading activity, bond characteristics, and bond issuer-level fundamentals. Sources, noted in parentheses for each variable, include: MSRB transaction data (MSRB), MSRB EMMA continuing disclosure data (EMMA), and Mergent FISD municipal bond characteristics data (FISD).

Variable	Description
Disclosure Month	An indicator equal to one if the observation is in the month of or the month following the filing of an annual financial disclosure, and zero otherwise. (MSRB, EMMA)
Volume	The total par traded during month m. Measured in thousands of dollars. (EMMA)
N Trades	The total number of trades in bond b in month m. (MSRB)
Time from Issue	The time from the bond's issuance as of month m. Measured in years. (MSRB, FISD)
Maturity	The bond's remaining time to maturity (in years) as of month m. (MSRB, FISD)
Rating	The bond's average numerical rating across Moody's, S&P and Fitch (where available), as of month m. Increasing in value from 1 (AAA) to 22 (D). (FISD)
Reporting Lag	The time between the fiscal/reporting period end date and disclosure posting date, excluding observations with negative lag. Measured in days unless indicated otherwise. (EMMA)
Offering Size	The total issuance size of the offering in which the bond was issued. Measured in millions. (FISD)
Bond Size	The total issuance size of the bond. Measured in millions. (FISD)
Least Timely	An indicator equal to one for financial disclosures that are in the least timely quartile of the sample, excluding those with negative lag, and zero otherwise. (EMMA)
Low Rating	An indicator equal to one for bonds in the lowest rating quartile of the sample, and zero otherwise. (FISD)
Uninsured	An indicator equal to one for bonds that are uninsured, and zero for bonds that are insured. (FISD)
Weight	The discussion of each document topic as a proportion of words in the document. Measured in percent. (EMMA)

APPENDIX B. SNAPSHOT FROM EMMA

This figure provides a snapshot of the Continuing Disclosure section of the EMMA web site.



LONDON INDEPENDENT SCHOOL DISTRICT, TEXAS UNLIMITED TAX SCHOOL BUILDING BONDS,SERIES 2014 (TX)
LONDON TEX INDPT SCH DIST ULTD TAX SCH BLDG BDS 2014 (TX)*

Dated Date:	**02/01/2014**
Closing Date:	02/26/2014

View issuer homepage:
LONDON TEX INDPT SCH DIST

Final Scale | Official Statement | Continuing Disclosure/Advance Refunding | Trade Activity

View continuing disclosure or advance refunding document, which provides important information about the security after initial issuance.

FINANCIAL INFORMATION & DOCUMENTS Collapse

Most Recent Continuing Disclosure for the year ended 08/31/2020 Document1 posted 02/23/2021 (173 KB) details
Continuing Disclosure for the year ended 08/31/2020 Document2 posted 02/23/2021 (2.3 MB) details

Annual Financial Information and Operating Data

Continuing Disclosure for the year ended 08/31/2020 Document1 posted 02/23/2021 (173 KB)	details
Continuing Disclosure for the year ended 08/31/2020 Document2 posted 02/23/2021 (2.3 MB)	details
Continuing Disclosure for the year ended 08/31/2019 Document2 posted 02/22/2020 (3.5 MB)	details
Continuing Disclosure for the year ended 08/31/2019 Document1 posted 02/22/2020 (215 KB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2018 Document1 posted 01/29/2019 (51 KB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2018 Document2 posted 01/29/2019 (1.7 MB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2017 Document1 posted 12/11/2017 (39 KB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2017 Document2 posted 12/11/2017 (1.9 MB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2016 Document1 posted 02/01/2017 (43 KB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2016 Document2 posted 02/01/2017 (1.4 MB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2015 posted 02/08/2016 (41 KB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2014 posted 01/26/2015 (57 KB)	details
London ISD - Continuing Disclosure for the year ended 08/31/2013 posted 01/31/2014 (29 KB)	details

Audited Financial Statements or CAFR

Annual Financial Report for the year ended 08/31/2020 posted 02/23/2021 (173 KB)	details
Annual Financial Report for the year ended 08/31/2020 posted 02/23/2021 (2.3 MB)	details
Annual Financial Report for the year ended 08/31/2019 posted 02/22/2020 (3.5 MB)	details
Annual Financial Report for the year ended 08/31/2019 posted 02/22/2020 (215 KB)	details
London ISD - Audit for the year ended 08/31/2018 posted 01/29/2019 (51 KB)	details
London ISD - Audit for the year ended 08/31/2018 posted 01/29/2019 (1.7 MB)	details
London ISD - Audit for the year ended 08/31/2017 posted 12/11/2017 (39 KB)	details
London ISD - Audit for the year ended 08/31/2017 posted 12/11/2017 (1.9 MB)	details
London ISD - Audit for the year ended 08/31/2016 posted 02/01/2017 (43 KB)	details

Links to Former NRMSIRs

Until 2009, the organizations listed below served as Nationally Recognized Municipal Securities Information Repositories (NRMSIRs) and may have primary market and continuing disclosure documents produced before July 1, 2009, when the EMMA website became the official repository for municipal market disclosures.

- Bloomberg L.P.
- DPC Data
- ICE Data Services (formerly Interactive Data Pricing and Reference Data)
- Standard & Poor's

REFERENCES

Atiase, R. K., Bamber, L. S., 1994. Trading Volume Reactions to Annual Accounting Earnings Announcements The incremental Role of Predisclosure Information Asymmetry. Journal of Accounting and Economics 17, 309–329.

Baber, W. R., Gore, A. K., 2008. Consequences of GAAP Disclosure Regulation: Evidence from Municipal Debt Issues. Accounting Review 83, 565–591.

Bamber, L. S., 1986. The Information Content of Annual Earnings Releases: A Trading Volume Approach. Journal of Accounting Research 24, 40–56.

Barth, M. E., Beaver, W. H., Landsman, W. R., 2001. The Relevance of the Value Relevance Literature for Financial Accounting Standard Setting: Another View. Journal of Accounting and Economics 31, 77–104.

Basu, R., Naughton, J. P., Wang, C., 2022. The Regulatory Role of Credit Ratings and Voluntary Disclosure. The Accounting Review. Forthcoming.

Beaver, W. H., 1968. The Information Content of Annual Earnings Announcements. Journal of Accounting Research 6, 67–92.

Beaver, W. H., McNichols, M. F., Wang, Z. Z., 2020. Increased Market Response to Earnings Announcements in the 21st Century: An Empirical Investigation. Journal of Accounting and Economics 69, 101244.

Beck, A. W., 2018. Opportunistic Financial Reporting Around Municipal Bond Issues. Review of Accounting Studies 23, 785–826.

Benoit, K., Watanabe, K., Wang, H., Nulty, P., Obeng, A., Müller, S., Matsuo, A., 2018. quanteda: An R Package for the Quantitative Analysis of Textual Data. Journal of Open Source Software 30, 774.

Bessembinder, H., Jacobsen, S., Maxwell, W., Venkataraman, K., 2018. Capital Commitment and Illiquidity in Corporate Bonds. Journal of Finance 73, 1615–1661.

Blankespoor, E., deHaan, E., Marinovic, I., 2020. Disclosure Processing Costs, Investors' Information Choice, and Equity Market Outcomes: A Review. Journal of Accounting and Economics 70.

Blankespoor, E., Dehaan, E., Wertz, J., Zhu, C., 2019. Why Do Individual Investors Disregard Accounting Information? The Roles of Information Awareness and Acquisition Costs. Journal of Accounting Research 57, 53–84.

Cornaggia, J., Cornaggia, K. J., Israelsen, R. D., 2018. Credit Ratings and the Cost of Municipal Financing. Review of Financial Studies 31, 2038–2079.

Costello, A. M., Petacchi, R., Weber, J. P., 2017. The Impact of Balanced Budget Restrictions on States' Fiscal Actions. The Accounting Review 92, 51–71.

Cready, W. M., 1988. Information Value and Investor Wealth: The Case of Earnings Announcements. Journal of Accounting Research 26, 1–27.

Cuny, C., 2018. When Knowledge is Power: Evidence from the Municipal Bond Market. Journal of Accounting and Economics 65, 109–128.

Cuny, C., Even-Tov, O., Watts, E. M., 2021. From Implicit to Explicit: The Consequences of Fee Disclosure. Journal of Accounting Research 59, 215–242.

DeFond, M., Hung, M., Trezevant, R., 2007. Investor Protection and the Information Content of Annual Earnings Announcements: International Evidence. Journal of Accounting and Economics 43, 37–67.

deHaan, E., Li, J., Watts, E. M., 2021. Retail Bond Investors and Credit Ratings. Unpublished Working Paper. University of Washington, University of Utah, and Yale School of Management.
Dick-Nielsen, J., Feldhütter, P., Lando, D., 2012. Corporate Bond Liquidity Before and After the Onset of the Subprime Crisis. Journal of Financial Economics 103, 471–492.
Donovan, J., Jennings, J., Koharki, K., Lee, J., 2021. Measuring credit risk using qualitative disclosure. Review of Accounting Studies 26, 815–863.
Dyer, T., Lang, M., Stice-Lawrence, L., 2017. The Evolution of 10-K Textual Disclosure: Evidence from Latent Dirichlet Allocation. Journal of Accounting and Economics 64, 221– 245.
Easton, P. D., Monahan, S. J., Vasvari, F. P., 2009. Initial Evidence on the Role of Accounting Earnings in the Bond Market. Journal of Accounting Research 47, 721–766.
Francis, J., Schipper, K., Vincent, L., 2002. Expanded Disclosures and the Increased Usefulness of Earnings Announcements. The Accounting Review 77, 515–546.
Gillette, J. R., Samuels, D., Zhou, F. S., 2020. The Effect of Credit Ratings on Disclosure: Evidence from the Recalibration of Moody's Municipal Ratings. Journal of Accounting Research 58, 693–739.
Givoly, D., Hayn, C., Katz, S., 2017. The Changing Relevance of Accounting Information to Debt Holders over Time. Review of Accounting Studies 22, 64–108.
Green, R. C., Hollifield, B., Schürhoff, N., 2007a. Dealer Intermediation and Price Behavior in the Aftermarket for New Bond Issues. Journal of Financial Economics 86, 643–682.
Green, R. C., Hollifield, B., Schürhoff, N., 2007b. Financial intermediation and the costs of trading in an opaque market. Review of Financial Studies 20, 275–314.
Green, R. C., Li, D., Schürhoff, N., 2010. Price Discovery in Illiquid Markets: Do Financial Asset Prices Rise Faster Than They Fall? Journal of Finance 65, 1669–1702.
Harris, M., Raviv, A., 1993. Differences of Opinion Make a Horse Race. The Review of Financial Studies 6, 473–506.
Holthausen, R. W., Watts, R. L., 2001. The Relevance of the Value-Relevance Literature for Financial Accounting Standard Setting. Journal of Accounting and Economics 31, 3–75.
Ingram, R. W., Raman, K. K., Wilson, E. R., 1989. The Information in Governmental Annual Reports: A Contemporaneous Price Reaction Approach. Accounting Review 64, 250–268.
Ivanov, I., Zimmermann, T., Heinrich, N., 2022. Limits of Disclosure Regulation in the Municipal Bond Market. Unpublished Working Paper. Board of Governors of the Federal Reserve System and University of Cologne.
Kandel, E., Pearson, N. D., 1995. Differential Interpretation of Public Signals and Trade in Speculative Markets. Journal of Political Economy 103, 831–872.
Karpoff, J. M., 1986. A Theory of Trading Volume. The Journal of Finance 41, 1069–1087. Kim, O., Verrecchia, R. E., 1991. Trading Volume and Price Reactions to Public Announcements. Journal of Accounting Research 29, 302–321.
Kim, W. J., Plumlee, M., Stubben, S., 2021. Overview of US State and Local Government Financial Reporting: A Reference for Academic Research. Accounting Horizons, forthcoming .
Landsman, W. R., Maydew, E. L., 2002. Has the Information Content of Quarterly Earnings Announcements Declined in the Past Three Decades? Journal of Accounting Research 40, 797–808.
Landsman, W. R., Maydew, E. L., Thornock, J. R., 2012. The Information Content of Annual Earnings Announcements and Mandatory Adoption of IFRS. Journal of Accounting and Economics 53, 34–54.

Lawrence, A., 2013. Individual Investors and Financial Disclosure. Journal of Accounting and Economics 56, 130–147.

Li, F., 2010. The Information Content of Forward-Looking Statements in Corporate Filings-A Naïve Bayesian Machine Learning Approach. Journal of Accounting Research 48, 1049– 1102.

Li, K., Mai, F., Shen, R., Yan, X., 2021. Measuring Corporate Culture Using Machine Learning. Review of Financial Studies 34, 3265–3315.

Lu, S., Nakhmurina, A., 2022. Measuring Cities' Climate Adaptation. Unpublished Working Paper. Harvard Business School and Yale School of Management.

Maffett, M., Samuels, D., Zhou, F., 2021. Regulatory Amnesty: Evidence from the Municipalities Continuing Disclosure Cooperation Initiative. Unpublished Working Paper. University of Chicago and University of Pennsylvania.

Moody's, 2012. U.S. Municipal Bond Defaults and Recoveries, 1970-2011.

Pennington, J., Socher, R., Manning, C. D., 2014. Glove: Global Vectors for Word Representation. Proceedings of the 2014 conference on empirical methods in natural language processing (EMNLP) .

Reck, J. L., Wilson, E. R., 2006. Information Transparency and Pricing in the Municipal Bond Secondary Market. Journal of Accounting and Public Policy 25, 1–31.

Robbins, M., Simonsen, B., 2010. The Quality and Relevance of Municipal Bond Disclosure: What Bond Analysts Think. Municipal Finance Journal 31, 1.

Schestag, R., Schuster, P., Uhrig-Homburg, M., 2016. Measuring Liquidity in Bond Markets. The Review of Financial Studies 29, 1170–1219.

Schmitt, P. J., 2009. The Consequences of Poor Disclosure Enforcement in the Municipal Securities Market. Tech. rep., DPC Data.

Schmitt, P. J., 2011. Recent Trends in Municipal Continuing Disclosure Activities. Tech. rep., DPC Data.

Schwert, M., 2017. Municipal Bond Liquidity and Default Risk. Journal of Finance 72, 1683– 1722.

Selivanov, D., Wang, Q., 2016. text2vec: Modern Text Mining Framework For R.

Shivakumar, L., Urcan, O., Vasvari, F. P., Zhang, L., 2011. The Debt Market Relevance of Management Earnings Forecasts: Evidence From Before and During the Credit Crisis. Review of Accounting Studies 16, 464–486.

U.S. Securities & Exchange Commission, 2012. Report on the Municipal Securities Market. Tech. rep.

Zimmerman, J., 1977. The Municipal Accounting Maze: An Analysis of Political Incentives. Journal of Accounting Research 15, 107–144.

FIGURES AND TABLES

Figure 1. Disclosure filing lag

This figure plots the cumulative probability of posting an annual financial disclosure on EMMA. The x-axis represents the number of days since the end of the reporting period. The y-axis represents the cumulative probability. For presentation purposes, reporting lags are capped at two years.

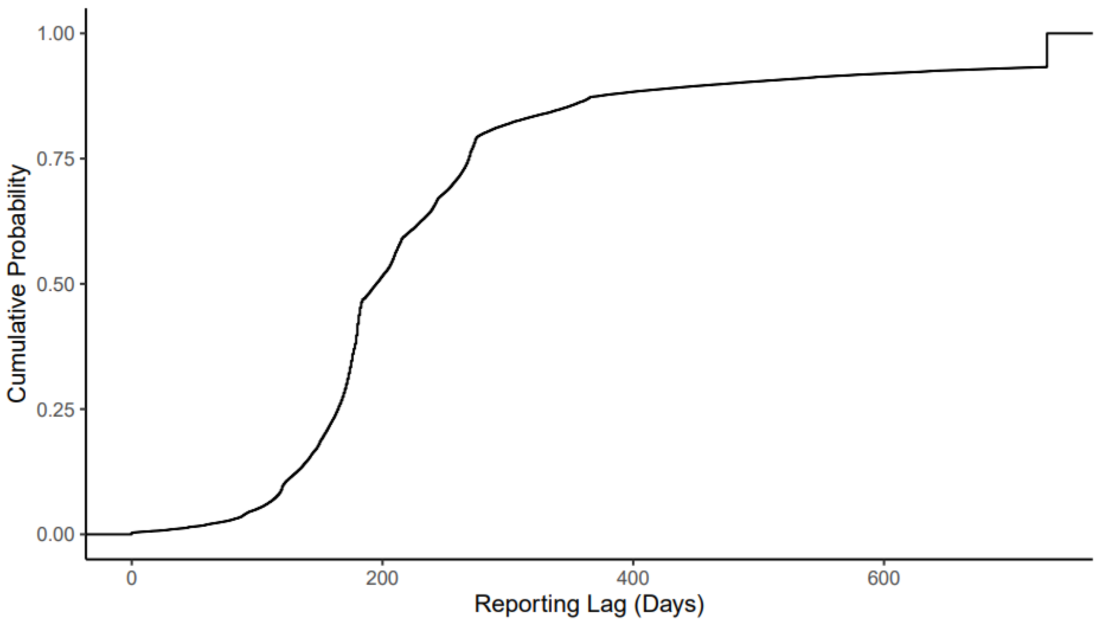
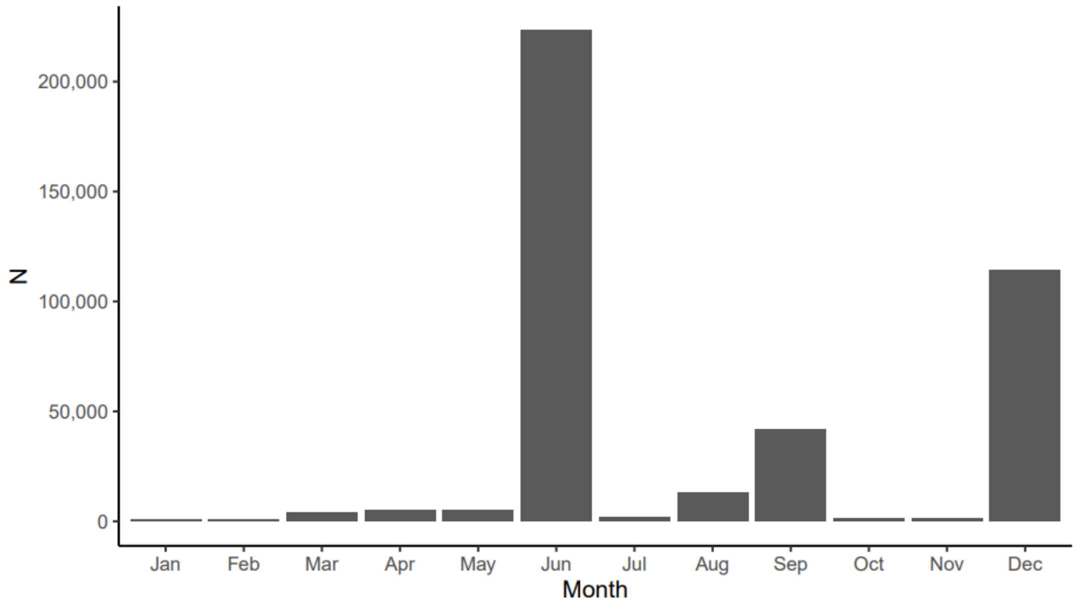
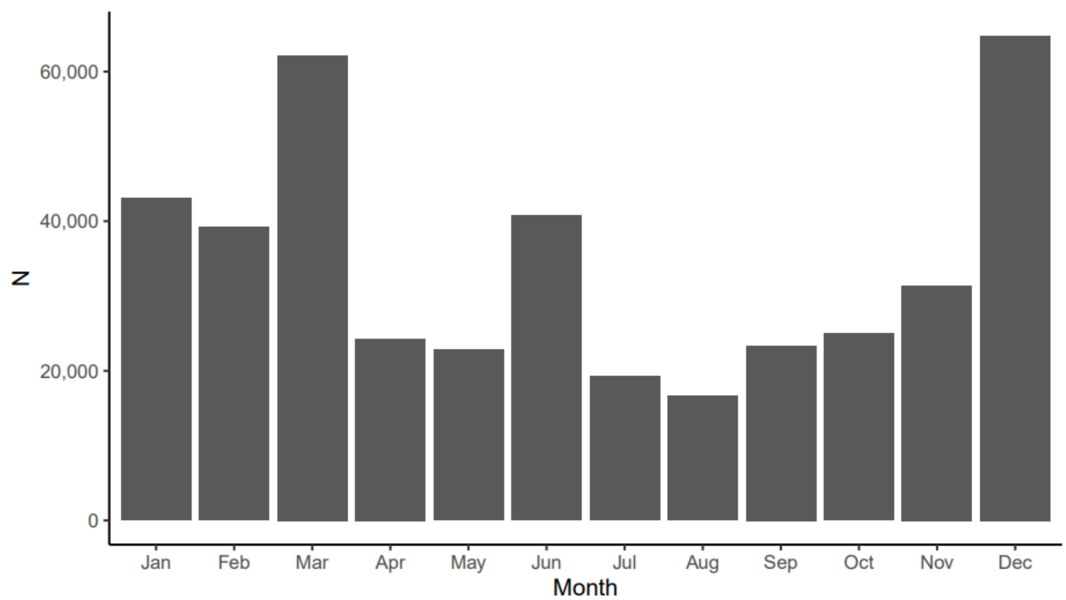


Figure 2. Fiscal period end and filing month counts

This figure presents the monthly count of annual financial disclosures, by fiscal period end and filings. Panel (a) presents the total count of filings by fiscal period end month. Panel (b) presents the total count of filings by filing (event) calendar-month. All statistics are generated from the full sample of observations described in Section 3.



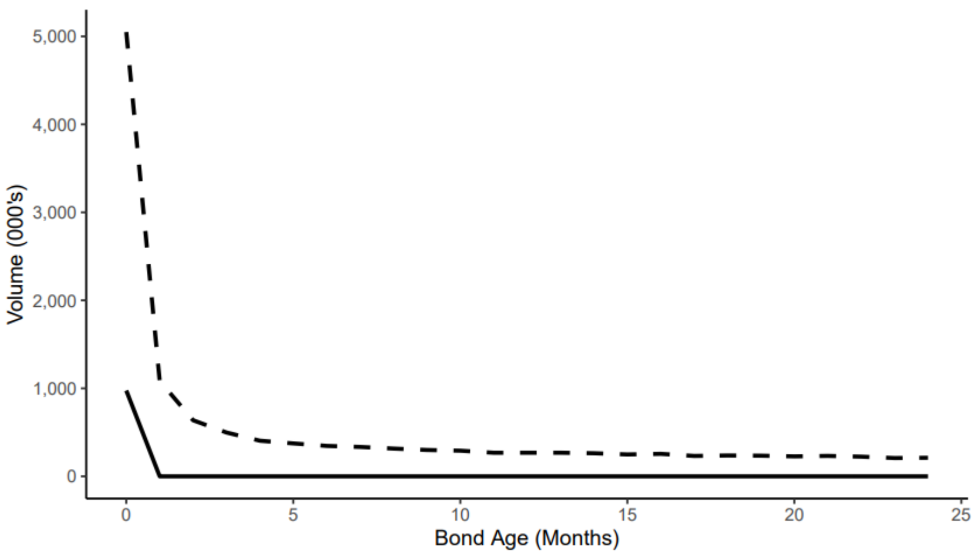
(a) Count of Filings, by fiscal period end month



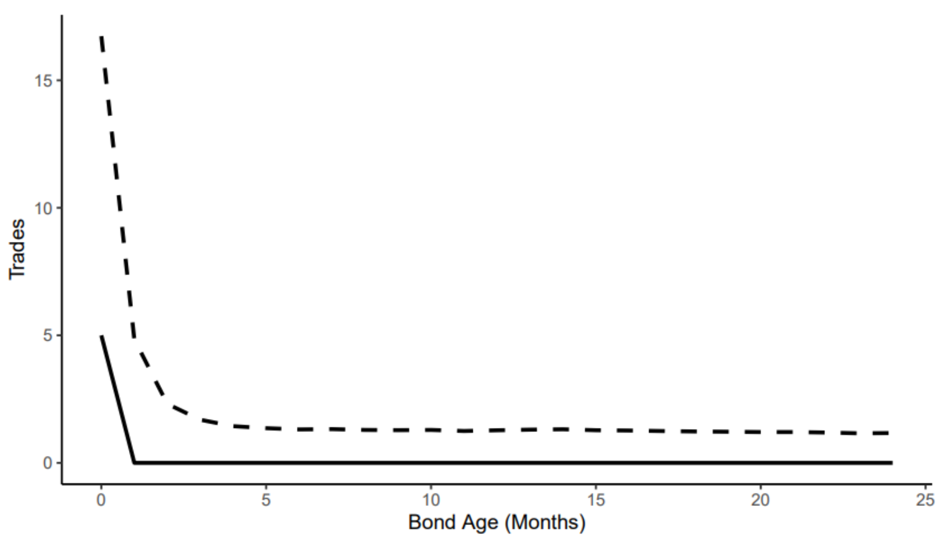
(b) Cout of Filings, by filing (event) month

Figure 3. Trading activity over a bond's life

This figure presents statistics on municipal bond trading activity for the first 24-months after issuance. Panels (a) and (b) present these analyses for *Volume* and *N* Trades, respectively. Dashed (solid) lines indicate the average (median) values for each trading activity measure. All measures are derived from the full sample of municipal securities described in Section 3.



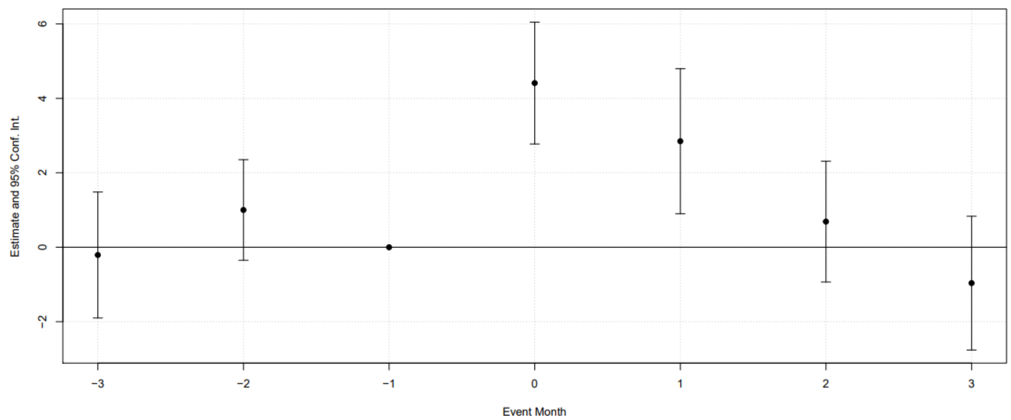
(a) Volume



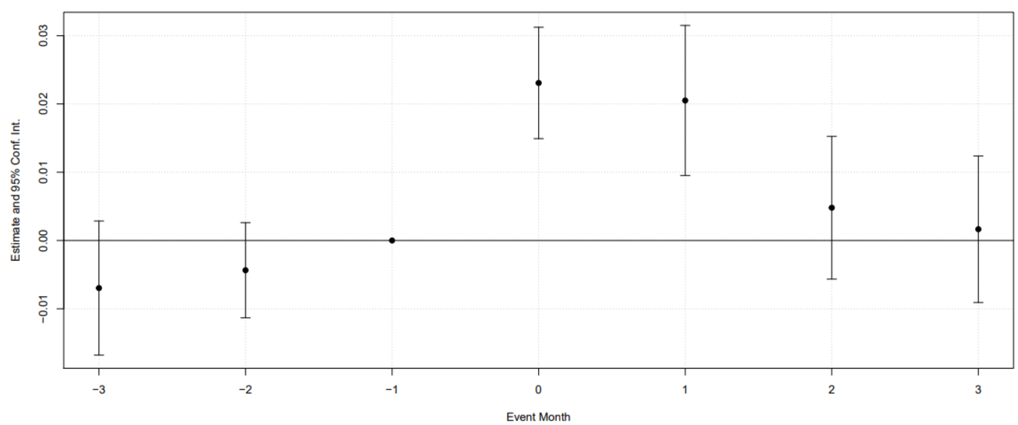
(b) Number of Trades

Figure 4. Event-time analysis of trading activity

This figure presents event-time analysis of trading activity around annual financial disclosure filings on EMMA. Panels (a) and (b) present these analyses for *Volume* and *N* Trades, respectively, as described in Section 4. Coefficient estimates (dots) and 95% confidence intervals (lines) are presented for each estimate. All regressions are run on the full sample of observations described in Section 3.



(a) Volume



(b) Number of Trades

Table 1. Sample selection and disclosure composition

This table summarizes the sample selection process and provides a breakdown of the types of disclosure considered in this study. Panel A describes the sample selection process. Panel B presents the sample composition by disclosure type. The total number of bond-disclosure events (Obs) and disclosure events (Disclosures) are presented for each disclosure type.

Panel A: Sample selection

	Obs	Disclosures
Select annual financial disclosures	60,334,474	602,015
Drop bundled disclosures	52,793,935	540,329
Drop observations w/ missing CUSIP or date information	52,782,359	534,973
Drop duplicate disclosure submissions	40,787,820	532,561
Mergent match	34,417,687	523,985
Remove matured or called bonds	16,525,083	493,720
Remove pre-refunded/escrowed securities	15,770,485	493,146
Drop observations less than 12-months from issuance	13,971,156	473,352
Drop adjustable rate securities	13,744,312	467,521
MSRB trading data match	8,284,927	412,947

Panel B: Financial disclosures

Disclosure Type	Obs	Disclosures
Audited Financial Statements Or CAFR15c212	4,481,643	220,526
Annual Financial Information Operating Data15c212	3,803,284	192,421

Table 2. Sample by year and issuer characteristics

This table presents breakdowns of the disclosure sample studied in this paper across years and issuer types. Panel A presents the total number of bond-disclosure events (Bond-Disclosure Level) and disclosure events (Disclosures) by year. Panels B and C present these breakdowns across bond repayment source and bond purpose, respectively.

Panel A: Disclosures by year

	Disclosure Level		Bond-Disclosure Level	
Year	Frequency	Percent	Frequency	Percent
2009	8,529	2.07	184,826	2.23
2010	23,916	5.79	468,307	5.65
2011	27,525	6.67	566,434	6.84
2012	31,632	7.66	633,349	7.64
2013	35,212	8.53	699,381	8.44
2014	43,974	10.65	855,822	10.33
2015	41,416	10.03	775,767	9.36
2016	41,016	9.93	792,564	9.57
2017	40,553	9.82	806,339	9.73
2018	39,384	9.54	809,649	9.77
2019	41,563	10.06	889,136	10.73
2020	38,227	9.26	803,353	9.70
Total	412,947		8,284,927	

Panel B: Disclosures by repayment source

	Disclosure Level		Bond-Disclosure Level	
Type	Frequency	Percent	Frequency	Percent
Double barreled	17,900	4.33	217,621	2.63
Education Loans	561	0.14	8,225	0.10
Fuel / Vehicle Tax	1,317	0.32	26,973	0.33
Lease/Rent	62,686	15.18	928,715	11.21
Limited G.O.	43,601	10.56	548,936	6.63
Loan Agreement	60,407	14.63	849,183	10.25
Mortgage Loans	8,142	1.97	115,521	1.39
Other	181	0.04	846	0.01
Public Improvement	25	0.01	124	0.00
Revenue	98,710	23.90	2,170,796	26.20
Sales Agreement	3,514	0.85	36,685	0.44
Sales/Excise Tax	12,707	3.08	159,115	1.92
Special Assessment	13,601	3.29	82,347	0.99
Special Tax	14,231	3.45	129,888	1.57
Tax Allocation	9,255	2.24	112,193	1.35
Tobacco Agreement	1,082	0.26	8,413	0.10
Tuition Agreement	391	0.09	3,196	0.04
Unlimited Tax G.O.	167,677	40.60	2,885,151	34.82
US Government	265	0.06	999	0.01

Panel C: Disclosures by bond purpose

Use	Disclosure Level		Bond-Disclosure Level	
	Frequency	Percent	Frequency	Percent
Agriculture	93	0.02	726	0.01
Airlines	94	0.02	421	0.01
Airports	4,482	1.09	119,371	1.44
Bridges	984	0.24	22,539	0.27
Civic/Convention Centers	3,624	0.88	39,699	0.48
Correctional Facilities/Jails	5,714	1.38	50,744	0.61
Courts	3,024	0.73	29,159	0.35
Economic Development	6,368	1.54	54,435	0.66
Fire Station/Equipment	4,730	1.15	27,864	0.34
Flood Ctl/Storm Drain	1,801	0.44	18,801	0.23
Gas	1,552	0.38	16,662	0.20
Gen Purpose/Pub Improvement	124,918	30.25	2,476,196	29.89
Govt/Public Buildings	9,116	2.21	84,204	1.02
Higher Education	27,157	6.58	721,229	8.71
Hospital Equipment Loans	92	0.02	778	0.01
Hospitals	18,172	4.40	236,725	2.86
Industrial Development	2,605	0.63	14,529	0.18
Irrigation	301	0.07	3,561	0.04
Land Preservation	594	0.14	4,885	0.06
Library or Museums	4,460	1.08	32,743	0.40
Malls/Shopping Centers	202	0.05	1,055	0.01
Mass/Rapid Tran	1,701	0.41	110,046	1.33
Multi-Family Housing	7,405	1.79	64,922	0.78
Multiple Public Utilities	4,626	1.12	48,253	0.58
New Public Housing	21	0.01	169	0.00
Nurse Homes	4,092	0.99	19,833	0.24
Office Bldg	936	0.23	5,451	0.07
Other Education	7,199	1.74	47,002	0.57
Other Healthcare	8,641	2.09	90,304	1.09
Other Housing	5,314	1.29	39,411	0.48
Other Industrial Development	26	0.01	270	0.00
Other Public Service	371	0.09	2,499	0.03
Other Recreation	4,260	1.03	27,055	0.33
Other Transportation	3,350	0.81	82,153	0.99
Other Utilities	2,576	0.62	18,420	0.22
Parking Facilities	3,841	0.93	41,562	0.50
Parks/Zoos/Beaches	5,282	1.28	39,775	0.48
Pension Funding/Retirement	6,436	1.56	43,270	0.52
Police Station/Equip	1,720	0.42	10,580	0.13
Pollution Control	1,968	0.48	23,449	0.28
Primary/Secondary Education	133,478	32.32	2,046,490	24.70
Public Power	9,274	2.25	176,892	2.14
Redevelopment/Ld Clearance	14,317	3.47	162,955	1.97
Retirement Centers	4,972	1.20	27,377	0.33
Sanitation	1,564	0.38	13,859	0.17
Seaports/Marine Terminals	1,642	0.40	34,783	0.42
Single Family Housing	1,261	0.31	42,024	0.51
Single/Multi-Family Housing	210	0.05	5,796	0.07
Solid Waste	3,349	0.81	28,704	0.35
Stadiums/Sports Complex	2,944	0.71	31,603	0.38
Student Loans	325	0.08	6,496	0.08
Telephone	54	0.01	421	0.01
Theaters	394	0.10	2,315	0.03
Toll Road and Highway	3,055	0.74	79,263	0.96
Tunnels	25	0.01	25	0.00
Veterans	198	0.05	5,048	0.06
Water and Sewer	62,888	15.23	950,099	11.47

Table 3. Top 20 topics

This table presents the top topics discussed in the text of municipal financial statements. Topics are formed based on converting words into GloVe vectors and clustering the word vectors into 100 topics (e.g., Pennington et al., 2014). Topic names are labeled based on the words in each topic. The Mean *Weight* (%) is the *Weight* for each topic, aver- aged across all observations in the sample. The "Example keywords" column presents the top keywords by frequency in the GloVe model.

Topic	Mean Weight (%)	Example Keywords
Balance Sheet	15.112	fund total year net funds assets debt june general fiscal activities cash governmental balance statement
Government Type	8.120	state city service district authority annual new used may required projects provided certain available provide
Bonds	5.463	bonds interest series rate bond principal issued obligation date outstanding refunding july proceeds maturity issuance
Financial Statements	4.895	financial statements information report accounting management reporting basic audit part accordance standards states analysis united
Expenditures	4.711	million current amount expenses amounts deferred payments costs cost related increase change prior paid expense
Statement of Activities	4.055	revenues revenue expenditures operating taxes income special actual grants charges sales fees final received receipts
Tax Sources	3.136	tax value property valuation real direct source assessed personal taxable levy limit assessment collections gross
Services	2.589	services public department health development community economic transportation housing office support improvement administration business safety
Pension	2.174	plan pension benefits contributions retirement employees benefit members contribution employee plans defined employer covered police
Quantities	2.025	years percent one per first two number average last three ten five equal days salary
Utilities	1.792	system water facilities operations maintenance municipal sewer enterprise utility facility airport electric operation utilities wastewater
Balance Sheet Accounts	1.591	liabilities due payable accounts accrued receivable equivalents receivables governments items interfund compensated absences noncurrent prepaid
Capital Assets	1.583	capital construction improvements equipment depreciation building land buildings accumulated infrastructure acquisition progress plant additions depreciated
Obligations	1.481	project obligations payment shall power resolution security mta ii trustee supplemental event respect masshousing pledged
Education	1.451	school education higher college schools student high instruction charter educational students tuition enrollment elementary regular
Insurance	1.221	based rates future expected projected assumptions results estimates applied historical experience determine inflation status reflect
State	1.155	university virginia commonwealth texas york ohio california florida kentucky jersey south washington illinois massachusetts georgia
Investments	1.149	investment investments asset return equity fixed private estate invested portfolio class allocation international short-term long
Deposits	1.098	trust credit securities held deposits bank deposit agent money collateral name custodial institutions deposited party
Aid Programs	1.018	program federal programs grant assistance aid title reimbursement recovery child subsidy passed pass-through formula cluster

Table 4. Summary statistics

Panel A reports basic summary statistics for the primary measures used in the paper. The unit of observation is a bond-month. Panel B provides the pairwise Spearman (Pearson) correlations among a subset of these variables in the upper (lower) triangular region. All correlations are statistically significant at the 5% (or smaller) level. All variable definitions are as indicated in Appendix A.

Panel A: Descriptive statistics

	Mean	StDev	$p^{10\%}$	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$	$p^{90\%}$	Obs.
Volume	129.374	996.270	0.000	0.000	0.000	0.000	120.000	39,098,098
$\text{Volume}^{\text{Inst.}}$	94.809	935.041	0.000	0.000	0.000	0.000	0.000	39,098,098
$\text{Volume}^{\text{Ret.}}$	33.756	132.589	0.000	0.000	0.000	0.000	85.000	39,098,098
N Trades	1.247	4.486	0.000	0.000	0.000	0.000	4.000	39,098,098
N $\text{Trades}^{\text{Inst.}}$	0.149	0.912	0.000	0.000	0.000	0.000	0.000	39,098,098
N $\text{Trades}^{\text{Ret.}}$	1.095	3.957	0.000	0.000	0.000	0.000	3.000	39,098,098
Time from Issue	5.233	3.076	1.811	2.863	4.710	6.984	9.000	39,098,098
Maturity	7.804	5.964	1.332	3.164	6.501	11.216	16.011	39,098,098
Rating	3.940	2.943	1.000	2.500	3.500	4.500	6.000	39,098,098
Reporting Lag	303.896	4,494.081	120.000	168.000	193.000	261.000	366.000	38,518,817
Offering Size	79.516	174.839	4.995	9.885	24.500	70.045	200.000	39,098,098
Bond Size	5.457	17.772	0.275	0.550	1.300	3.725	11.180	39,098,098

Panel B: Pairwise correlations

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
[1] Volume		0.995	-0.017	0.153	0.026	-0.055	0.314	0.378
[2] N Trades	0.529		-0.013	0.160	0.030	-0.056	0.313	0.379
[3] Time from Issue	-0.008	0.012		-0.209	0.146	0.048	-0.019	-0.015
[4] Maturity	0.110	0.211	-0.186		0.044	-0.015	0.068	0.192
[5] Rating	0.022	0.047	0.196	0.043		0.042	-0.054	-0.035
[6] Reporting Lag	-0.002	-0.003	0.003	-0.000	0.003		-0.173	-0.147
[7] Offering Size	0.230	0.316	0.013	0.065	0.020	-0.007		0.780
[8] Bond Size	0.372	0.470	0.036	0.251	0.046	-0.004	0.491	

Table 5. Municipal financial disclosures and trading activity

This table analyzes municipal market trading activity around annual financial disclosure filings on EMMA. The dependent variables *Volume* and *N Trades* are measured in each month m and bond b. The independent variable of interest is a *Disclosure Month* indicator equal to one if month $m \in (0, 1)$. Controls, as defined in Appendix A, include *Rating*, *Maturity*, and *Time from Issue*. Column (2) includes disclosure fixed effects that absorb the mean level of trading activity of an issuer around each disclosure filing. Column (3) includes disclosure-CUSIP fixed effects that absorb the mean level of trading activity at the bond level around each disclosure filing. The sample includes all annual financial disclosures filed on EMMA, as described in Section 3. All estimates are calculated from the sample period ($dm - 2$, $dm + 2$), where dm is the disclosure month. Cluster robust t-statistics, by disclosure filing, are included in parentheses. Levels of significance are presented as follows: $*p<0.1$; $**p<0.05$; $***p<0.01$.

Panel A: Volume

		Volume	
	(1)	(2)	(3)
Disclosure Month	3.863***	3.914***	3.796***
	(5.678)	(5.732)	(6.191)
Controls	Yes	Yes	Yes
Disclosure fixed effects	No	Yes	No
Disclosure-Cusip fixed effects	No	No	Yes
R^2	0.054	0.099	0.444
Observations	39,098,098	39,098,098	39,098,098

Panel B: Number of Trades

		N Trades	
	(1)	(2)	(3)
Disclosure Month	0.026***	0.027***	0.027***
	(7.024)	(7.135)	(8.313)
Controls	Yes	Yes	Yes
Disclosure fixed effects	No	Yes	No
Disclosure-Cusip fixed effects	No	No	Yes
R^2	0.156	0.234	0.675
Observations	39,098,098	39,098,098	39,098,098

Table 6. Outcomes of municipal financial disclosures by trader type

This table analyzes municipal market trading activity around annual financial disclosure filings on EMMA, by trader type. Dependent variables in Panel A, *VolumeInst.* and *N TradesInst.* represent trading activity for institutional investors in each month *m* and bond *b*. Dependent variables in Panel B, *VolumeRet.* and *N TradesRet.* represent retail trading activity in each month *m* and bond *b*. Trades are assigned to institutional (retail) investors following the commonly used cutoff of greater than (less than or equal to) $100,000 of par volume traded. *Volume* and *N Trades* are standardized to have a mean of zero and a standard deviation of one hundred for purposes of interpretation and to facilitate trader-type comparisons. Controls, as defined in Appendix A, include *Rating*, *Maturity*, and *Time from Issue*. Disclosure-CUSIP fixed effects absorb the mean level of trading activity at the bond level around each disclosure filing. The sample includes all financial disclosures filed on EMMA, as described in Section 3, using the sample period spanning $dm - 2$ through $dm + 2$, relative to disclosure month dm. Cluster robust t-statistics, by disclosure filing, are included in parentheses. We use a fully interacted specification to assess the significance of the difference between Institutional and Retail investors' responses. Levels of significance are presented as follows: $*p<0.1$; $**p<0.05$; $***p<0.01$.

Panel A: Volume (Standardized)

	Institutional Volume (1)	Retail Volume (2)
Disclosure Month	0.328*** (5.641)	0.548*** (7.925)
Institutional - Retail difference (t-statistic)		(-4.537***)
Controls	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes
R^2	0.413	0.598
Observations	39,098,098	39,098,098

Panel B: Number of Trades (Standardized)

	Institutional Trades (1)	Retail Trades (2)
Disclosure Month	0.450*** (7.962)	0.563*** (7.997)
Institutional - Retail difference (t-statistic)		(-2.653***)
Controls	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes
R^2	0.442	0.676
Observations	39,098,098	39,098,098

Table 7. Outcomes of municipal financial disclosures and timeliness

This table explores cross-sectional heterogeneity, across disclosure timeliness, in municipal market trading activity around annual financial disclosure filings on EMMA. The dependent variables *Volume* and *N Trades* and are measured in each month *m* and bond *b*. The independent variable of interest is a *Disclosure Month* indicator equal to one if month $m \in (0, 1)$. *Least Timely* takes the value of one for financial disclosures that are in the upper sample quartile of *Reporting Lag*. Controls, as defined in Appendix A, include *Rating*, *Maturity*, and *Time from Issue*. Disclosure-CUSIP fixed effects absorb the mean level of trading activity at the bond level around each disclosure filing. The sample includes all financial disclosures filed on EMMA, as de- scribed in Section 3, using the sample period spanning $dm - 2$ through $dm + 2$, relative to disclosure month *dm*. Levels of significance are presented as follows: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01.

Panel A: Continuous Interaction

	Volume (1)	N Trades (2)
Disclosure Month	9.507***	0.068***
	(4.227)	(7.429)
Disclosure Month × Log(Reporting Lag, Months)	-3.238***	-0.025***
	(-3.036)	(-5.717)
Controls	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes
R^2	0.438	0.667
Observations	38,101,204	38,101,204

Panel B: Discrete Interaction

	Volume (1)	N Trades (2)
Disclosure Month	3.806***	0.025***
	(6.020)	(9.007)
Disclosure Month × Least Timely	-2.698*	-0.021***
	(-1.826)	(-3.086)
Pr(Disclosure Month + Disclosure Month × Least Timely = 0)	0.4071	0.9979
Controls	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes
R^2	0.438	0.667
Observations	38,101,204	38,101,204

Table 8. Issuer risk and trading activity around municipal financial disclosures

This table explores risk heterogeneity in municipal market trading activity around annual financial disclosure filings on EMMA. In Panel A, we identify risky bonds as those with credit ratings in the lowest quartile of the sample (*Low Rating*). In Panel B, we identify risky bonds as those without bond insurance (*Uninsured*). The dependent variables *Volume* and *N Trades* are measured in each month *m* and bond *b*. The independent variable of interest is a *Disclosure Month* indicator equal to one if month $m \in (0, 1)$. Controls, as defined in Appendix A, include *Rating*, *Maturity*, and *Time from Issue*. Disclosure-CUSIP fixed effects absorb the mean level of trading activity at the bond level around each disclosure filing. All estimates are calculated from the sample period ($dm - 2, dm + 2$), where dm is the disclosure month. Cluster robust t- statistics, by disclosure filing, are included in parentheses. Levels of significance are presented as follows: *p<0.1; **p<0.05; ***p<0.01.

Panel A: Credit Ratings

	Volume (1)	N Trades (2)
Disclosure Month	2.866***	0.020***
	(6.127)	(8.997)
Disclosure Month × Low Rating	3.724*	0.025**
	(1.684)	(2.206)
Disclosure-Cusip fixed effects	Yes	Yes
R^2	0.444	0.675
Observations	39,098,098	39,098,098

Panel B: Insurance

	Volume (1)	N Trades (2)
Disclosure Month	1.033**	0.010***
	(1.980)	(3.277)
Disclosure Month × Uninsured	4.252***	0.025***
	(4.132)	(4.535)
Disclosure-Cusip fixed effects	Yes	Yes
R^2	0.444	0.675
Observations	39,098,098	39,098,098

Table 9. Text-based analyses

This table presents coefficients from individual regressions of *Volume* or *N Trades* regressed on *Disclosure Month*, the topic *Weight*, the interaction between the two, and the controls and fixed effects in Equation (2). Topics are formed based on converting words into GloVe vectors and clustering the word vectors into 100 topics (e.g., Pennington et al., 2014). Regressions are run individually on each outcome and each topic weight. Topics that have statistically significant interaction terms with *Volume* or *N Trades* are presented. A topic with a positive (negative) interaction coefficient sug- gests that filings that have more discussions of the particular topic have higher (lower) *Volume* or *N Trades* in the disclosure month. The "Example keywords" column presents the top keywords by frequency in the GloVe model. All estimates are calculated from the sample period ($dm - 2, dm + 2$), where dm is the disclosure month. Cluster robust t-statistics, by disclosure filing, are included in parentheses. Levels of significance are presented as follows: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01.

	Volume		N Trades		
Topic	Coef.	t-stat	Coef.	t-stat	Example Keywords
Estimates	5.72	1.568	0.048***	2.689	multiple evaluation covering incentives studies
Interest Rates	4.284	1.550	0.024*	1.833	index libor yield vary bear
Transportation	3.167*	1.712	0.022***	2.583	air passenger bus rail terminal
Contracts	2.951***	3.055	0.014***	3.066	agreement lease agreements leases terms
Obligations	2.828*	1.889	0.021***	2.802	project obligations payment shall power
Bonds	1.971	1.469	0.012*	1.861	bonds interest series rate bond
Regulatory	1.968	0.954	0.021*	1.925	events although affect potential regulatory
Infrastructure	1.864	1.346	0.014**	2.068	road replacement completed design bridges
Government Type	1.642	1.496	0.012**	2.229	state city service district authority
Direction of Change	1.627	0.904	0.017**	2.057	lower increasing low significantly decline
Function	1.331	0.793	0.017**	2.036	data responsibility records preparation underlying
Financial Institutions	1.303**	1.968	0.003	1.077	wells n.a ny fargo tx
Obligations	1.083*	1.829	0.004*	1.652	rights owners obligated right written
Utilities	0.125	0.248	-0.004**	-1.972	system water facilities operations maintenance
Corporations	0.107	0.222	-0.004**	-2.063	corporation inc company association llc
Financing Sources	-0.403	-0.861	-0.006***	-2.745	financing sources transfers uses noncapital
Revenues and Expenses	-0.432	-0.902	-0.005**	-2.366	imposed parties external restrictions placed
Balance Sheet Accounts	-0.586	-0.843	-0.008**	-2.267	liabilities due payable accounts accrued
Statement of Activities	-0.67	-1.106	-0.005*	-1.911	revenues revenue expenditures operating taxes
County Names	-0.71*	-1.676	-0.003*	-1.815	union valley el clark lincoln
Medical	-0.738	-1.555	-0.004*	-1.951	care medical hospital medicare medicaid
County	-0.797*	-1.803	-0.005**	-2.365	county township beach passaic borough
Financial Statements	-0.806	-1.102	-0.008**	-2.478	financial statements information report accounting
Administrative Miscellaneous	-0.813	-0.930	-0.009**	-2.247	maintains operates makes cps msd
Administrative General	-0.921***	-2.593	-0.005***	-2.657	administrative salaries supplies purchased central
Capital Assets	-0.989	-1.413	-0.008**	-2.541	capital construction improvements equipment depreciation
Forms, Counties	-1.018**	-2.068	-0.004**	-2.019	form unified description object resource
Accounting Method	-1.032*	-1.646	-0.006**	-2.119	period recognized recorded accrual incurred
Budgeting	-1.201**	-1.984	-0.001	-0.434	budget appropriations approved appropriation review
Parks and Recreation	-1.258**	-2.518	-0.002	-0.876	center park convention arts hall
Audit	-1.325***	-2.731	-0.008***	-3.642	compliance opinion procedures whether appropriate
Tax Sources	-1.362***	-2.987	-0.007***	-3.638	tax value property valuation real
Facilities	-1.39***	-3.504	-0.005***	-2.585	foundation campus arkansas science branch
Resources	-1.419**	-2.159	-0.009***	-3.130	resources restricted reserve unrestricted assigned
Education	-1.441***	-2.972	-0.006***	-2.790	school education higher college schools
Officials	-1.489**	-2.371	-0.007**	-1.996	board council elected consists governor
Balance Sheet	-1.545	-1.625	-0.012**	-2.506	fund total year net funds

Table 10. Excluding concurrent event disclosures and bond offerings

This table analyzes municipal market trading activity around annual financial disclosure filings on EMMA. Column (1) excludes disclosures that occur in the same month as a material event filing (e.g., credit rating change). Column (2) exclude sdisclosures that coincide with a new bond offering. Column (3) presents the results of the regressions excluding both material event filings and bond offerings. The sample is restricted to 2009 – 2018 because our Mergent Municipal data on bond offerings ends in 2018. The dependent variables *Volume* and *N Trades* are measured in each month *m* and bond *b*. The independent variable of interest is a *Disclosure Month* indicator equal to one if month $m \in (0, 1)$. Controls, as defined in Appendix A, include *Rating*, *Maturity*, and *Time from Issue*. Disclosure-CUSIP fixed effects absorb the mean level of trading activity at the bond level around each disclosure filing. All estimates are calculated from the sample period ($dm - 2, dm + 2$), where dm is the disclosure month. Cluster robust t-statistics, by disclosure filing, are included in parentheses. Levels of significance are presented as follows: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01.

Panel A: Volume

	Volume		
	No Events (1)	No Offerings (2)	No Events or Offerings (3)
Disclosure Month	1.680***	3.889***	1.790***
	(3.553)	(6.061)	(3.660)
Controls	Yes	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes	Yes
R^2	0.434	0.443	0.433
Observations	35,496,381	36,690,609	33,552,345

Panel B: Number of Trades

	N Trades		
	No Events (1)	No Offerings (2)	No Events or Offerings (3)
Disclosure Month	0.016***	0.028***	0.016***
	(6.742)	(8.192)	(6.799)
Controls	Yes	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes	Yes
R^2	0.661	0.676	0.660
Observations	35,496,381	36,690,609	33,552,345

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