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ORIGINAL RESEARCH

Should more local governments purchase a bond rating?

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Abstract We investigate whether issuers that choose to forgo a bond rating suffer an interest cost penalty greater than the cost of the rating. We use estimated ratings provided by Moody's Investor Service to proxy for what the rating would have been if it had been purchased. We find that the primary factors associated with an issuer's decision to purchase a rating are the rating expected by the issuer and the extent to which an issue is marketed locally. After controlling for self-selection bias, we find that the issuers that forgo a rating do not suffer an interest cost penalty.

Keywords Ratings · Municipal bonds · Selection bias

JEL Classification G12 · G24 · H74

1 Introduction

Bond ratings are widely believed to provide information to market participants regarding a bond issue's default risk. A large body of prior research (e.g., Hsueh and Liu 1993) has examined the value of bond ratings, finding that unrated bonds sell for higher yields than

The estimator rating data for the non-rated securities used in this study was supplied by Moody's Investors Service.

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most rated bonds. The major limitation of prior research is that researchers were unable to determine, for unrated issues, what the rating would have been if a rating had been purchased. Issuers who anticipate low ratings are expected to be more likely to forgo purchasing ratings. The higher yields of unrated bonds, then, may reflect premiums for uncertainty due to a lack of information, or they may reflect efficient pricing based on the higher default risks of issuers who do not purchase ratings. We are able to disentangle these competing explanations by using a proprietary database of estimator ratings. Our data is provided by Moody's and is created using Moody's procedures and expertise.[1] Thus, we are able to directly compare the yields of bonds that received a particular rating (e.g., Baa) to the yields of unrated bonds that would have received the same rating had the issuer applied for it.

Unlike some prior research, we correct for self-selection bias using Heckman-Lee procedures. After correcting for selection bias, we find that the decision to forgo a rating does not result in an interest cost penalty. Our results are driven by two factors. First, issuers that forgo a rating would have received a low rating: 66% of the unrated issues in our sample would have received a rating of Baa or Ba while only 6% of the rated sample received such a low rating. Second, although most issuers of unrated bonds would have received a low rating, these issues are generally marketed locally. Because local buyers have more issue and issuer specific information, they are less dependent on the rating agencies' opinions. Locally marketed issues that receive a low rating may cause investors to reevaluate their default risk assessment, and therefore, some issuers risk an interest cost penalty if they purchase a rating. Contrary to prior research, we find that issuers who forgo a rating are acting rationally and are not paying higher interest costs.

The next section develops our hypotheses and reviews relevant literature. The third section describes the data and methods. The fourth and fifth sections present the results and conclusions, respectively.

2 Local government bond ratings

Several studies have examined the impact of bond ratings on corporate and municipal bond yields (e.g., Ingram et al. 1983). Liu and Thakor (1984, 1988), Reiter and Ziebart (1991) and Liu and Seyyed (1991) show that credit ratings have an independent effect on prices; that is they provide information to investors that is in addition to economic characteristics, financial information, and other publicly available information. Investors are likely to rely heavily on ratings in the municipal bond market because this market is characterized by

[1] When the authors asked a representative of Moody's whether the analysts knew that the estimator ratings provided were not part of the normal business of Moody's, their response was as follows:

> "No they did not. A large percentage of our business is assessing credits outside of providing an actual public rating. For example, in 2003 we assigned over 28,000 rating actions in the public finance group, only 7,000 were new issues. Analysts routinely perform updates on existing transactions as well as assess the credit risk for other debt instruments. We also provide a similar type of rating estimate or "code" for insured debt so that our analysts who follow the insurance companies can assess the risk profile of the insurer. Our analysts are expected to do these types of analyses as part of their routine responsibilities. The analysts who worked on the estimated ratings for your project were not aware that these estimated ratings were for a pricing project nor did it seem unusual for them to have to provide such ratings."

The first author of this paper signed a confidentiality agreement with Moody's not to release the estimator ratings.

limited financial information. Municipal issuers are not directly regulated by the SEC, and issuers are not required to issue GAAP financial statements or obtain an audit.[2] In the corporate bond market, virtually all new issues are rated, despite the wide availability of financial statement information. However, about a fifth of uninsured municipal issuers during our sample period (1999–2000) chose to obtain neither a rating nor insurance.[3] Given the greater potential for information asymmetries in the municipal market, independent ratings should be more valuable to investors in this market, yet compared to corporate bonds, a much smaller percentage of municipal bonds are rated. If ratings are more valuable in the municipal market, are issuers acting rationally when they opt to forgo ratings on new issues?

Interest costs on bond issues are frequently among the largest expenses incurred by municipalities. The cost of a Moody's general obligation rating ranges from $4,400 to $8,300 for issues under $10 million. Even for smaller issues, however, relatively small improvements in yield justify the expenses associated with obtaining a rating. For example, for a $1 million, 10-year issue, if a rating results in a ten basis point yield reduction, then the present value benefits of the rating exceed the explicit costs of the rating. The low cost of ratings relative to the potential interest savings would suggest that issuers should reduce investor default uncertainty by obtaining a rating.

However, while ratings can reduce investor uncertainty, obtaining a rating may not be in the best interest of the issuer for at least two reasons. First, if the rating provides new information that the default risk is higher than the risk perceived by investors, the rating may increase yields. Second, smaller issues can generally be marketed locally to investors with prior knowledge of an issuer. These investors can more easily evaluate the credit quality of the issuer, and therefore may not require an independent rating. The rating signal, then, provides no new information and, thus, there is no cost saving to the issuer; incurring ratings costs would be irrational. The value of the rating to the issuer is dependent on the quality and quantity of competing information sources.

Previous municipal studies have examined whether issuers should purchase two ratings or only one rating (Hsueh and Kidwell 1988 and Thompson and Vaz 1990),[4] but only one paper has investigated whether tax-exempt borrowers should purchase at least one credit rating (Hsueh and Liu 1993). Using a statistical model of bond ratings predicted with financial data, they estimated whether unrated bonds would have received an investment grade rating. They find that unrated bonds for which their model predicts an investment grade quality sell at higher yields than bonds with investment grade ratings.

[2] Municipal issuers are not directly regulated by the SEC, but underwriters must provide assurance of the truthfulness and completeness of financial information. SEC chairman Christopher Cox concluded that "disclosure in the municipal securities market is substantially less comprehensive and less readily available, particularly to individual investors, than disclosure by public reporting companies" (as quoted in Hume and Ackerman 2007).

[3] Data on the number of unrated issues is scarce, but Albano (2000) reports that there were 1,460 unrated issues from 1/1/1999 to 12/31/1999 and 860 unrated issues from 1/1/2000 to 5/26/2000 which would project out to about 3,300 issues for all of 1999–2000. This compares to a total of 16,295 (20%) uninsured issues and 24,141 total issues (14%) in 1999–2000.

[4] Hsueh and Kidwell (1988) and Thompson and Vaz (1990) both find evidence that obtaining a second identical rating results in yields that are lower than yields for bonds with a single rating. These authors recommend that issuers purchase the second rating because the savings from the average yield reduction were estimated to be more than the cost of the additional rating. However, there would seem to be little advantage to purchasing a second rating if there was a reasonable chance that it could be lower than the first rating.

The major limitation of Hsueh and Liu is that they are estimating the credit quality of unrated issues, and prior research has found the predictive power of local government rating models to be modest, especially in out-of-sample tests.[5] The model they use is generated from a sample of rated bonds which could be quite different from unrated bonds. This paper is able to investigate the importance of bond ratings more directly than prior research because we have a better measure of the credit quality of unrated issues.

3 Data and methods

3.1 Data

The data on bond issue characteristics were drawn from the Bond Buyer Online for municipal bonds issued over the period beginning January 20, 1999 and ending December 31, 2000. We obtained sale information for all competitive and negotiated general obligation bonds issued during this period. Revenue bonds, certificates of participation, etc., were excluded because reoffering yields for these instruments can vary widely depending on issue and issuer characteristics that cannot be captured by the available data. About half of all municipal bond issues during the sample period were revenue bonds. Insured issues, including those with state credit enhancements, were also excluded from the sample.[6] Published bond ratings were obtained from Moody's Bond Record or from the monthly publication Mergent Bond Record.[7] A complete data set was obtained for 892 issues, including 715 issues with a published rating and 177 issues in which the rating was estimated by Moody's.[8] If no rating could be found, a search was made for a Standard & Poor's rating in their Municipal Ratings Handbook. The data for the number of prior issues was obtained from the annual publication *Moody's Municipal & Government Manual* (1990–2001).

For all uninsured, unrated issues for which bond pricing data is available, we asked Moody's for an estimator rating. Moody's then contacted issuers to obtain information necessary to the ratings process. The analysts who worked on the estimator ratings were unaware that these issues were part of an academic study.[9] The only difference between the process used by Moody's to create the estimator ratings and the process used to create an actual public rating was that the analysts did not have access to the rated entity's personnel. However, because the size of the estimated ratings issues is relatively small, it is unlikely

[5] See Loviscek and Crowley (1990) for a review of this research.

[6] The municipal market is characterized by a greater reliance on bond insurance. Approximately half of all municipal issues are marketed with bond insurance. These issues automatically receive a AAA credit rating.

[7] Issuers of municipal bonds sell a "bond issue" as a package to underwriters that typically includes numerous maturities. For competitively-bid issues, the underwriter with the best price (lowest True Interest Cost or Net Interest Cost) buys the entire package. We use the term "issue" or "bond issue" to denote the entire package of maturities purchased by the underwriter. In general, an issue's features (e.g., revenue versus general obligation, fixed versus variable interest rates, security and call provisions) apply to all maturities in an issue.

[8] Moody's was kind enough to examine most of the uninsured issues in the sample to verify their ratings. They were able to identify a few issues that were insured but not reported as such in the Bond Buyer. In addition, Moody's was able to identify a few issues that had higher ratings than the entity's underlying G.O. rating because these issues benefited from a particular enhancement program. The results were unchanged when the sample was restricted to the issues that Moody's reviewed.

[9] See footnote 1.

that analysts would choose to spend their limited time contacting this particular group of issuers.[10] The estimator ratings are used to control for default risk differences between rated and unrated issues as described in the next section.

3.2 Methodology

The primary research question in this study is whether non-rated, non-insured issuers could achieve significant yield reductions by purchasing bond ratings. However, the comparison between rated and unrated bonds is complicated by self-selection bias. Issuers who believe they are likely to receive a low bond rating are less likely to apply for a rating. If we were to use a single OLS model to compare the yields of public ratings versus estimated ratings, the model's coefficients would be biased. To address the self-selection issue, we use a two-stage switching regression model[11] developed by Heckman (1979) and Lee (1979).[12] In the first stage, we employ a Probit regression model predicting whether an issuer chooses to apply for a rating. The estimates from the first stage model are used to compute the Inverse Mills Ratios used in the second stage models.[13] The second stage models new issue local government bond yields with the Inverse Mills Ratios from the first stage included as an additional explanatory variable, along with variables to control for default risk, size and other important factors.

The estimator ratings are used in both the first-stage Probit model and the second stage regression model as follows:

First Stage Probit Model:

$$\begin{aligned} \textit{Rating Purchased} = {} & \alpha_1 + \alpha_2 \textit{Rating Expected} + \alpha_3 \textit{Size} + \alpha_4 \textit{Competitive} + \alpha_5 \textit{Prior Issues} \\ & + \alpha_6 \textit{Underwriter Rank} + \alpha_7 \textit{Bank-Qualified} + \alpha_8 \textit{Tax Difference} + \varepsilon \end{aligned} \tag{1}$$

[10] Analysts can have only limited contact with issuers given that a small group of analysts provides over 20,000 municipal ratings per year.

[11] Li and Prabhala (2007) review a variety of self-selection models and discuss which model is appropriate for various settings in finance research. One alternative approach is similar to our two-stage models except that separate models are used for entities selecting each group (e.g., rating purchased versus not purchased) in the second stage. This approach relaxes the assumption that the coefficients of the independent variable are identical across the two groups. Two disadvantages of using separate models in the second stage are as follows. First, because each model contains only entities that made the same choice of whether to purchase a rating, there can be no choice variable in the models. Therefore, there is no direct test of the effect of the choice. Second, the power of the tests is smaller because of the smaller sample sizes in each model. In an untabulated analysis, we use separate models in the second stage, but are forced to simplify the measurement of rating because of the very small sample sizes of some rating categories in the model with no purchased ratings. The effects of rating on bond yields are very similar between models, providing evidence that the choice of whether to purchase a rating does not affect yields. These conclusions are broadly similar to those reached with our methods as issuers who do not purchase a rating do not appear to pay higher interest costs.

[12] Similar models that correct for self-selection have been widely used in several areas including research investigating a corporation's decision to solicit a rating (Poon 2003), a local government's decision to purchase a rating (Moon and Stotsky 1993) or a second rating (Hsueh and Kidwell 1988), a corporation's decision to solicit a third rating (Cantor and Packer 1997), and a property-liability insurer's decision to purchase one or more financial strength ratings (Pottier and Summer 1999).

[13] The Inverse Mills Ratio is the ratio of the probability density function to the cumulative density function of a distribution.

Second Stage Regression Model:

$$\begin{aligned} \textit{Reoffer Yield} = {} & \beta_1 + \beta_2 \textit{Interest Rate} + \beta_3 \textit{Maturity} + \beta_4 \textit{Bids} + \beta_5 \textit{Callable} \\ & + \beta_6 \textit{Bank-Qualified} + \beta_7 \textit{Refunding} + \beta_8 \textit{Competitive} + \beta_9 \textit{County} \\ & + \beta_{10} \textit{School} + \beta_{11} \textit{Size} + \beta_{12} \textit{Prior Issues} + \beta_{13} \textit{Tax Difference} \\ & + \beta_{14} \textit{Underwriter Rank} + \beta_{15} Aa_j + \beta_{16} A_j + \beta_{17} Baa_j + \beta_{18} Ba_j \\ & + \beta_{19} \textit{Lambda} + \beta_{20} \textit{Rating Purchased}_j + \varepsilon_j \end{aligned} \quad (2)$$

where:

Rating Purchased = 1 if an issuer purchased a rating, 0 otherwise;
Rating Expected = 5 if the actual or estimated rating is Aaa, 4 if Aa, 3 if A, 2 if Baa, and 1 if Ba;
Size = log of the dollar amount of the issue;
Competitive = 1 if the issue is competitively offered, 0 if negotiated;
Prior Issues = log of the number of prior issues within the last 10 years plus one;
Underwriter Rank = the underwriter's rank from 1 to 100 where 1 represents the underwriter which sold the largest volume of long-term municipal issues that year; unranked underwriters are coded 101;
Bank-Qualified = 1 if the issue is bank-qualified, 0 otherwise;
Tax Difference = Maximum personal state tax rate for issues in states that tax out-of-state issues and not in-state issues, 0 otherwise;
Reoffer Yield = the 10 year reoffering yield of the issue (or the reoffering yield closest to 10 years if the 10 year reoffer yield is unavailable);
Interest Rate = Bond Buyer's weekly index of municipal bond yields;
Maturity = log of the issue's maturity (in months);
Bids = Log of the number of bids for competitive issues; negotiated issues are assumed to have one bid;
Callable = 1 if the issue is callable, 0 otherwise;
Refunding = 1 if the issue is a refunding issue, 0 otherwise;
County = 1 if the issuer is a county, 0 otherwise;
School = 1 if the issuer is a school district, 0 otherwise;
Aa_j = 1 if the actual or estimated rating is Aa, 0 otherwise;
A_j = 1 if the actual or estimated rating is A, 0 otherwise;
Baa_j = 1 if the actual or estimated rating is Baa, 0 otherwise;
Ba_j = 1 if the actual or estimated rating is Ba, 0 otherwise;
$Lambda_j$ = the Inverse Mills Ratio generated from the probit model.

We first discuss the rating purchased probit model and then the yield regression model.

3.3 Rating purchased probit model

Prior research has investigated the determinants of the decision to purchase a rating (Ziebell and Rivers 1992; Moon and Stotsky 1993). These studies found that financial and demographic factors expected to be correlated with ratings were found to be important determinants of the rating decision. In place of financial and demographic factors, we use the estimator ratings for unrated bonds and actual ratings for rated bonds. Given the modest out-of-sample explanatory power of prior models of local government ratings, our use of actual and estimator ratings should provide a much better model of the issuer's decision to apply for a rating.

The dependent variable in this model (*Rating Purchased*) is coded 1 if the issuer chooses to purchase a rating and 0 if the issuer forgoes a rating. The most important determinant of *Rating Purchased* is likely to be the rating the issuer expects to receive. Issuers that expect a low rating are much less likely to purchase a bond rating. We code the variable *Bond Rating Expected* as 5 for Aaa, 4 for Aa, 3 for A, 2 for Baa, and 1 for Ba. Both actual and estimated ratings are used to create this variable. We assume that the issuer is, *ex ante*, informed about the default risk of an issue and that the issuer's expectation, on average, reflects the actual rating that is, or would be, received.

In addition to the expected bond rating, we also anticipate that issues marketed to local buyers will have less need for a rating because these buyers will be familiar with local issuers and thus better able to independently assess default risk (Feroz and Wilson 1992). Ivkovic and Weisbenner (2005) find that stock investors put a large portion of their portfolios in companies headquartered nearby, and that this strategy allows investors to exploit their local knowledge to earn much larger returns. Reeve and Herring (1986) suggest that issuers potentially benefit from marketing to a narrow or local audience because of the relative efficiency of providing information to buyers which would reduce the necessity of purchasing a rating.

We have four proxies to measure whether an issue is likely to be marketed to a local audience: size (measured as the log of issue size), sale method (an indicator variable coded 1 for competitively sold issues and 0 for negotiated issued), number of prior issues, and underwriter prestige. Larger issues may exceed the lending capacity of local investors; these issues are more likely to require regional or national marketing. Larger issues are also more likely to have active secondary markets and are therefore preferred by institutional investors. Institutional investors are more likely to require a rating because of constraints on credit quality imposed by fund prospectuses or investment guidelines.

Negotiated issues tend to be used for "story" bonds that are less marketable in the secondary market (e.g., Mysak 1998). This reduces national interest in these issues as many institutional buyers are prohibited from investing in illiquid issues. Competitively-sold issues are generally rated in order to attract a wide range of underwriters as bidders. Bidding windows on competitively sold issues are typically short, so bidders have limited time to complete independent credit analyses of these issues. Because underwriters do not know if they will be the successful bidder on an issue, they are less likely to invest resources in credit analysis, because the payoff to such analyses must be weighted by the probability of submitting the winning bid. In this environment, ratings save bidders time and resources. Of the 892 observations, 666 (143) are rated (unrated) and competitive, while 49 (34) are rated (unrated) and negotiated. Therefore, 93% of rated issues are competitively sold, compared to 81% of the unrated issues; 59% of the negotiated issues are rated, compared to 82% of the competitive issues.

In the second stage yield regression, we include control variables for both sale type and the number of bidders in competitive issues. The *Number of Bidders* variable is excluded from the Probit model because ratings are obtained prior to competitive sales, so the number of bidders is not known at the time the rating is purchased.

The *Prior Issues* variable is used to measure issuer experience and activity. This variable is calculated as the log of one plus the number of issues by a particular issuer within the 10 years prior to the current issue.[14] More frequent issuers are more likely to obtain a rating for at least two reasons. First, they are more likely to exhaust the local area's lending

[14] One is added to the number of prior issues to avoid taking the log of zero for those issuers with zero prior issues.

capacity, and would therefore need a rating to attract more regional or national buyers who are less familiar with the issuer. Second, rating agencies offer substantial discounts to frequent issuers, thus reducing the explicit cost of obtaining a rating.

We include the variable *Underwriter Ranking* to control for the effect of underwriter prestige on the decision to purchase a rating. Unlike small regional underwriters, prestigious underwriters have national distribution networks. These underwriters are typically associated with larger or more complex issues that benefit from prestigious underwriters' specialized expertise and nationwide sales capabilities. Because these underwriters tend to market bonds nationally, they are likely to recommend purchasing a rating. We measure underwriter prestige using the annual Bond Buyer's Municipal Marketplace ranking of the top 100 underwriters by volume.[15] We use an inverse measure of underwriter prestige; the higher the prestige, the lower the underwriter rank.

Because locally-marketed issues are far more likely to forgo a rating, we use four proxies of local marketability to fully capture this tendency. Using multiple measures of the same construct is potentially problematic because of collinearity. However, variance inflation factors (VIFs) in the models are reasonable (maximum of 3.73 for the primary model) and the results are robust to omitting any one or two of these variables from the model, suggesting that collinearity is not a problem. Municipalities issuing less than $10 million in tax-exempt bonds in a calendar year generally meet the criteria for designation as "bank-qualified" bonds. If these bonds are purchased by banks, the banks can deduct the cost-of-carry (i.e. the interest paid on borrowed funds used to purchase the bonds). Because of the cost-of-carry deduction, bank-qualified bonds are sought-after by financial institutions. Banks generally have the financial expertise to complete their own credit evaluations, therefore bank-qualified bonds may have less need for a rating. The *Bank-Qualified* variable is an indicator variable coded 1 for issues qualifying for the cost-of-carry interest deduction for financial institutions.

Several states have tax provisions that exempt interest on bonds issued in the state and purchased by residents of the state. For example, if a Nebraska investor purchases a municipal bond issued by a Nebraska municipality, the investor is exempt from state income taxes on the bond interest. By purchasing an in-state bond, an investor can receive interest payments that are exempt from both federal and state tax. Bonds with in-state tax advantages are more likely to be marketed within the state to investors who may already have some familiarity with the issuer. These investors may be less reliant on ratings to assess default risk. The *Tax Difference* variable is defined as the maximum personal income tax rate for those states with differential taxation. This variable is coded zero for states which do not differentiate taxation on in-state versus out-of-state bonds.

Although the cost of a rating would appear to be a key factor in the decision to purchase a rating, we exclude rating expenses because rating costs for both Moody's and Standard and Poor's (the two largest rating agencies) are very highly correlated with issue size. Including both size and rating fees (which are essentially a fixed percentage of size) in the

[15] Most underwriters are ranked. For example, the top 100 underwriters accounted for 213 out of 219 billion dollars of new local government bonds issued during 1999. Underwriters not in the top 100 were coded 101. Based on Bond Buyer statistics for the 1999–2000 combined period, by dollar volume (number of issues), the top 5 underwriters accounted for 46.7% (12.9%), the top 10 accounted for 62.3% (24.0%), the top 25 accounted for 80.6% (47.6%), the top 50 accounted for 90.3% (66.3%), and the top 100 accounted for 97.0% (84.3%) of all issues. The top underwriters handle a much larger percentage of total volume than total issues. The underwriter rank of our rated sample is reasonably similar to the population (which includes insured and revenue bonds). However, the underwriter rank of our unrated sample shows a much greater preponderance of local underwriters.

regression would introduce multicollinearity problems. The results are not substantially changed when the other variables from the second stage regression model (e.g., level of interest rates, maturity) are also included in the *Ratings Purchased* probit model. We do not include these other variables because there is no a priori reason to believe that they should affect the issuer's decision to purchase a rating.

3.4 Yield model

Our yield model is based on earlier work in the analysis of pricing in municipal bond markets (e.g., Kidwell et al. 1987; Roden and Bassler 1996; Leonard 1999). The dependent yield variable is measured using the 10 year reoffering yield for each issue. We choose 10 years because this was the average maturity of the competitive issues and it was commonly available. Where a 10 year reoffering yield was not available, we used the reoffering yield closest to 10 years. We choose to use reoffering yield instead of true interest cost (TIC) because the reoffering yield most directly measures the behavior of bond buyers. Also, Simonsen et al. (2001) provide several criticisms of TIC including the fact that underwriting costs are sometimes included in the calculation of TIC while at other times they are excluded.

Many of the variables in the second stage model are the same as variables included in the Probit model, but in the second stage the justification for including these variables is based on prior research showing a relationship between the control variables and bond yields. To control for differences in the level of municipal bond interest rates across time, we include the Bond Buyer's index of weekly yields on long-term investment grade bonds. We use the log of maturity (in months) to control for effects of the term structure of interest rates on yields.[16] We include a dummy variable in the regression to control for the effects of competitive versus negotiated issues. Benson (1979) found that municipal interest cost varies inversely with the number of bidders for competitive issues. We control for this underwriter competition effect by including the log of the number of bidders listed in the online *Bond Buyer* for each issue. The number of bidders is set to 1 for negotiated issues. Call provisions grant the bond issuer a valuable refinancing option (at the expense of the investor) and therefore are expected to increase yields. We include a variable coded 1 for callable bonds and 0 otherwise.[17]

[16] Prior studies have used a variety of specifications to control for maturity. The results are substantively unchanged when maturity is defined as the log of maturity in years or when maturity is defined as the number of years to maturity.

[17] Other callability measures used by prior research are years to first call and years to first call at par. Our results for using these call measures are essentially the same as those reported. Although other factors are expected to influence the effect of callability on yields (e.g., volatility of interest rates), Ederington and Stock (2002) examine the effect of call provision on corporate bonds yields and conclude that "the effect of call provisions [on bond yields is] potentially negligible." We believe that the effect of calls is particularly small in the current study for the following reasons. First, our sample covers a short time period (1999–2000), and therefore, there is relatively little variation across observations in the expected change in interest rates, a key determinant of the effect of calls on yields (Spivey 1989). Second, unlike the call features of corporate bonds, the call features of municipal bonds demonstrate remarkably little variation. Virtually all callable municipal issues place the call date 5–10 years from issue date, virtually all call premiums are between 0 and 2% of par, and virtually all call premiums are at par by 10 years from the issue date. The size of the issue premium or discount could also affect the relationship between a call and the yield premium. Municipal bonds are not issued at large premiums because the coupon payments, not the actual interest earned, are exempt from taxation. To prevent investors from receiving excessive tax benefits, IRS rules prevent significant premiums on tax-exempt bonds. Investors of tax-exempt bonds issued at a discount receive tax-exemption for only a portion of the interest earned. Therefore, tax exempt bonds are rarely

Although we do not include revenue bonds, we do include general obligation bonds from counties and school districts as well as municipalities. We include separate dummy variables for counties and school districts, with municipalities as the excluded group. Refunding bonds may be associated with less risk than other issues so we include a dummy variable coded 1 for refunding bonds and 0 for other issues. Bonds that are bank qualified are in high demand and therefore are expected to sell for lower yields. We code a dummy variable 1 for bank qualified bonds and 0 for other bonds. The size of the issue (measured as the log of the total par value) proxies for marketability; larger issues may require regional or national marketing.

Prior research (Lovely and Wasylenko 1992; Kidwell et al. 1984, 1987) finds that municipal bond yields are lower in states which impose state taxes on out-of-state bonds but not in-state bonds. We control for this differential tax effect with the *Tax Difference* variable.

Roden and Bland (1986) found that issuers with more experience in the market are able to issue bonds at lower yields. We include the *Prior Issues* variable to control for issuer experience, but argue that this variable may also proxy for local demand. If frequent issuers exhaust local demand for their bonds and are forced to market their bonds nationally, frequent issuance could be associated with higher yields. Roden and Bassler (1996) hypothesized that prestigious underwriters are associated with lower yields. The *Underwriter Rank* variable is included to control for underwriter prestige. Because rank is an inverse measure of underwriter prestige, we expect underwriter rank to be negatively associated with yields. We also include four indicator variables to control for default risk as measured by the actual or estimated rating: Aa, A, Baa, and Ba (with Aaa the excluded group). The final control variable is *Lambda,* the Inverse Mills Ratios (IMR) computed from the Ratings Purchased Probit model. This variable controls for the tendency of issuers to choose to forgo a rating if they expect the rating to be low. The variable of interest in this study is Rating Purchased which is coded 1 if the issuer purchased a rating and 0 otherwise.

4 Results

4.1 Descriptive statistics

Table 1 provides descriptive statistics for the data used in the study. There were 892 issues with complete data; 715 with actual ratings and 177 with estimator ratings.[18] Insured bonds and unrated bonds missing an estimator rating were deleted. Table 1 shows that the mean values of all but two variables are significantly different between the actual rating and estimator rating samples. When the issuer chooses to apply for a rating, the issue size is much larger, there are many more prior issues, there are more bids, and a more prestigious underwriter is chosen. When the issuer chooses not to apply for a rating, the issue is more

Footnote 17 continued
issued at a significant discount. An exception is zero-coupon bonds for which the implicit interest is exempt. Zero-coupon bonds are excluded from our sample. Finally, call features in our sample for non-rated versus rated issues are similar, and therefore, we do not expect variations in call features to affect our main results.

[18] Before our sample was selected, we were able to gather 2,527 observations from the Bond Buyer. Of these, 1,117 purchased insurance from one of the major insurers, and 115 participated in a state credit enhancement program. Of the remaining 1,295 new issues, 276 were unrated and we were unable to obtain an estimated rating from Moody's. Of the remaining 1,019 observations, 127 did not have a published reoffering yield. The final sample was 892 observations.

Table 1 Descriptive statistics

	Actual ratings sample ($N = 715$)		Estimated ratings sample ($N = 177$)		Differences	
	Mean	SD	Mean	SD	*t*-statistic	*p*-value
(a) Continuous variable						
Reoffer yield	4.81	0.37	4.89	.49	−1.92	0.057
Interest rate	5.57	0.30	5.55	.32	0.57	0.572
Log of maturity (in months)	4.73	0.21	4.70	.25	1.80	0.074
Log of bids	1.46	0.57	1.13	.48	7.70	0.001
Underwriter rank	43.17	38.52	72.62	34.62	−9.90	0.001
State tax difference	5.76	2.77	5.01	3.33	2.78	0.006
Log of prior issues	1.13	1.12	0.13	.53	17.24	0.001
Log of issue size	15.56	1.42	14.09	.92	16.92	0.001

	Actual ratings sample ($N = 715$)		Estimated ratings sample ($N = 177$)		Differences	
	Mean	SD	Mean	SD	Chi-square	*p*-value
(b) Categorical variables						
Aa	0.52	0.50	0.01	0.08	153.67	0.001
A	0.28	0.45	0.34	0.48	2.56	0.110
Baa	0.05	0.22	0.55	0.50	271.09	0.001
Ba	0.01	0.07	0.11	0.31	58.85	0.001
Callable	0.90	0.30	0.92	0.26	0.90	0.342
Bank-qualified	0.36	0.48	0.67	0.47	53.35	0.001
Refunding issue	0.08	0.27	0.17	0.38	12.99	0.001
Competitive	0.93	0.25	0.80	0.40	27.77	0.001
County	0.20	0.40	0.10	0.30	9.71	0.001
School district	0.11	0.31	0.38	0.49	74.47	0.001

The R*eoffer Yield* is the 10 year reoffering yield (or the reoffering yield closest to 10 years if the 10 year reoffer yield is unavailable). *Interest Rate* is the Bond Buyer weekly index of long-term municipal bond interest rates. *Log of Maturity* is the natural log of the maturity (in months) of the associated reoffer yield. *Log of Bids* is the natural logarithm of the number of bids for competitive issues (negotiated issues are recorded as having one bidder). *Underwriter Rank* is coded 1–101 for the rank of the underwriter by the total dollar amounts underwritten during the year of issuance for the top 100 underwriters (with unranked underwriters coded 101). *State Tax Difference* is the maximum income tax rate for states which tax interest on out-of-state municipal bonds but not in-state municipal bonds; this variable is coded zero if there is no difference in taxation between in-state and out-of-state municipal bonds. *Log of Prior Issues* is the natural logarithm of one plus the number of bond issues the entity originated in the 10 years prior to the current issue. *Log of Issue Size* is the natural logarithm of the total par value of an issue. The default indicator variables *Aa*, *A*, *Baa*, and *Ba* are coded 1 if a bond's estimator or actual rating falls in a particular category, The *Callable* indicator variable is coded 1 if a bond issue is callable. *Bank-Qualified* is coded 1 if a bond issue is designated as qualifying for the interest cost-of-carry deduction for financial institutions. If a bond is part of a refunding issue, *Refunding Issue* is coded 1. *Competitive* is coded 1 for competitively-sold bond issues. *County* and *School District* are indicator variables coded 1 if the issuing entity is a county or school district, respectively

likely to be bank qualified and a negotiated sale. Counties were more likely to apply for a rating and school districts less likely to apply for a rating. Bond issue size tended to be fairly small with the 5th percentile at $500,000, the 10th percentile at $775,000, the first

quartile at $1,500,000, the median at $3,660,000, the third quartile at $10,550,000, the 90th percentile at $32,000,000, and the 95th percentile at $55,825,000. Unrated bonds tended to be much smaller with a median issue size of $1,442,500 compared to $5,103,000 for the rated bonds.

The most striking difference between the two groups is the level of default risk as measured by the actual or estimator ratings. Of the 715 rated issues, 99 (13.8%) received a Aaa, 373 (52.2%) received a Aa rating, 200 (28.0%) received an A rating, 39 (5.5%) received a Baa rating, and only 4 (0.6%) received a Ba rating. By contrast, of the 177 unrated issues, none would have received a Aaa, only 1 (0.6%) would have received a Aa, 61 (34.5%) would have received an A rating, 96 (54.2%) received a Baa rating, and 19 (10.7%) would have received a Ba rating. Table 1 confirms that there are large differences between the two groups and suggests that an issuer's expected rating is the key determinant of whether an issuer chooses to apply for a rating.

Table 2 contains Spearman correlations between the variables. The variables with the highest correlation with *Rating Purchased* are *Bond Rating Expected* (.62), *Log of Issue Size* (.42) and *Log of Prior Issues* (.38). The variables with the highest correlation with *Yields* are *Interest Rates* (.81), *Bank-Qualified* (.39), *Log of Issue Size* (−.22), and *Bond Rating Expected* (−.18). The pairwise correlations between the independent variables tend to be modest. The results from Table 2 confirm that the issuer's expected rating is the strongest determinant of whether the issuer will choose to acquire a rating.

4.2 Determinants of the decision to apply for a rating

Table 3 contains the results of a probit model explaining an issuer's decision to apply for a rating. Five of the seven variables are significant in the expected direction at the .05 level. The model is highly predictive as evidenced by 93.9% concordant pairs and 91.2% correct classifications.[19] As anticipated, the key variable in the model is Bond Rating Expected. Issuers with greater default risk have less to gain by purchasing a bond rating. The rating is likely to merely confirm an assumption that the investor would make in the absence of a rating, i.e., that the issuer is of lower quality than the average. Higher quality issuers have incentives to expend resources to provide extra information in the form of a rating to signal strong financial condition. Lower quality issuers have weaker incentives to do so.

Another circumstance in which the bond rating provides relatively little incremental information is when the buyers have local knowledge of the issuer's default risk. Table 3 shows that our four proxies for local placement are statistically significant in the expected direction. Issuers are more likely to purchase a rating when the issue is competitive, when a prestigious underwriter is used, when the issue is larger, and when there are more prior issues. The coefficient on the *Tax Difference* variable is (marginally) significantly positive (p-value = .052), indicating that issuers of bonds from states with preferential tax treatment for in-state bonds are more likely to purchase a rating. The primary findings reported in this section are that issuers are more likely to forgo a rating when they are expecting low ratings or expect to place more of the issue with local buyers.

[19] An observation is considered to be correctly classified if the predicted probability that it is rated (unrated) is greater (less) than 50% and the observation is actually rated (unrated). Because 80% (715/892) of the observations are rated, correct classifications by random chance would be 68% [(80%*80%) + (20%*20%)].

Table 2 Spearman correlations

	Rating purchased	Reoffer yield	Interest rate	Log of maturity	Log of bids	Log of issue size	Tax difference	Log of prior issues	Under-writer rank	Callable	Bank qualified	Refunding	Competitive	County	School district	Expected bond rating
Rating													purchased	1.00		
Reoffer yield	−0.11	1.00														
Interest rate	0.02	0.81	1.00													
Log of maturity	0.11	0.20	−0.01	1.00												
Log of bids	0.23	−0.19	−0.04	0.01	1.00											
Log of issue size	0.42	−0.22	−0.09	0.19	0.29	1.00										
Tax													difference	0.05	0.09	0.04
0.08	−0.11	−0.15	1.00													
Ln(Prior issues)	0.38	−0.07	0.00	0.06	0.18	0.49	−0.11	1.00								
Underwriter	−0.29	0.06	0.04	−0.14	−0.13	−0.44	−0.11	−0.26	1.00							
Callable	−0.03	0.14	0.03	0.15	0.01	0.05	0.05	0.08	−0.06	1.00						
Bank qualified	−0.24	0.39	0.41	−0.11	−0.10	−0.53	0.08	−0.30	0.29	0.07	1.00					
Refunding	−0.12	−0.04	−0.03	−0.03	0.00	−0.03	0.07	−0.06	0.02	−0.07	0.04	1.00				
Competitive	0.18	−0.14	0.00	−0.08	0.28	−0.03	0.07	0.04	−0.08	−0.05	−0.10	−0.06	1.00			
County	0.10	−0.04	−0.01	0.04	0.03	0.22	−0.07	0.21	−0.12	0.05	−0.16	−0.06	0.05	1.00		
School district	−0.29	−0.12	−0.13	0.02	−0.09	−0.02	0.15	−0.20	−0.01	−0.09	−0.09	0.14	−0.11	−0.21	1.00	
Bond rating expected	0.62	−0.18	−0.01	0.12	0.28	0.59	−0.04	0.44	−0.34	−0.03	−0.38	−0.02	0.13	0.19	−0.13	1.00

Rating purchased is coded 1 if the issuer chose to apply for a Rating and 0 otherwise. Bond rating expected is coded 5 for Aaa, 4 for Aa, 3 for A, 2 for Baa, and 1 for Ba; these ratings are either actual or estimated. All other variables are defined in Table 1

Table 3 Determinants of the decision to apply for a rating: probit model

Variable	Hypothesized sign	Parameter estimate	Chi-square	*p*-value
Intercept		−4.247	61.37	0.001
Bond Rating expected	+	1.166	118.40	0.001
Log of issue size	+	0.096	4.42	0.036
Competitive issue	+	0.836	11.37	0.001
Log of prior issues	+	0.363	12.97	0.001
Underwriter rank	−	−0.512	7.33	0.007
Bank qualified	−	0.180	1.42	0.233
Tax difference	−	0.335	3.79	0.052

The dependent variable *Rating Purchased* is coded 1 if the entity applied for a bond rating. It is coded 0 if the entity is unrated and a Moody's estimator rating is available. *Bond Rating Expected* is coded 5 for Aaa, 4 for Aa, 3 for A, 2 for Baa, and 1 for Ba; these ratings are either actual or estimated. See Table 1 for a description of the other variables

$N = 892$, concordant pairs = 93.9%, correctly classified = 91.2%

4.3 The effect of ratings on bond yields: regression results

Results of the yield regression model are presented in Table 4. For comparison purposes, Table 4 presents results for both a single stage model that ignores self-selection bias and a two-stage model that corrects for the self-selection bias. For the single stage model, 13 of the 18 variables are significant at the .05 level and one variable (Aa) is significant at the .057 level. The adjusted R^2 is .83. The coefficient on the *Log of Prior Issues* variable is positive and significant, a finding that is counter to Roden and Bland (1986), but consistent with the argument that frequent issuers are more likely to exhaust local demand. All other variables have the expected signs. The ratings variables control for the level of default risk allowing us to focus on the decision to purchase a rating. The *Rating Purchased* variable is statistically significant but is unexpectedly positive. The coefficient on the *Rating Purchased* variable can be interpreted as the increase or decrease in yield associated with the purchase of a rating, holding constant all other factors in the regression model.

The second model presented in Table 4 is a two-stage model that controls for self-selection bias by including the variable Lambda (the IMR). Lambda is computed from the first stage model presented in Table 3. Lambda is statistically significant ($t = 4.56$) which indicates that self-selection is a possible problem, and the coefficients from the single stage model are potentially biased. However, tests of differences in coefficients for each variable across the two models (unreported) resulted in no statistically significant differences at the .10 level. The *Rating Purchased* variable continues to be positive and statistically significant. A positive coefficient is consistent with investors underestimating the default risk of non-rated bonds.

The positive coefficient on the ratings purchased variable seems to imply that issuers who purchase a rating are paying an interest cost penalty. However, other explanations exist. Higher quality issuers may well benefit by signaling their lower default risk, especially if the local demand for the issue is weak. In periods of high supply of municipal bonds in a local region, issuers who would generally market to local investors may find that they need to purchase a rating to expand an issue's marketability due to temporary saturation of the local market. There could be omitted variables in our first

Table 4 The effect of ratings on bond yields: single stage and switching regression models

Variable	Single stage model			Switching regression model		
	Parameter estimate	*t*-statistic	*p*-value	Parameter estimate	*t*-statistic	*p*-value
Intercept	−3.187	−16.47	0.001	−3.191	−16.54	0.001
Interest rate	1.07	51.67	0.001	1.07	51.82	0.001
Log of maturity	0.489	17.68	0.001	0.488	17.71	0.001
Log of bids	−0.051	−4.63	0.001	−0.05	−4.49	0.001
Callable	0.075	3.72	0.001	0.071	3.55	0.001
Bank qualified	−0.003	−0.16	0.871	−0.004	−0.29	0.775
Refunding issue	−0.013	−0.66	0.512	−0.02	−1.01	0.314
Competitive	−0.109	−5.10	0.001	−0.118	−5.48	0.001
County	0.000	0.05	0.961	0.002	0.14	0.893
School district	−0.065	−3.80	0.001	−0.071	−4.11	0.001
Log of issue size	−0.017	−2.78	0.006	−0.016	−2.71	0.007
Log of prior issues	0.015	2.47	0.014	0.017	2.69	0.007
Tax difference	−0.018	−1.16	0.245	−0.021	−1.36	0.175
Underwriter rank	−0.041	−2.53	0.012	−0.043	−2.71	0.007
Aa	0.037	1.91	0.057	0.037	1.92	0.055
A	0.091	4.09	0.001	0.071	3.02	0.003
Baa	0.281	9.89	0.001	0.27	9.41	0.001
Ba	0.302	6.72	0.001	0.298	6.67	0.001
Lambda (λ)				0.052	2.64	0.008
Rating purchased	0.059	2.88	0.004	0.073	3.47	0.001

The rating variables are coded 1 if the actual or expected rating falls in that category and 0 otherwise; Aaa is the excluded group. The switching regression model has been corrected for self-selection bias using Heckman-Lee procedures. The dependent variable is the reoffering yield of the issue. Lambda is the IMR; see Table 1 for a description of the other independent variables. Probability values are for two-tailed tests. The adjusted R^2 is .828 for the single-stage model and .832 for the switching regression model

stage model. For example, if there is a government scandal just prior to an issue, local investors may be skittish. In this case, the issuer could purchase a rating to reassure investors, but the yields would still be higher than expected for that type of issuer. These idiosyncratic factors could lead to the purchase of a rating when yields are expected to be high.

Our results indicate that those municipal issuers choosing to forgo a rating are not paying an interest cost penalty for their decision. These results are in contrast to prior research which concluded that issuers should always purchase a rating (e.g., Hsueh and Liu 1993; Hsueh and Kidwell 1988). Our models provide evidence that issuers who would benefit least from a rating (e.g., issuers with high default risk and local buyers) rationally choose to forgo the purchase of a rating. This result can be interpreted in two ways. Our sample for the unrated issues consists largely of small issues from infrequent issuers. These issues are more likely to be purchased by local buyers. These purchasers may be less sophisticated and informed than other investor groups, and may systematically underestimate default risk. Alternately, local investors may have access to additional information that was not considered by the rating agencies. Ratings are based primarily on objective

factors. Liu and Thakor (1984) find that most of the variation in ratings can be explained by just four economic variables: total net direct debt, per capita debt, unemployment rate and median home value. It is difficult for bond rating agencies to evaluate more subjective factors that nonetheless may substantially affect default risk (e.g. ability and character of municipal financial officers, resolve or determination of the issuer to abide by bond covenants and commitment to debt repayment, or potential future development opportunities). Local buyers may have more subjective knowledge of the issuer, so their risk assessment including this information may be more accurate.

The next section describes several supplemental analyses to provide assurance that our results are not spurious.

4.4 Supplemental analysis

One potential concern with our results is that they may have been affected by collinearity, especially given that we have multiple measures of local demand. The correlation between underwriter rank and issue size is −.44 (see Table 2), and the correlation between underwriter rank and prior issues is .52. We examine alternative models that omit any one or two of the local demand variables (underwriter rank, issue size, and prior issues) from the models reported in Table 4. We also examine the effect of leaving out any one of the other 13 control variables (exclusive of rating), and the results (unreported) are robust to these alternative model specifications; the coefficient of *Ratings Purchased* is significant at .01 or greater for every model. In addition, the VIFs in the primary models are reasonable (maximum of 3.73 for the primary model).

Another issue of potential concern is that the results may be sensitive to whether the bonds are offered competitively or on a negotiated basis. We examine a competitive issue only sample ($n = 808$), and the results are consistent with the main analysis. We are unable to use a negotiated issue only sample because only 83 of the 892 observations were negotiated. Therefore, one limitation of our study is that the results may only apply to competitively offered issues.

We examine subsamples where only issues with high local demand are included in the sample. We create three samples of high local demand bonds by limiting the sample to those issues below the median of our three measures of local demand (underwriter rank, issue size, or the number of prior issues). For each of these high local demand subsamples, the results are similar to those in the primary models reported in Table 4. We are unable to examine subsamples with low local demand because almost all the low local demand issues purchased ratings. A limitation of our study is that we can not generalize our findings to bonds with low local demand.

We examine whether the exclusion of high rated issues (either Aa and above or A and above) affect the results, and find that when only low rated bonds are included in the sample, the results are similar to our primary models in Table 4. We cannot exclude low rated bonds because no unrated issue would have received a Aa or Aaa rating, and only a modest number (61) would have received an "A" rating.

In summary, our subsample analysis provides evidence that the results are robust to the subsamples we are able to examine. They also highlight some limitations of the study. Because the unrated issues have high default risk (estimated ratings of A and below) and have high local demand, our results are not generalizable to high grade bonds or bonds with low local demand.

5 Conclusions

Prior research has concluded that local government issuers without bond ratings incur higher interest costs than issuers who obtain ratings. We investigate whether local government issuers opting to forgo a rating would be better advised to obtain a rating. Moody's provided estimated ratings for a sample of unrated bonds, allowing us to compare the yields of rated bonds with the yields of unrated bonds of comparable credit quality. We employ a self-selection model to control for issuers' tendency to avoid obtaining a rating when the rating is expected to be poor. We find that issuers with high default risk are far less likely to purchase a rating. We also find that issuers who are better able to place their issue locally are less likely to purchase a rating. We expect that local investors are more knowledgeable about local issuers, and therefore, have less need for a bond rating.

After controlling for self-selection bias, we find that local government bond issuers who do not contract for a bond rating do not pay a higher yield than would be expected given the issuers' level of default risk. We interpret this to indicate that investors in unrated bonds have alternative ways to assess bond default risk and adjust the risk premium so that bond yields are about the same regardless of whether a rating is obtained. For competitively-sold general obligation bonds, we find that the purchase of a rating is associated with increases in yield, after controlling for other factors. One possible explanation for our results is that investors in unrated bonds underestimate the default risk of these bonds. Alternately, investors may be accurately evaluating default risk, but may be including subjective determinants of this risk that were not considered by the rating agencies, such as the ability and character of the issuer's financial officers. These results contrast with those of prior research which concluded that issuers would be better off if they purchased a rating (e.g., Hsueh and Liu 1993).

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