The Information Content of Municipal Financial Statements

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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 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. The finding is apparent in both institutional and retail trades, and is more pronounced for timelier disclosures. Our results contrast with earlier research and suggest that participants in the 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 users of financial reports.[1] However, many market participants dispute the usefulness of municipal continuing disclosures, citing their lack of timeliness, frequency, and completeness.[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 as a result of the disclosure. These differences come from either differential predisclosure 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,

[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.

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 returns 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 MSRB's EMMA web site (similar to the 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.

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 instead had to be hand-collected

[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.

(Ingram et al., 1989; Reck and Wilson, 2006). However, the breadth of data that is available to researchers to study disclosure-related questions has dramatically increased recently.

We obtain all continuing disclosures filed with the Municipal Securities Rulemaking Board (MSRB) through the Electronic Municipal Market Access (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. The disclosures include both audited financial statements (53%) and unaudited annual reports (47%). These disclosures are similar to those provided by corporations but are non-standardized, less frequent, and less timely.

To evaluate whether investors react when annual financial disclosures are filed with the MSRB, we study changes in volume, turnover, 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, whereas trading volume and turnover encompass 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. Bond returns require two trades in consecutive months, which 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).

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

We find that trading activity increases in the month the financial disclosure is filed and in 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 approximately 1 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 and disclosures. First, we separate trading activity by investor type, based on trade size (e.g., Schwert (2017)). Retail investors likely have less capacity to process information than institutional investors, which can limit their responsivness to disclosure filings (Cready, 1988).[5] Nonetheless, we find that both retail and institutional investors trade around financial disclosure filings. This evidence suggests that information processing costs play a limited role in impeding responsiveness to the disclosures.

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

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

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. After nine months, investors' response to annual disclosures is negligible, suggesting that either the information is stale or that other information sources preempt the disclosure filing. These findings corroborate the longstanding concerns of regulators and market participants that untimely disclosures are less useful than timely disclosures.

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.

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 Municipal Securities Rulemaking Board (MSRB). However, the MSRB does not have direct regulatory authority over municipal bond issuers themselves (i.e., state and local governments). The Securities and Exchange Commission (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 Electronic Municipal Market Access (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 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

[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.

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.

3. Data

We obtain the data on the full universe of disclosures from the MSRB. Our sample covers disclosures filed with 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 associated 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). There are 888,050 annual financial disclosures, which gives us a potential sample of 84,185,995 disclosure-CUSIP observations.

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.

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

[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 in calculating textual measures.

issuance.[11] Third, following Green et al. (2010), we also remove bonds with variable rates.

We then merge the bond-level disclosure data with municipal bond transaction data from the MSRB. Before merging, 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 ten trades (Schwert, 2017).[12] The final sample includes 412,947 distinct annual financial disclosures, or 8,284,927 disclosure-CUSIP observations.

3.1. Descriptive statistics

Table 1, Panel B breaks the financial disclosures down by type. Issuers categorize financial disclosures when they are filed in EMMA.[13] The most common disclosure type is *Audited Financial Statements*, comprising 53 percent of disclosures. *Annual Financial Information* (typically unaudited financial statements) comprise the remaining 47 percent of disclosures. These disclosures are filed an average of 283 days after period-end.

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 propor-

[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, 2007).

[12] Because the MSRB data include the initial sale of the bond, which involves the underwriter selling it in blocks to investors, most bonds have over ten trades.

[13] An individual disclosure can be categorized in multiple categories.

tion of the sample (2.07 percent). The frequency of disclosure filings increases over time, and peaks in 2014, which comprises 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. Forty 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. Fourteen 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.

4. Results

We use several measures of trading activity, including $Turnover_{b,m}$, $Volume_{b,m}$, and $N\ Trades_{b,m}$. $Turnover_{b,m}$ is the percentage of the total par value outstanding of bond b that is traded in month m, in basis points. $Volume_{b,m}$ 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. Panel A of Table 3 shows that the median level of all of our trading activity measures is 0.000, illustrating the illiquidity of the market. The average *Turnover* is 521.269. The average *Volume* in the sample is 155.516. The average *N Trades* is 1.292.[14] Panel B shows the correlations between the variables. The Spearman correlations (in the upper triangular region) among the three variables are highly correlated (above 98 percent).

We also present trading activity statistics separated into institutional and retail trades. Consistent with prior research (e.g., Schwert (2017)), 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 *Turnover* and *Volume* are based on par values traded, the average is higher for institutional trades than retail trades. For example, the average institutional *Volume* is 120.536 while the average for retail trades is 34.980. While 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 0.158 and is 1.134 for retail trades.

We begin by providing a graphical representation of the mean of our three trading activity

[14] To address potential data errors and the skew in the trading activity variables, we Winsorize at the 0.5% and 99.5% level.

measures by month, where month zero is the month the financial disclosure is filed in EMMA. Figure 1 shows a meaningful increase in each of the measures in the month of the disclosure filing and the month after.

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:

$$\begin{aligned} Trading\ Activity_{b,m} = \beta_0 + \beta_1 DisclosureMonth_{b,m} + \sum \gamma Controls_{b,m} \\ + Fixed\ Effects_{b,m} + \varepsilon_{b,m}. \end{aligned} \tag{1}$$

$DisclosureMonth_{b,m}$ is an indicator 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. First, we calculate the bond's average numerical credit rating across Moody's, S&P, and Fitch (where available), as of month m. *Rating* increases in value from 1 (AAA) to 22 (D/Unrated). The average bond in our sample is rated AA- (corresponding to a value of 3.945 in Table 3, Panel A). Second, we control for the bond's remaining time to maturity in month m. The average *Maturity* in our sample is 7.913 years. Finally, we control for the time from the bond's issuance in month m. The average *Time from Issue* is 5.267 years.

Table 4 corroborates the observations from the figure 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 the 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 1, 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 4.016 in Panel A, Column (3) indicates an 0.770 percent increase in *Turnover* following a disclosure filing. Panel B shows that *Volume* increases by 1.323 percent. Panel C shows that *N Trades* increase by 1.935 percent.[15]

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-perform our analyses separately for retail and institutional trades. 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. Sophis-

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

ticated investors also have a greater capacity to quickly acquire and integrate information than unsophisticated investors. Table 5, Panel A shows shows a significantly positive response from institutional investors. In economic terms, Columns (1) through (3) show that institutional trading activity increases by 0.812, 1.161, and 1.899 percent, respectively.

By contrast, retail investors have limited capacity to actively monitor issuers' disclosures. Because monitoring is costly, these investors may not even be aware that the disclosure was filed. Nonetheless, Table 5, Panel B shows a significantly positive response from retail investors in the period after the disclosures are filed. The coefficient of 1.560 in Column (1) represents an approximately 0.553 percent increase in retail trade volume in the post-disclosure period. The coefficients in the subsequent columns indicate an increase of 1.670 percent, and 1.675 percent, respectively. Thus, both types of investors (institutional and retail) respond to the disclosure filings.

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, 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. 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).

Table 6 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 5.476 in Column (1) indicates an increase in trading volume of 1.051 percent relative to the unconditional mean for these timely disclosures. This economic magnitude is substantially larger than that presented in Table 4. Notably, the effect attenuates for the least timely disclosures. The difference between the coefficient on *Disclosure Month* (5.476) and the coefficient on the interaction between *Disclosure Month* and *Least Timely* (−6.192) is −0.716, suggesting a much smaller response to untimely disclosures. Thus, investors' responsiveness to disclosure varies predictably with its timeliness.

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.[16] However, it is unclear whether retail investors use financial disclosures when they make investment decisions.[17] 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 so-

[16]Other initiatives include the Municipalities Continuing Disclosure Cooperation (MCDC) Initiative of 2014, which allowed issuers to voluntarily disclose their noncompliance with continuing disclosure obligations to avoid monetary penalties. See https://www.sec.gov/divisions/enforce/municipalities-continuing-disclosure-cooperation-initiative.shtml. 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).

[17]See https://www.gao.gov/assets/gao-12-698.pdf.

phistication 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.

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 consistent across small and large investors, and suggests that 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. Collectively, our evidence shows that municipal financial disclosures are useful in the sense that investors perceive them to have informational value.

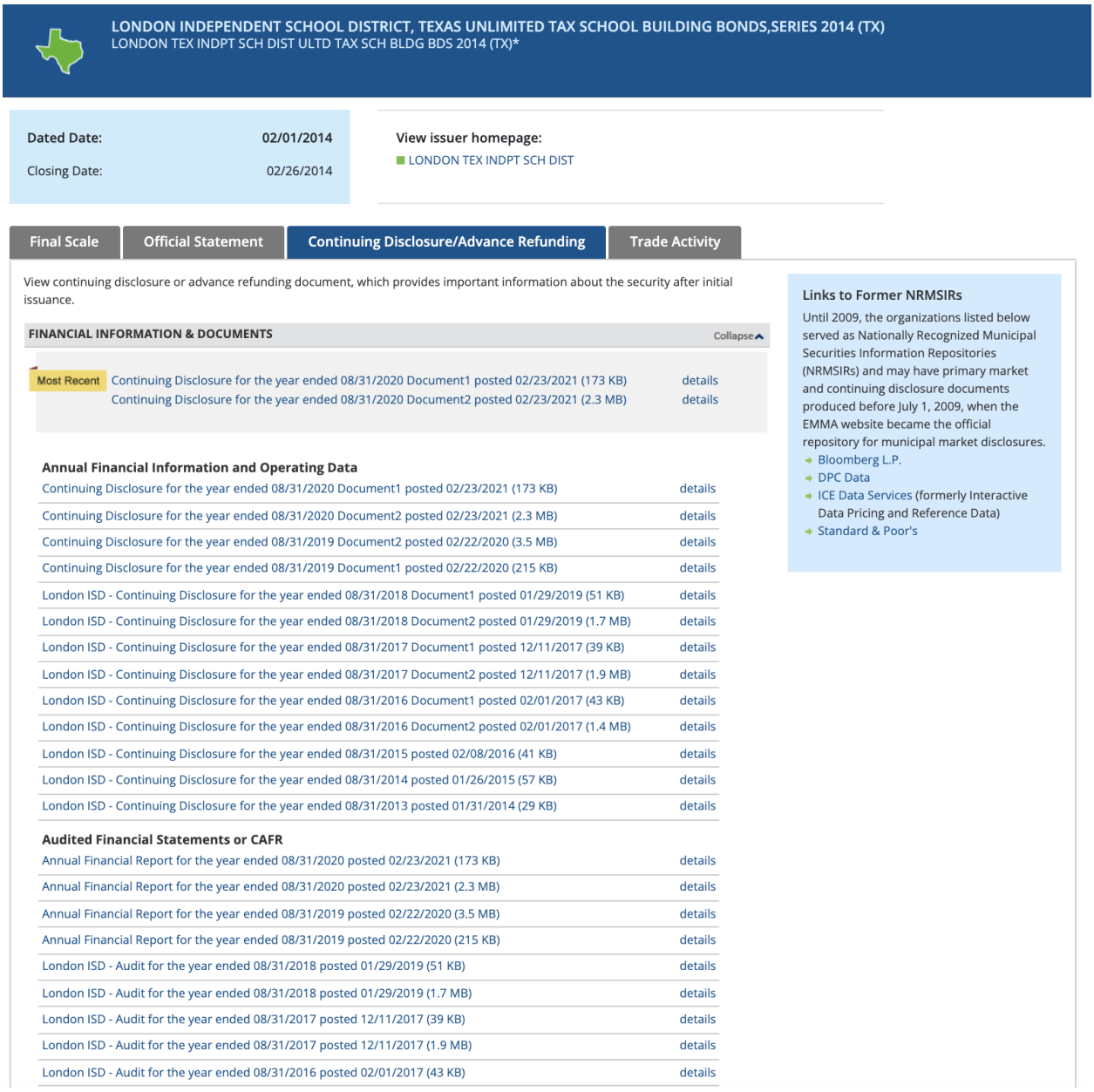
Appendix A. Variable Definitions

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)
Turnover	The percentage of the total par value outstanding of bond b traded in month m. Measured in basis points. (MSRB)
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/Unrated). (FISD)
Reporting Lag	The time between the fiscal/reporting period end date and disclosure posting date. Measured in days. (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 (i.e., those filed more than 261 days after period end), and zero otherwise. (EMMA)

Appendix B. Snapshot from EMMA

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



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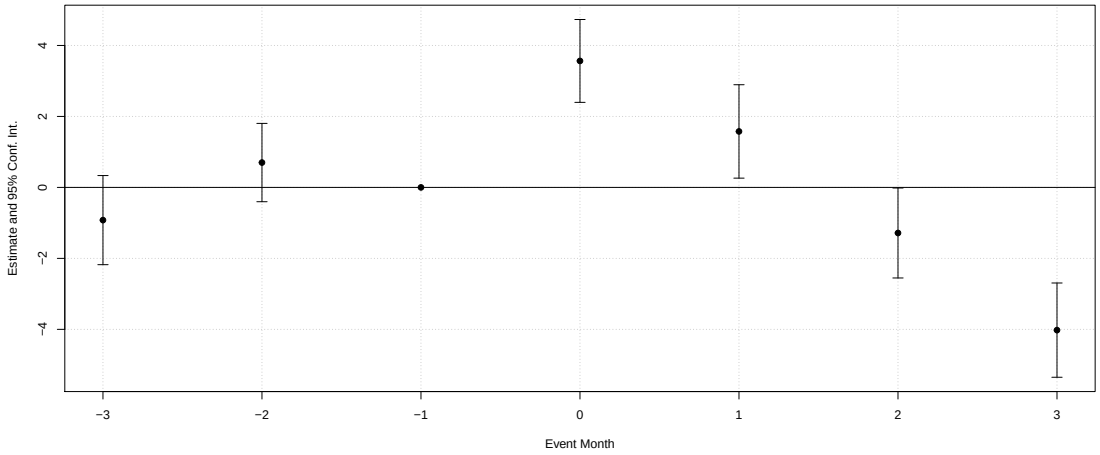
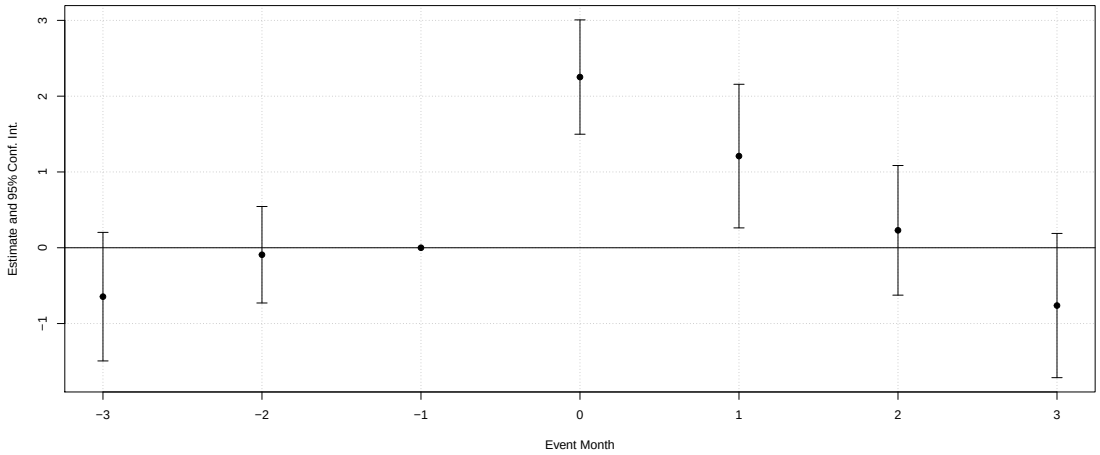
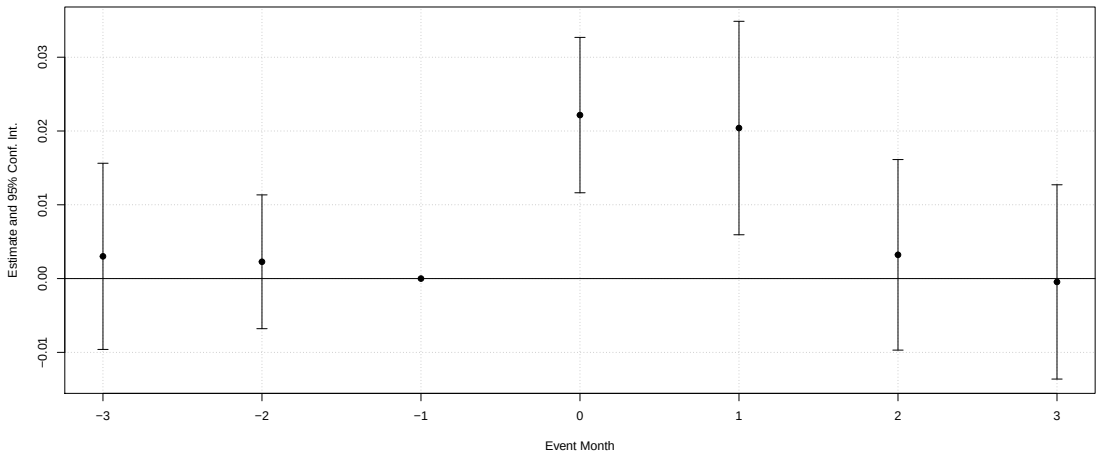


(a) Turnover



(b) Volume



(c) Number of Trades

Fig. 1 Financial disclosures. This figure presents event-time analysis of trading activity around annual financial disclosure filings on EMMA. Panels (a), (b), and (c) present these analyses for *Turnover*, *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.

Table 1
Sample selection and disclosure composition

Panel A: Sample selection

	Obs	Disclosures
Select financial and operating disclosures	84,185,995	888,050
Drop observations w/ missing CUSIP or date information	84,164,497	878,209
Drop duplicate disclosure submissions	64,271,151	877,618
Mergent match	53,186,265	857,010
Remove matured or called bonds	25,770,955	804,146
Remove pre-refunded/escrowed securities	24,591,970	803,170
Drop observations less than 12-months from issuance	21,767,227	761,044
Drop adjustable rate securities	21,190,331	748,320
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

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.

Table 2
Sample by year and issuer characteristics

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

Table 2, continued

Panel C: Disclosures by bond purpose

	Disclosure Level		Bond-Disclosure Level	
Use	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

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.

Table 3
Summary statistics

Panel A: Descriptive statistics

	Mean	StDev	$p^{10\%}$	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$	$p^{90\%}$	Obs.
Turnover	521.269	366,943.104	0.000	0.000	0.000	0.000	268.456	40,336,884
$\text{Turnover}^{\text{Inst.}}$	239.142	84,116.936	0.000	0.000	0.000	0.000	0.000	40,336,884
$\text{Turnover}^{\text{Ret.}}$	282.127	356,033.449	0.000	0.000	0.000	0.000	163.934	40,336,884
Volume	155.516	2,711.462	0.000	0.000	0.000	0.000	115.000	40,560,034
$\text{Volume}^{\text{Inst.}}$	120.536	2,663.675	0.000	0.000	0.000	0.000	0.000	40,560,034
$\text{Volume}^{\text{Ret.}}$	34.980	178.465	0.000	0.000	0.000	0.000	80.000	40,560,034
N Trades	1.292	6.273	0.000	0.000	0.000	0.000	4.000	40,560,034
$\text{N Trades}^{\text{Inst.}}$	0.158	1.217	0.000	0.000	0.000	0.000	0.000	40,560,034
$\text{N Trades}^{\text{Ret.}}$	1.134	5.487	0.000	0.000	0.000	0.000	3.000	40,560,034
Time from Issue	5.267	3.165	1.808	2.863	4.721	7.019	9.063	40,560,034
Maturity	7.913	6.074	1.334	3.170	6.584	11.342	16.301	40,560,034
Rating	3.945	2.950	1.000	2.500	3.500	4.500	6.000	39,316,027
Reporting Lag	283.468	4,844.372	118.000	166.000	191.000	261.000	365.000	40,560,034
Offering Size	79.408	179.236	4.760	9.640	23.780	68.990	199.790	40,560,034
Bond Size	5.630	27.633	0.269	0.535	1.275	3.665	11.045	40,336,884

Panel B: Pairwise correlations

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
[1] Turnover		0.993	0.988	-0.020	0.140	0.023	-0.045	0.281	0.338
[2] Volume	0.002		0.995	-0.017	0.153	0.026	-0.053	0.314	0.378
[3] N Trades	0.002	0.347		-0.013	0.160	0.030	-0.054	0.313	0.379
[4] Time from Issue	0.000	-0.001	0.009		-0.209	0.146	0.047	-0.019	-0.015
[5] Maturity	0.001	0.067	0.173	-0.184		0.044	-0.014	0.068	0.191
[6] Rating	-0.000	0.022	0.040	0.195	0.044		0.042	-0.055	-0.036
[7] Reporting Lag	-0.000	-0.001	-0.002	0.002	-0.000	0.003		-0.167	-0.143
[8] Offering Size	-0.000	0.149	0.271	0.013	0.065	0.020	-0.006		0.780
[9] Bond Size	-0.000	0.301	0.370	0.029	0.184	0.036	-0.002	0.435	

Panel A reports basic summary statistics for the primary measures used in the paper. 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.

Table 4
Municipal financial disclosures and trading activity

Panel A: Turnover

	Turnover		
	(1)	(2)	(3)
Disclosure Month	3.251***	3.311***	4.016***
	(7.283)	(7.405)	(9.236)
Controls	Yes	Yes	Yes
Disclosure fixed effects	No	Yes	No
Disclosure-Cusip fixed effects	No	No	Yes
R^2	0.002	0.026	0.282
Observations	39,098,098	39,098,098	39,098,098

Panel B: Volume

	Volume		
	(1)	(2)	(3)
Disclosure Month	2.060***	2.101***	2.058***
	(6.367)	(6.464)	(7.179)
Disclosure fixed effects	No	Yes	No
Disclosure-Cusip fixed effects	No	No	Yes
R^2	0.086	0.134	0.463
Observations	39,098,098	39,098,098	39,098,098

Panel C: Number of Trades

	Trades		
	(1)	(2)	(3)
Disclosure Month	0.025***	0.025***	0.025***
	(5.123)	(5.220)	(6.080)
Controls	Yes	Yes	Yes
Disclosure fixed effects	No	Yes	No
Disclosure-Cusip fixed effects	No	No	Yes
R^2	0.094	0.168	0.634
Observations	39,098,098	39,098,098	39,098,098

This table analyzes municipal market trading activity around financial disclosure filings on EMMA. The dependent variables *Turnover*, *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*. 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.

Table 5
Outcomes of municipal financial disclosures by trader type

Panel A: Institutional investors

	Turnover (1)	Volume (2)	Trades (3)
Disclosure Month	1.941***	1.399***	0.003***
	(6.538)	(6.250)	(8.232)
Controls	Yes	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes	Yes
R^2	0.274	0.406	0.408
Observations	39,098,098	39,098,098	39,098,098

Panel B: Retail investors

	Turnover (1)	Volume (2)	Trades (3)
Disclosure Month	1.560***	0.584***	0.019***
	(9.592)	(9.377)	(10.093)
Controls	Yes	Yes	Yes
Disclosure-Cusip fixed effects	Yes	Yes	Yes
R^2	0.284	0.563	0.639
Observations	39,098,098	39,098,098	39,098,098

This table analyzes municipal market trading activity around financial disclosure filings on EMMA, by trader type. Dependent variables in Panel A, $Turnover^{Inst.}$, $Volume^{Inst.}$, and $N\ Trades^{Inst.}$ represent trading activity for institutional investors in each month m and bond b. Dependent variables in Panel B, $Turnover^{Ret.}$, $Volume^{Ret.}$, and $N\ Trades^{Ret.}$ 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. Controls, as defined in Appendix A, include *Rating*, *Maturity*, and *Time from Issue*. 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. Levels of significance are presented as follows: *p<0.1; **p<0.05; ***p<0.01.

Table 6
Outcomes of municipal financial disclosures and timeliness

	Turnover (1)	Volume (2)	Trades (3)
Disclosure Month	5.476***	2.727***	0.029***
	(9.478)	(7.481)	(5.975)
Disclosure Month × Least Timely	-6.192***	-1.980***	-0.032***
	(-5.524)	(-2.818)	(-3.342)
Disclosure-Cusip fixed effects	Yes	Yes	Yes
R^2	0.282	0.463	0.634
Observations	39,098,098	39,098,098	39,098,098

This table explores cross-sectional heterogeneity, across disclosure timeliness, in municipal market trading activity around financial disclosure filings on EMMA. The dependent variables *Turnover*, *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*. 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. Levels of significance are presented as follows: *p<0.1; **p<0.05; ***p<0.01.