

# A Comprehensive Evaluation of the Comparative Cost of Negotiated and Competitive Methods of Municipal Bond Issuance

**Eric Fruits, James Booth, Randall Pozdena, and Richard Smith\***

*Municipal finance relies heavily on the issuance of debt. The debt is issued by a diverse range of public entities. The issuer of the debt has a choice in how the debt is issued. The issuer may choose a negotiated method or a competitive method. Some analysts believe they have observed systematic differences in the cost to the issuer by type of*

---

\*Eric Fruits is president of the Economics International Corporation. James Booth is professor of finance at Arizona State University's W.P. Carey School of Business. Randall Pozdena is an economic consultant at ECONorthwest. Richard Smith is the Philip L. Boyd chair and professor of finance at the University of California Riverside's A. Gary Anderson Graduate School of Management. Eric Fruits can be reached by email at [fruits@econinternational.com](mailto:fruits@econinternational.com).

The authors wish to acknowledge the kind and capable assistance of Dan Clark, Dr. Stephen Grover, and Dr. Ted Helvoigt of ECONorthwest; Professor Richard Greene; Matthew Toole of Thomson Corporation; Linda Rebbel of Municipal Market Data; the Municipal Securities Rulemaking Board; the Standard & Poor's Corporation; and Steve Davidson, Michael Decker, Marcelo Vieira, Lynnette Hotchkiss, and Leslie Norwood of the Securities Industry and Financial Markets Association. Funding for the research was provided by the Securities Industry and Financial Markets Association. Any opinions presented here represent those of the authors only.

*issuance. These findings have, in turn, led researchers to evaluate whether—or under what conditions—one method of issuance is superior to another. The empirical findings presented in this study suggest that there is no general advantage of competitive over negotiated issuance processes. Rather, there appears to be a strong tendency for issuers to select the method of issuance that best suits the nature of the issue at hand, such that efforts to mandate one type of issuance over the other will likely increase, rather than decrease, issuance costs.*

A municipal bond issuer has a choice in how its debt is issued. With negotiated issuance, one or more underwriting firms acting together purchase the bonds from the issuer. The issuer and the underwriter negotiate many of the terms of the issuance. With competitive issuance, bidders buy all the bonds according to take-it-or-leave-it terms proposed by the issuer in a widely circulated prospectus.

Some market participants, researchers, and policymakers believe they have observed systematic differences in the cost to the issuer by type of issuance. These perceived differences have, in turn, led to research to evaluate whether—or under what conditions—one method of issuance is superior to another. Earlier studies found relatively large price advantages associated with competitive issuance. More recent research suggests that, on average, issuers tend to optimally select the method of issuance that minimizes their costs. In other words, when the self-selection and sample selection processes are controlled, issuers using a negotiated method would be no better off with competitive issuance and vice versa.

## **COMPETITION AND COST IN MUNICIPAL BOND ISSUANCE**

### **Competitive Issuance**

In a competitive issue, competitive discipline in the pricing of the issue is brought to bear by the bidding process. The market is apprised of the forthcoming issue and prospective bidders for the issue have an opportunity to evaluate the issue and formulate bids. The willingness of an individual bidder to pay for a particular issue depends on the bidder's sense of the strength of demand downstream in its distribution channel. Market intelligence is brought to the design and timing of the issue by the issuer, the financial advisor, or others in the marketplace consulted by the issuer or financial advisor.

In an environment of good information about the issue, well-informed bidders, and a strong showing of candidate bidders, competitive discipline should yield pricing that represents the market value of the security in the ambient market environment. The primary market is not, however, highly atomistic. The number of bidders is limited by the cost of appraising the

prospects of the issue, the accessibility enjoyed by the bidder to the downstream retail or institutional investors, and the perceived ability of the bidders to prevail against their rivals.

## **Negotiated Issuance**

In negotiated issuance, competitive discipline is brought to bear in the selection of underwriter. Generally, underwriters become part of an issuer's underwriting team through a competitive proposal process. In addition, the market for underwriter relationships is highly competitive. Other underwriters are eager to replace the underwriter who fails to satisfy an issuer or who generates poor aftermarket performance of issues. Indeed, even within firms, competition among the underwriter's own sales staff to fill an order tends to work for the benefit of the issuer.

Underwriters' performance is readily tracked in the aftermarket. If an issue displays sharp upward positive increases in price in the immediate aftermarket, the issuer may conclude that the underwriters caused the issuer to "leave too much money on the table" and may seek either other underwriters or a competitive issuance method to improve issue pricing. All of these forces discipline new offering pricing to the benefit of the issuer. Thus—nomenclature aside—it is not clear a priori whether one or the other process brings more competitive discipline to pricing.

## **Comparing the Costs**

Earlier published studies comparing the costs of negotiated and competitive issuances have found that the interest costs of negotiated issuance are 10 to 70 basis points more than for competitively issued bonds (see Braswell et al., 1983; Gershberg et al., 2001; Joehnk and Kidwell, 1979; Maese, 1985; Robbins, 2002; Simonsen et al., 2001; Simonsen and Robbins, 1996; and Sorenson, 1979). If correct, these findings represent a significant premium in borrowing costs and would support the greater use of competitive issuance. Numerous crucial problems, however, call into question the findings of the early studies of comparative issuance costs.

Nearly all of the studies performed use a small number of issues in the empirical analysis.<sup>1</sup> It is well known that the power of statistical tests depends crucially upon sample size. A smaller and narrowly focused sample, however, allows for more detailed investigation and collection of issue-specific factors and allows for greater control of the factors that influence borrowing costs. In many cases, however, a smaller and narrowly focused sample may be too small to control for the variation in issues that occurs

---

<sup>1</sup> Most studies have fewer than 500 observations, and the largest study (Gershberg et al., 2001) uses fewer than 5,000 observations involving tax-exempt hospitals.

within a specific jurisdiction over a short time period.<sup>2</sup> In addition, caution must be exercised in generalizing the results.

Furthermore, most studies do not account for the observation that the choice of method of issue is not independent of the nature of the bond issue, the bond issuer, and the bond's likely performance in the marketplace. Although some researchers acknowledge that certain types of issues may be more effectively marketed through negotiated means, most of the studies ignore the simultaneity of the choice of issue method and cost of issuance in the statistical analysis.<sup>3</sup> This simultaneity issue can be seen as a form of self-selection bias, wherein the negotiated issues that come to market are those that have characteristics such that, had they been brought to market in a competitive bidding process, would have been even more costly to the issuer. Smith (1987), Leonard (1996), Peng and Brucato (2003), and Kriz (2003) are the only known studies that report results after controlling for self-selection. They each employ a Heckman-type two-step approach.

Many of the earlier studies used the net interest cost (NIC) of the issue as the measure of issue interest cost (see Bland, 1985; Joehnk and Kidwell, 1979; Maese, 1985; Smith, 1987; and Sorenson, 1979). NIC is a simple arithmetic measure that does not respect that the time pattern of payments influences the effective interest cost. An alternative measure, true interest cost (TIC) is such a measure.<sup>4</sup> In effect, TIC is the interest rate that, when used in an internal rate of return calculation, equalizes the present value of the future stream of interest payment obligations and the issue price value. Unfortunately, TIC is not always reported in publicly available databases. In fact, since 1990, only 16% of new issues in the Thomson database report a TIC.<sup>5</sup>

As with any empirical study, many of the earlier studies must discard certain issues from the sample because the available record does not capture all of the variables or characteristics of the issue that the researcher deems relevant. To the extent the absence or presence of a necessary variable is associated non-randomly with another important variable, such

---

<sup>2</sup> For example, McCaskill (2005) has a sample of 161 issuances of which 17 were issued competitively. Of the competitive issuances, only three were for fire/ambulance districts (11 fire/ambulance districts used a negotiated method). Such a small number of observations makes it difficult to draw any statistically relevant conclusion regarding the relative costs of negotiated or competitive issuance for fire/ambulance districts.

<sup>3</sup> Leonard (1996), for example, tests for the possibility of self-selection but does not account for it in estimating the cost of issuance.

<sup>4</sup> Competitive issuances have moved from NIC to TIC pricing because the coupon structure can be easily manipulated to reduce NIC without necessarily affecting (or increasing) the TIC.

<sup>5</sup> The data used for the comparative cost analysis are all U.S. municipal new issues between January 1, 1990, and June 30, 2006, available from Thomson Financial Services.

as method of issuance, the resulting analysis may be affected by what is known as sample-selection bias.

### **The Paucity of Published Data**

Curiously, the paucity of published data on the TIC variable itself suggests the possibility of sample selection bias in a manner that is particularly germane to studies of the effect of issuance method. Specifically, TIC data for negotiated issues is particularly sparsely represented in published bond databases despite the dominance of the negotiated method of issuance. As noted above, only 16% of new issues in the Thomson database report a TIC, yet only 7.2% of new negotiated issues report a TIC. In more recent years, the number of negotiated issues reporting a TIC has been fewer than 2% of number of negotiated issues in the database.

With the exception of a few jurisdictions, there is no requirement that a TIC be calculated or reported. In many negotiated issuances, a TIC is calculated after the key terms of the issuance have been determined. In these cases, TIC could be characterized more properly as a result rather than a choice. As such, calculation and reporting of TIC is relatively unimportant to the issuer or the underwriter. In contrast, TIC is one of the terms on which underwriters bid in competitive issuances. In these cases, TIC is a choice variable. Thus, it is clear that many of the factors that affect the negotiated/competitive choice in turn affect whether a TIC is calculated and reported.

Gershberg et al. (2001) recognize the possibility that a low response rate to a survey they conducted may introduce sample selection bias. They suggest Heckman's (1979) methodology to account for potential sample selection, but instead opt to interpret their results as being conditional on receiving a survey response.

We are unaware of any studies that have used large samples and corrections for self-selection and sample selection biases. There are a few instances of studies that control for self-selection bias (see Kriz, 2003; Peng and Brucato, 2003; and Smith, 1987). No study, however, uses a Heckman-type control for both types of potential bias.<sup>6</sup>

Recently, there have been a small number of studies that have approached the question of comparative issuance costs in a different manner. Robbins (2002) examines the cost of competitive issuance only. Specifically, the study examines the comparative issuance costs of certain competitive issues in the state of New Jersey before and after policy was adopted to promote greater use of the competitive issuance method. The study hypothesizes that if negotiated issues are inherently more costly to issue because

---

<sup>6</sup> As a way to control for sample selection, Peng and Brucato (2003) calculated TIC for all issues that did not report TIC.

of complexity or other independent factors, then “forcing” competitive issuance should cause the observed cost of competitive issue to rise. The study fails to find this elevation in competitive issue costs and concludes that there is latitude to increase the use of competitive bid processes over the negotiated issue process. Indeed, the study concludes that competitive issues have a 35 basis point cost advantage over negotiated issues. In contrast, Peng and Brucato (2001) find that “competitive only” laws are associated with higher, but statistically insignificant, issuance costs.

## **OBSERVATIONS AND ISSUES RAISED BY MARKET PARTICIPANTS**

To inform the design and implementation of our empirical analysis, we conducted a series of interviews with investment bankers, issuers, and investors in municipal debt. Market participants represented a wide range of experiences and viewpoints. Some investment bankers focused on negotiated issuances, and others focused on competitive issuances. More than one issuer relied almost exclusively on competitive issuance. Interview participants provided observations on perceived advantages and disadvantages of both negotiated and competitive offering methods. In some cases, the perceptions related directly to differences in issue cost and are amenable to the empirical analysis of interest cost. However, many of the respondents identified, and sometimes emphasized, considerations that are more qualitative in nature and that we cannot examine directly or control for in the empirical analysis.

None of the parties interviewed appeared to believe that either the negotiation process or the competitive bid process uniformly would produce the best outcomes for all issuers. Rather, every interviewee who offered an opinion on the topic indicated that some kinds of issues are better suited to competitive bid and others are better suited to negotiated issuance. In addition, several interviewees noted that the difference in fees between negotiated and competitive issuance has declined in recent years.

Several respondents were familiar with earlier peer-reviewed studies of comparative interest costs. Some respondents noted that the earlier studies employ methods that, in essence, assume that issuers randomly select the competitive bid process or the negotiation process. In contrast, common sense and economic logic suggest that issuers choose between the two methods based on the perceived advantages and disadvantages of each. If so, then the empirical evidence will yield biased estimates of expected interest cost by the two approaches unless we specifically control for the factors that bear on the negotiated/competitive choice.

Some respondents noted that even a properly designed study cannot fully correct for bias related to selection unless all of the important factors

that contribute to the selection can be measured and controlled for in the analysis. Some interviewees expressed concern that highly qualitative features of one method of issuance over another could not be captured in the available data characterizing new issues. Others were concerned about the quality of the available new issue data, questioning whether the indicators in those databases properly measured such things as TIC, given the complexity of issues and/or the fact that some costs of issuance may not be included in such measures. Similarly, the concern was expressed that the growing use of derivatives may confound efforts to develop a consistent database on issue characteristics. For example, new issues that employ a variable rate structure often are issued alongside a derivative instrument that, when combined, synthesizes a fixed rate obligation.

### **Fundamental Differences Between Negotiated and Competitive Issuances**

Interview respondents identified a number of factors that they perceive to affect the relative advantages of negotiated and competitive issuance. Generally, they indicated that risky issues, very large issues, and issues with complex factors (also known as “complex stories”) are likely to be better conducted via negotiated issuance than by competitive bid.

Complex stories pose problems for the competitive bid process because underwriters will hesitate to bid aggressively on issues that require extensive investigation in order to fully understand the risks. Negotiated issues ostensibly enable the underwriter to commit the necessary resources to risk assessment so that the issue can be fully priced. Issues with complex stories, such as difficult credits, and issues with complex derivative structures pose problems because accurate pricing may require extensive modeling and the underwriter may have trouble anticipating the demand for the various tranches.

Concerns about large issues are more fundamentally concerns about market saturation. Because of tax and other considerations, the municipal debt market is highly segmented and some parts of the market are saturated. When saturation is a concern, pre-marketing is more important, and it is generally not done to the same degree for competitive bid issues, where the underwriter is not certain of getting the deal. Thus, lack of pre-marketing can lead to more conservative bidding when the debt is to be sold into a saturated market. Further, competitive bidding impedes customization of portions of the issue to fit the idiosyncratic preferences of specific investors. For example, customization may include things as simple as modifying the maturity structure or the coupon to meet pockets of demand. In addition, when a market segment is saturated, customization has potential value for reducing the adverse impact of the saturation.

Several respondents indicated that negotiated offerings provide greater access to individual, as opposed to institutional, investors and that

negotiated issues could enable a municipality to place debt with non-traditional buyers. They indicated that negotiated issues offer more flexibility, such as the ability to:

- Offer discount bonds to individuals and premium bonds to institutions;
- Market first to individuals and then to reprice the issue to better fit the preferences of institutions; and
- Customize the debt to particular investors; placing an issue partly with individuals and non-traditional buyers could reduce interest cost on the issue.

A split coupon is a differential coupon on portions of the issue so as to broaden the appeal to a heterogeneous investor marketplace. Moreover, retail investors tend to demand par bond or bonds issued at a slight discount. Institutions, on the other hand, tend to demand premiums. The only way to effectively market to both types of customers is through the use of split coupons. Respondents indicated that negotiated issues are amenable to split coupon issues. They also indicated that with competitive issues, it is difficult to offer more than one coupon per maturity.

Respondents appeared to agree that negotiation enables issuers to engage in market timing in order to place issues during times when demand for an issue is likely to be relatively high. Understandably, some interviewees were skeptical that underwriters had a better grasp of the future path of interest rates than other market participants. Some interviewees noted, however, that the notion of market timing has less to do with forecasts of market conditions than with flexibility in modifying an issue's features in response to changes in market conditions over the period of analysis of the issue.<sup>7</sup> Better market timing, in this sense, could, for example, enable an issuer to adjust the size of the offering upward at the last minute if market conditions have strengthened. In particular, respondents noted that market timing can be critical in refunding issues because meeting a savings target often requires that the issue quickly be brought to market.

Some respondents indicated that competitive issuance, because of limitations on the rapidity with which changes to the issue documentation can be made, may offer less flexibility. In the empirical analysis, we control for market conditions at the time of the issue, but we cannot observe or control

---

<sup>7</sup> As an example, one interviewee noted that in the last full week of October 2006, the bond market rallied sharply as the week progressed. In response, many of the week's deals were repriced with yields 3 to 4 basis points below the initial yields. This decrease was in the face of one of the heaviest new issue calendars in the prior six months. Competitive issues do not allow for such flexibility in response to market conditions.

The interviewee also noted that market timing can also refer to issue-specific conditions, including the existence of a large volume of similar issues within a state or sector during the same day or week.

for the effects of market timing. Thus, to the extent that the negotiated offering method yields a benefit related to market timing, that benefit cannot be reflected in an empirical analysis that focuses on comparative issuance costs.

Respondents noted that the competitive bid process discourages pre-marketing, because bidders are not certain of winning the bid. Because they are less involved in preparing the official statement than negotiated underwriters are, they have less opportunity to examine the revenue projections that underlie revenue-based issues. In addition, competitive underwriters face additional risk from their inability to reprice the issue if conditions change. In marketing the issue, competitive underwriters are unable to structure the issue to meet pockets of demand and are limited in their abilities to expand pockets of demand to include direct retail investors. The result is that the underwriter of a competitive bid offering is exposed to greater risk of being unable to place the issue. This risk exposure is greater, as noted above, when the issue is risky or complex, and when the market segment is saturated. The implication is that competitive bid underwriters are likely to bid conservatively in circumstances when their exposure to mispricing risk is high.

### **Advice and Innovation**

Some issuers indicated that they had sophisticated staffs and did not need to rely on financial advisors. In the empirical analysis, we are unable to observe or measure the benefits of financial innovations arising from the negotiation process and cannot observe the advice provided to issuers without compensation. Presumably, the fees paid to underwriters of negotiated offerings compensate indirectly for the cost of providing advice to issuers and for efforts to innovate.<sup>8</sup> All else equal, the higher fees could result in higher costs for negotiated issues. If the advice and innovations result in the ability to place issues at lower yields, the net effect on the issuer's interest cost of a given issue could be either positive or negative.

Several interviewees noted, however, that a financial advisor on a negotiated issuance acts to discipline the underwriter—the tension between the senior managing underwriter and the financial advisor guides the issue to the optimal cost.

There is no reason for the cost necessarily to be offset by a lower interest rate paid to investors. Rather, the effects could be to lower the overall interest cost of the issuer's entire structure of municipal debt or to mitigate market saturation so that the quantity of debt can be increased. We cannot observe these effects. Additionally, to the extent that a competitive bid issuer relies on financial advisors or internal resources to substitute for the advice and innovation efforts provided by investment bankers, these costs are not

---

<sup>8</sup> An interviewee noted, however, that if negotiated issuances included fees for advice, then such fees would be reflected in higher average spreads.

reflected in the issue's "true interest cost." Thus, the cost of competitive bid offerings may be understated relative to the cost of negotiated offerings.

### **Loss Leader Pricing**

Several respondents suggested that underwriters may sometimes bid aggressively for a competitive issue when they believe winning the bid will give them greater exposure to the issuer and increase the probability of being selected for the issuer's negotiated offerings. If so, then direct comparisons of interest cost between competitive and negotiated issues are biased in favor of competitive issues. One respondent pointed out that an issuer who occasionally used competitive bid would face higher interest costs if the issuer were to announce that it no longer would use negotiated issues. This observation implies that issuers who are precluded from using negotiation will face higher competitive-bid interest costs, as would issuers who predominantly used competitive bid.

### **Agency Concerns**

Some respondents indicated that historically, issuers who selected negotiation have been accused of doing so for reasons that do not benefit the issuer, such as for campaign contributions from the investment banker. The respondents indicated that MSRB Rules G-37 and G-38 now have substantially removed this potential concern about the negotiated issuance process.

## **HYPOTHESES AND AN EMPIRICAL TEST**

The approach taken in this study has been to test two, related hypotheses regarding the behavior of municipal bonds issued under negotiated and competitive methods. The primary innovations that are offered in the current study are the use of a large dataset and the use of statistical controls for both sample and self-selection bias. The null hypotheses are that:

- There is no difference in the TIC associated with issues offered by negotiated or competitive issuance methods once sample selection and self-selection biases have been controlled; and
- Issuers optimally select the issuance method that minimizes their issuance costs:

As noted above, several published studies comparing the costs of negotiated and competitive issuances have found that the interest costs of negotiated issuance are 10 to 70 basis points more than for competitively issued bonds. Smith (1987), Leonard (1996), Kriz (2003), and Peng and Brucato (2003) suggest that self-selection bias may be affecting these conclusions. In other words, factors that affect the negotiated/competitive issuance choice may also affect the interest cost. For example, a complex issuance by an entity with a lower credit rating would be more likely to:

- Use a negotiated issuance method; and
- Be associated with higher interest costs.<sup>9</sup>

Failure to control for such simultaneity would tend to ascribe differences in the costs to issuance method rather than to underlying fundamentals of the issuance itself.

In addition to possible self-selection bias, a sample selection bias may also be affecting the conclusion that the interest costs of negotiated issuance are greater than for competitively issued bonds. In particular, most issuances—especially negotiated issuances—do not report TIC. It is possible, therefore, that many of the characteristics that affect the negotiated/competitive decision and the TIC also affect whether a TIC is reported.

The following sections describe data used and a two-step procedure described by Heckman (1979), Maddala (1983), and Amemiya (1985), in which we first examine the factors affecting TIC reporting and the factors determining negotiated/competitive decision in a sample of municipal bond issues and then incorporate these factors into a comparison of TIC for negotiated and competitive issuances. This approach is an extension of Smith (1987), Leonard (1996), Kriz (2003), and Peng and Brucato (2003), who also employ a Heckman-type approach. Specifically, we examine:

- Whether the probability that a TIC is reported in the dataset is a function of bond and issuer characteristics; and
- Whether the probability that an issuance is negotiated is a function of bond and issuer characteristics.

We next examine the TIC for negotiated and competitive offerings, using a vector of variables believed to affect issuance costs, and controlling for the interdependence between the decision to use a negotiated process and the issuance costs. We then estimate the selectivity-bias-adjusted TIC for both negotiated and competitive issuances under the alternative issuance method.

## DATA

The data used for the comparative cost analysis are all U.S. municipal new issues between January 1, 1990, and June 30, 2006, available from Thomson Financial Services. The original dataset consists of a total of 270,265 issues. Descriptive statistics are provided in Table 1. In the sample, 260,649 issues are either negotiated or competitive issuances. Of the negotiated and competitive issuances, 41,655 (16%) reported TIC (Table 2).

---

<sup>9</sup> Note that even within rating categories and “mega-sectors” (e.g., revenue bonds), credit characteristics and complexity may differ from sector to sector. For example, an A-rated hospital bond may be perceived to be riskier, may be less likely to be eligible for bond insurance, and may be more complex to analyze than an A-rated water and sewer revenue bond. Thus, such a hospital bond would yield more in a given state and would also be more likely to be a negotiated issuance than the similarly rated water and sewer bond.

**Table 1: Characteristics of Municipal Bond Issues in Thomson Dataset, 1990–2005**

Variable	All Observations			TIC Reported			No TIC Reported		
	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD	Obs.
<b>Bond characteristics</b>									
True interest cost (TIC)	5.00	1.19	41,540	5.81	1.26	10,762			
Amount of issue (\$ mil.)	18.71	75.15	260,393	34.79	101.74	10,762	23.11	87.59	138,551
Bond Buyer GO index	5.61	2.03	251,969	5.97	1.25	10,696	5.56	2.16	133,630
Bond Buyer revenue index	5.82	0.74	251,969	6.18	0.70	10,696	5.76	0.73	133,630
Years to maturity	15.09	14.66	260,315	18.71	10.66	10,762	18.61	16.50	138,521
Revenue bond	0.385		260,393	0.634		10,762	0.567		138,551
Serial bond	0.885		260,393	0.977		10,762	0.828		138,551
Callable bond	0.591		260,224	0.792		10,761	0.670		138,431
Refund bond	0.084		260,393	0.201		10,762	0.080		138,551
Credit enhancement	0.348		260,393	0.437		10,762	0.432		138,551
Best bond rating from Moody's or S&P	0.022		260,393	0.020		10,762	0.022		138,551
High bond rating from Moody's or S&P	0.111		260,393	0.120		10,762	0.107		138,551
Upper medium bond rating from Moody's or S&P	0.092		260,393	0.125		10,762	0.091		138,551
Medium bond rating from Moody's or S&P	0.028		260,393	0.053		10,762	0.030		138,551

<b>Use of proceeds</b>										
Public facilities	0.052		260,345	0.061		10,762	0.055		138,525	
Education	0.319		260,361	0.254		10,762	0.271		138,531	
Electric power	0.012		260,381	0.028		10,762	0.016		138,540	
Housing	0.063		260,381	0.070		10,762	0.108		138,540	
Utilities	0.110		260,292	0.153		10,762	0.118		138,521	
Healthcare	0.050		260,381	0.110		10,762	0.081		138,540	
Development	0.039		260,378	0.042		10,762	0.059		138,539	
Transportation	0.039		260,358	0.060		10,762	0.044		138,529	
Environmental facilities	0.016		260,381	0.024		10,762	0.025		138,540	
<b>Bond characteristics contd.</b>										
True interest cost (TIC)	5.00	1.19	41,540	4.72	1.03	30,778				
Amount of issue (\$ mil.)	18.71	75.15	260,393	21.07	57.14	30,778	8.06	47.52	80,233	
Bond Buyer GO index	5.61	2.03	251,969	5.41	1.70	29,484	5.73	1.98	78,098	
Bond Buyer revenue index	5.82	0.74	251,969	5.66	0.68	29,484	5.93	0.75	78,098	
Years to maturity	15.09	14.66	260,315	16.40	7.21	30,776	8.01	10.87	80,187	
Revenue bond	0.385		260,393	0.223		30,778	0.099		80,233	
Serial bond	0.885		260,393	0.997		30,778	0.928		80,233	
Callable bond	0.591		260,224	0.816		30,771	0.342		80,192	
Refund bond	0.084		260,393	0.109		30,778	0.066		80,233	
Credit enhancement	0.348		260,393	0.453		30,778	0.150		80,233	

(continued)

**Table 1: Characteristics of Municipal Bond Issues in Thomson Dataset, 1990–2005 (continued)**

Variable	All Observations			TIC Reported			No TIC Reported		
	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD	Obs.
Best bond rating from Moody's or S&P	0.022		260,393	0.044		30,778	0.014		80,233
High bond rating from Moody's or S&P	0.111		260,393	0.254		30,778	0.061		80,233
Upper medium bond rating from Moody's or S&P	0.092		260,393	0.174		30,778	0.057		80,233
Medium bond rating from Moody's or S&P	0.028		260,393	0.031		30,778	0.021		80,233
<b>Use of proceeds (contd.)</b>									
Public facilities	0.052		260,345	0.055		30,767	0.044		80,222
Education	0.319		260,361	0.312		30,775	0.415		80,224
Electric power	0.012		260,381	0.010		30,778	0.003		80,232
Housing	0.063		260,381	0.017		30,778	0.003		80,232
Utilities	0.110		260,292	0.116		30,762	0.088		80,178
Healthcare	0.050		260,381	0.008		30,778	0.005		80,232
Development	0.039		260,378	0.023		30,777	0.008		80,231
Transportation	0.039		260,358	0.039		30,771	0.027		80,227
Environmental facilities	0.016		260,381	0.009		30,778	0.004		80,232

**Table 2: Number of Municipal Bond Issues in Thomson Dataset, 1990–2005**

Year	With TIC			Without TIC			Total		
	Negotiated	Competitive	Total	Negotiated	Competitive	Total	Negotiated	Competitive	Total
1990	613	625	1,238	5,111	4,888	9,999	5,724	5,511	11,605
1991	1,313	1,092	2,405	6,485	5,276	11,761	7,798	6,368	14,649
1992	1,652	1,340	2,992	7,960	5,044	13,004	9,612	6,384	16,416
1993	2,025	1,764	3,789	8,392	5,427	13,819	10,417	7,191	18,164
1994	1,226	1,492	2,718	6,635	4,983	11,618	7,861	6,475	14,953
1995	932	1,523	2,455	6,753	4,833	11,586	7,685	6,356	14,846
1996	412	1,563	1,975	8,008	5,383	13,391	8,420	6,946	16,163
1997	350	1,508	1,858	8,338	5,301	13,639	8,688	6,809	16,585
1998	476	2,059	2,535	10,192	5,366	15,558	10,688	7,425	18,996
1999	302	1,651	1,953	8,875	5,175	14,050	9,177	6,826	16,955
2000	190	1,791	1,981	7,497	4,982	12,479	7,687	6,773	15,223
2001	289	2,398	2,687	9,400	5,010	14,410	9,689	7,408	17,612
2002	376	2,719	3,095	9,895	4,579	14,474	10,271	7,298	17,950
2003	275	2,977	3,252	10,275	4,630	14,905	10,550	7,607	18,464
2004	181	2,547	2,728	9,898	3,924	13,822	10,079	6,471	16,891
2005	143	2,591	2,734	10,605	3,686	14,291	10,748	6,277	17,232
2006	53	1,207	1,260	4,536	1,654	6,190	4,589	2,861	7,561
Total	10,808	30,847	41,655	138,855	80,139	218,994	149,663	110,986	270,265

The data include variables measuring the characteristics of the issue, the issuer, and the market itself at the time of issue. The variables used in the analysis are as follows:

- *TIC*: True interest cost or the rate, compounded semi-annually, necessary to discount the amounts payable on the respective principal and interest payment dates to the purchase price received for the new issue of bonds.
- *TIC dummy*: Dummy variable equal to 1 if issuance reports TIC, 0 otherwise.
- *Negotiated issuance*: Dummy variable equal to 1 if negotiated issuance, 0 if competitive.
- *Issue amount*: Dollar amount issued, in millions; natural log used in regressions.
- *Bond Buyer GO bond index*: Bond Buyer general obligation municipal bond index on date of issue; equal to index if the issue is a general obligation issue, 0 otherwise.
- *Bond Buyer revenue bond index*: Bond Buyer revenue municipal bond index on date of issue; equal to index if the issue is a revenue bond issue, 0 otherwise.
- *Years to maturity*: Number of years from date of issue until date of maturity.
- *Revenue bond*: Dummy variable equal to 1 for revenue bond issuance, 0 otherwise.
- *Callable bond*: Dummy variable equal to 1 if bond is callable, 0 otherwise.
- *Refund*: Dummy variable equal to 1 if issuance is a refund, 0 otherwise.
- *Credit enhancement*: Dummy variable equal to 1 if issuance has credit enhancement (e.g., insurance), 0 otherwise.
- *Bank qualified*: Dummy variable if issuance has a bank-qualified provision, 0 otherwise.
- *Best bond rating from Moody's or Standard & Poor's*: Dummy variable equal to 1 if the underlying long-term rating is the highest given by either Moody's (Aaa) or Standard & Poor's (AAA), 0 otherwise.
- *High bond rating from Moody's or Standard & Poor's*: Dummy variable equal to 1 if the underlying long-term rating is Aa1, Aa2, Aa3 (Moody's) or AA+, AA, AA- (Standard & Poor's), 0 otherwise.
- *Upper medium bond rating from Moody's or Standard & Poor's*: Dummy variable equal to 1 if the underlying long-term rating is A1, A2, A3 (Moody's) or A+, A, A- (Standard & Poor's), 0 otherwise.
- *Medium bond rating from Moody's or Standard & Poor's*: Dummy variable equal to 1 if the underlying long-term rating is Baa1, Baa2, Baa3 (Moody's) or BBB+, BBB, BBB- (Standard & Poor's), 0 otherwise.
- *Bond Buyer use of proceeds*: Use of the proceeds from the issuance, as reported in Bond Buyer. Dummy variable equal to 1 for particular

use of proceeds, 0 otherwise. Use of proceeds types are (a) general purpose, (b) public facilities, (c) education, (d) electric power, (e) housing, (f) utilities, (g) healthcare, (h) development, (i) transportation, and (j) environmental facilities.

- *State of issue*: Dummy variable equal to 1 for particular state, 0 otherwise. Variable coded for each state and the District of Columbia.
- *Year of issue*: Dummy variable equal to 1 for each year, 0 otherwise. Variable coded for each year from 1990 to 2006.
- *Trend*: Daily trend variable.

*TIC* is the dependent variable of interest and is the dependent variable in the impact regressions. Whether a bond is a *negotiated issuance* is an independent variable in the selection regressions and an independent variable in the impact regression. *Issue amount* and *years to maturity* are continuous variables of issue characteristics. *Revenue*, *callable*, *refund*, *credit enhancement*, *bank qualified*, and *bond rating*, are indicator variables of an issue's riskiness and complexity and proxy, to the extent possible, for any contingent claims. "Unrated" or "not rated" bonds (i.e., the bond has no rating) is the excluded group among the bond rating variables (e.g., the dummy variable equals zero). *GO bond index* and *revenue bond index* are continuous variables designed to control for market conditions at the time of issuance and are applied only to the appropriate type of bond. For example, a general obligation bond will have an index number in the *GO bond index* field and zero in the *revenue bond index* field. *State of issue*, *year of issue*, and *trend* are control variables designed to control for differences in regulations, preferences, and other ambient conditions across geography and time. Because these variables capture many factors that are not explicitly modeled, caution should be exercised in interpreting their coefficients and significance.

The data used include control variables to take account of such factors as the risk and size of an issue. However, the available measures of these factors are much less than perfect measures of the factors and are likely not to fully control for them. For example, Fabozzi et al. (1988) indicate that market uncertainty may be an important determinant of the relative costs of negotiated and competitive issuance. The data used in this analysis, however, are not amenable to relatively complex calculation of market variability at the time of issuance. In addition, although our methodology is designed to control for selection, it does so imperfectly and therefore still may understate the advantages of negotiation when issues are risky, complex, or large relative to the market.

As noted in interviews with market participants, timing of issuance or last-minute changes to the terms of issuance can play a key role in the negotiated/competitive choice as well as the cost of issuance. However, it

is impossible with the available data to observe or control for the effects of such timing issues. Thus, to the extent that the negotiated offering method yields a benefit related to market timing, that benefit cannot be reflected in an empirical analysis that focuses on comparative issuance costs.

TIC is a variable that is reported by the issuer, its financial advisor, or its underwriter. To the extent that a competitive bid issuer relies on financial advisors or its own internal resources to substitute for the advice and innovation efforts provided by investment bankers, these costs may not be reflected in the issue's TIC. Depending on the extent of such underreporting, the TIC on competitive issues would tend to be lower than the economically "true" cost of issuance.

## MODEL AND RESULTS

Several early studies comparing the costs of negotiated and competitive offerings employ a linear regression model to evaluate the relationship between issuance costs and the negotiated/competitive decision and other factors. In the basic formulation, the negotiated/competitive issuance decision is indicated by a dummy variable that, for example, takes on the value of 1 for a negotiated issuance and 0 for a competitive issuance. The estimated coefficient on this dummy variable thus is intended to capture any effect of negotiated/competitive choice on TIC. However, as noted elsewhere, such analysis does not control for self-selection or sample selection biases.

If one believes that the competitive/negotiated decision has merely an intercept effect on TIC (i.e., results in a parallel shift up or down in TIC), then the appropriate model includes the negotiated/competitive decision as a right-hand-side variable and pools the entire sample of negotiated and competitive issuances:

$$TIC = X_1\beta_1 + NEG \delta_1 + u_1 \quad (1)$$

where  $TIC$  is a vector the true interest cost for each issue,  $X_1$  is a matrix of independent variables for each issue,  $NEG$  is a dummy variable representing the negotiated/competitive choice (e.g.,  $NEG = 1$  if the issue is negotiated and 0 if the issue is competitive);  $\beta_1$  and  $\delta_1$  are the estimated coefficients and  $u_1$  is the error term.

Table 3 presents the results from a naïve model that does not account for selection biases. The results are consistent with earlier studies—all other things being held constant, the average TIC associated with negotiated issuances is 25 basis points higher than the average TIC associated with competitive issuance and is statistically significantly different from zero.<sup>10</sup>

<sup>10</sup> Earlier research suggests that the coefficients on the bond index would be approximately 1. The coefficients presented in this study are positive, but less than 1. The presence of other explanatory variables that are correlated with the bond indices (i.e., *year of issue*, and *trend*) account for the results presented here.

**Table 3: Naïve TIC Regression Without Sample Selection of Self-Selection Corrections (Dependent Variable: TIC)**

Variable	Coef.	Std. Error
Intercept	6.174	0.098***
Negotiated issuance	0.214	0.009***
Amount of issue (\$ mil., ln)	-0.091	0.003***
Bond Buyer GO index	0.040	0.002***
Bond Buyer revenue index	0.205	0.009***
Years to maturity	0.041	0.001***
Revenue bond	-0.837	0.052***
Callable bond	0.354	0.009***
Refund bond	0.078	0.010***
Credit enhancement	-0.053	0.008***
Bank qualified	-0.249	0.008***
Best bond rating	-0.103	0.017***
High bond rating	-0.090	0.009***
Upper medium bond rating	-0.042	0.009***
Medium bond rating	0.269	0.017***
Public facilities	-0.004	0.007
Education	-0.018	0.007**
Electric power	0.046	0.025
Housing	0.205	0.019***
Utilities	0.009	0.007
Healthcare	0.273	0.018***
Development	0.356	0.019***
Transportation	0.022	0.010**
Environmental facilities	0.120	0.027***
R <sup>2</sup>	0.755	
Adjusted R <sup>2</sup>	0.754	
Total observations	39,291	

\*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. State, year, and trend variables are not displayed.

## Controlling for Sample Selection and Self-Selection

In the case at hand, we are confronted with both sample selection bias and self-selection bias in the same model. The data provide negotiated/competitive information for nearly every issuance but report TIC for only a small

subset. Thus, our model must account for the possibility that factors affecting the negotiated/competitive decision also affect the TIC reporting decision as well as the reported TIC. Thus, a double selection model is appropriate for achieving consistent estimators. First, a probit model explaining the TIC reporting decision is estimated, and the inverse Mills ratio (IMR) is calculated. A second probit equation explaining the negotiated/competitive decision is then estimated. The IMR term from the first probit and the fitted values from the second probit are included in TIC equations estimated using ordinary least squares (OLS). We employ two different methods.

The first method is a two-step approach in which the coefficients on the independent variables are restricted to be the same for negotiated and competitive issuances:

- Step 1: Estimate with probit the following equations:

$$TIC^* = X_1\beta_1 + u_1 \quad (2)$$

$$NEG = X_2\beta_2 + u_2 \quad (3)$$

- Step 2: Use the results from Step 1 to calculate the IMR,  $IMR_f$ , from (2). Substitute the fitted values for the competitive/negotiated decision (3) into the OLS regression, where  $NEG_f$  denotes the fitted value from the probit in Step 1:

$$TIC = X_3\beta_3 + IMR_f \gamma_3 + NEG_f \delta_3 + u_3 \quad (4)$$

The results from this method are presented in Table 4.

The second method is also a two-step method. In this method, however, the coefficients on the independent variables may differ across negotiated and competitive issuances:

- Step 1: Estimate with probit the following equation:

$$TIC^* = X_1\beta_1 + u_1 \quad (5)$$

$$NEG = X_2\beta_2 + u_2 \quad (6)$$

- Step 2: Use the results from Step 1 to calculate the IMR for each observation ( $IMR_f$  from the first probit,  $IMR_n$  and  $IMR_c$  from the second probit). Substitute the IMRs into the negotiated and the competitive OLS regressions, as follows:

$$TIC_n = X_3\beta_3 + IMR_f \gamma_3 + IMR_n \delta_3 + u_3 \quad (7)$$

$$TIC_c = X_4\beta_4 + IMR_f \gamma_4 + IMR_c \delta_4 + u_4 \quad (8)$$

The results from this method are presented in Table 5.

**Table 4: Probit Regressions for Self-Selection (Dependent Variable: Negotiated Dummy = 1 if Negotiated, 0 if Competitive)**

Variable	Coef.	Std. Error
Intercept	0.433	0.219**
Amount of issue (\$ mil., ln)	0.016	0.007**
Years to maturity	0.003	0.001***
Revenue bond	0.483	0.019***
Callable bond	-0.099	0.023***
Refund bond	-0.036	0.023
Credit enhancement	-0.116	0.019***
Bank qualified	-0.055	0.020***
Best bond rating	-0.285	0.043***
High bond rating	-0.278	0.022***
Upper medium bond rating	-0.137	0.022***
Medium bond rating	-0.019	0.040
Public facilities	-0.005	0.020
Education	0.035	0.017**
Electric power	0.111	0.059
Housing	0.473	0.045***
Utilities	-0.002	0.018
Healthcare	1.116	0.047***
Development	0.111	0.042***
Transportation	0.024	0.024
Environmental facilities	0.130	0.062**
Observations with dependent variable = 0	30,464	
Observations with dependent variable = 1	10,187	
Total observations	40,651	
***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. State, year, and trend variables are not displayed.		

## Discussion

When the sample selection and self-selection corrections are applied to the naïve model, the negative coefficient on  $NEG_f$  indicates that, after controlling for selection biases, negotiated issuances may have lower TICs than competitive issues. The small  $t$ -statistic indicates, however,

**Table 5: Probit Regressions for Sample Selection (Dependent Variable: TIC Dummy = 1 if TIC Reported, 0 Otherwise)**

Variable	Coef.	Std. Error
Intercept	-1.902	0.087***
Amount of issue (\$ mil., ln)	0.074	0.003***
Years to maturity	-0.001	0.000***
Revenue bond	-0.309	0.009***
Callable bond	0.511	0.009***
Refund bond	0.029	0.011**
Credit enhancement	0.331	0.008***
Bank qualified	0.086	0.009***
Best bond rating	0.495	0.020***
High bond rating	0.571	0.010***
Upper medium bond rating	0.416	0.010***
Medium bond rating	0.253	0.019***
Public facilities	0.014	0.010
Education	-0.150	0.008***
Electric power	-0.103	0.029***
Housing	-0.715	0.018***
Utilities	-0.012	0.007
Healthcare	-0.402	0.017***
Development	-0.316	0.019***
Transportation	-0.018	0.012
Environmental facilities	-0.317	0.028***
Observations with dependent variable = 0	206,413	
Observations with dependent variable = 1	40,651	
Total observations	247,064	
***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. State, year, and trend variables are not displayed.		

that such costs are not statistically significant. Thus, once selection biases are accounted for, there is no difference in the costs associated with the method of issuance (Table 6).<sup>11</sup>

<sup>11</sup> The positive and significant coefficient on the sample selection variable implies that issuances reporting TIC would be expected to have higher TICs than issuances that do not report TIC.

**Table 6: TIC Regression Correcting for Sample Selection and Self-Selection (Dependent Variable: TIC)**

Variable	Coef.	Std. Error
Intercept	8.140	0.186***
NEG <sub>t</sub>	-0.225	0.083***
IMR <sub>t</sub>	-2.155	0.186***
Amount of issue (\$ mil., ln)	-0.112	0.004***
Bond Buyer GO index	0.039	0.002***
Bond Buyer revenue index	0.240	0.010***
Years to maturity	0.042	0.001***
Revenue bond	-0.865	0.054***
Callable bond	0.164	0.018***
Refund bond	0.059	0.010***
Credit enhancement	-0.188	0.013***
Bank qualified	-0.281	0.008***
Best bond rating	-0.325	0.024***
High bond rating	-0.340	0.021***
Upper medium bond rating	-0.210	0.016***
Medium bond rating	0.176	0.018***
Public facilities	-0.011	0.008
Education	0.039	0.008***
Electric power	0.097	0.026***
Housing	0.495	0.030***
Utilities	0.014	0.007**
Healthcare	0.547	0.036***
Development	0.485	0.022***
Transportation	0.030	0.010***
Environmental facilities	0.244	0.029***
R <sup>2</sup>	0.752	
Adjusted R <sup>2</sup>	0.752	
Total observations	39,291	

\*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. State, year, and trend variables are not displayed.

**Table 7: TIC Regressions Correcting for Sample Selection and Self-Selection, Separate Regression for Negotiated and Competitive Issuances (Dependent Variable: TIC)**

Variable	Negotiated		Competitive	
	Coef.	Std. Error	Coef.	Std. Error
Intercept	6.422	0.402***	8.862	0.269***
IMR <sub>t</sub>	-2.215	0.392***	-1.388	0.217***
IMR <sub>n</sub>	1.184	0.380***	-1.051	0.129***
Amount of issue (\$ mil., ln)	-0.116	0.007***	-0.096	0.004***
Bond Buyer GO index	0.179	0.014***	0.031	0.002***
Bond Buyer revenue index	0.429	0.023***	0.204	0.012***
Years to maturity	0.029	0.001***	0.052	0.001***
Revenue bond	-1.112	0.133***	-0.757	0.063***
Callable bond	0.258	0.036***	0.127	0.021***
Refund bond	0.077	0.021***	0.058	0.011***
Credit enhancement	-0.464	0.029***	-0.044	0.015***
Bank qualified	-0.295	0.022***	-0.267	0.008***
Best bond rating	-0.516	0.067***	-0.218	0.025***
High bond rating	-0.557	0.049***	-0.208	0.024***
Upper medium bond rating	-0.352	0.036***	-0.109	0.018***
Medium bond rating	0.106	0.039***	0.204	0.020***
Public facilities	0.010	0.035	-0.009	0.007
Education	0.039	0.025	0.023	0.008***
Electric power	0.150	0.051***	0.125	0.031***
Housing	0.551	0.061***	0.539	0.038***
Utilities	0.020	0.028	0.013	0.006***
Healthcare	0.662	0.071***	0.553	0.048***
Development	0.499	0.048***	0.434	0.024***
Transportation	0.105	0.036***	0.017	0.010
Environmental facilities	0.312	0.057***	0.166	0.034***
R <sup>2</sup>	0.645		0.766	
Adjusted R <sup>2</sup>	0.642		0.765	
Total observations	10,121		29,170	

\*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. State, year, and trend variables are not displayed.

	<b>Negotiated</b>	<b>Competitive</b>
Actual mean TIC	5.807	4.718
Standard deviation	1.258	1.030
Estimated TIC under alternative issuance	6.237	5.196
Standard deviation	1.258	1.061
Difference	0.430	0.478
Total observations	10,729	29,856

Table 7 is based on an assumption that the relationship between TIC and the independent variables differ across negotiated and competitive issuances. This assumption is useful for developing a “what if” scenario to describe the effect of the negotiated/competitive decision on TIC. Table 8 shows the TIC associated with each type of issuance if the opposite type had been chosen instead. That is, it shows the costs of competitive issues if they had been negotiated, instead, and vice versa. Under the assumption that issuers act rationally to minimize their expected issuance costs, one would expect to see higher issuance costs under the alternative method of issuance. Consistent with economic expectation, the results of what-if analysis indicate that, on average, issuers tend to select the least cost issuance method. Table 8 shows that if issuers were forced to choose the “wrong” issuance method, the TIC would be approximately 45 basis points higher than that which was actually incurred. For example, if a competitive issue were required to be negotiated, the costs would be 48 basis points higher. If a negotiated issue were required to be competitive, the costs would be 43 basis points higher. It is important to note that these differences are not statistically significant; however, they indicate that, on average, issuers tend to select the cost-minimizing method of issuance.

## **CONCLUSION**

Municipal finance relies heavily on the issuance of debt, and the debt is issued by a diverse range of public entities. The issuer of the debt has a choice in how the debt is issued. The issuer may choose a negotiated method or a competitive method. A negotiated issue differs from competitive issues in that the initial price is struck not by competitive bidding but directly between the issuer and underwriters. In a negotiated offering, the underwriters negotiate the offering price of the new issue with the issuer.

Some analysts believe they have observed systematic differences in the cost to the issuer by type of issuance. These findings have, in turn, led to research to evaluate whether, or under what conditions, one method of issuance is superior to another.

The empirical findings presented in this study suggest that once selection biases are accounted for, there is no general advantage of one method over another. Rather, there appears to be a strong tendency for issuers to select the method of issuance that best suits the nature of the issue at hand. Indeed, our analysis indicates that efforts to mandate one type of issuance over the other would likely increase issuance costs.

## References

- Amemiya, T. (1985). *Advanced Econometrics*. Cambridge, MA: Harvard University Press.
- Bland, R.L. (1985). "The Interest Cost Savings from Experience in the Municipal Bond Market." *Public Administration Review*, 45(1), 233–237.
- Braswell, R.C., E.J. Nosari, and D.L. Sumners (1983). "A Comparison of the True Interest Costs of Competitive and Negotiated Underwritings in the Municipal Bond Market: Note." *Journal of Money, Credit, and Banking*, 15(1), 102–106.
- Fabozzi, F.J., E. Moran, and C.K. Ma (1988). "Market Uncertainty and the Least-Cost Offering Method of Public Utility Debt: A Note." *Journal of Finance*, 43(4), 1025–1034.
- Gershberg, A.I., M. Grossman, and F. Goldman (2001). "Competition and the Cost of Capital Revisited: Special Authorities and Underwriters in the Market for Tax-Exempt Hospital Bonds." *National Tax Journal*, 54(2), 255–280.
- Heckman, J.J. (1979). "Sample Selection Bias as a Specification Error." *Econometrica*, 47(1), 153–162.
- Joehnk, M.D., and D.S. Kidwell (1979). "Comparative Costs of Competitive and Negotiated Underwritings in the State and Local Bond Market." *Journal of Finance*, 34(3), 725–731.
- Kriz, K. (2003). "Comparative Costs of Negotiated Versus Competitive Bond Sales: New Evidence from State General Obligation Bonds." *Quarterly Review of Economics and Finance*, 43, 191–211.
- Leonard, P.A. (1996). "An Empirical Analysis of Competitive Bid and Negotiated Offerings of Municipal Bonds." *Municipal Finance Journal*, 17(1), 37–67.
- Maddala, G.S. (1983). *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press.
- Maese, J.E. (1985). "Competitive Versus Negotiated Municipal Revenue Bond Issues: An Investigation of Underpricing." *Financial Management*, 14(1), 26–32.
- McCaskill, C. (2005). "General Obligation Bond Sales Practices Follow-Up." Jefferson City, MO: Missouri State Auditor's Office.
- Peng, J., and P.F. Brucato (2001). "Do Competitive-Only Laws Have an Impact on the Borrowing Cost of Municipal Bonds?" *Municipal Finance Journal*, 22(3), 61–76.
- Peng, J., and P.F. Brucato (2003). "Another Look at the Effect of Method of Sale on the Interest Cost in the Municipal Bond Market: A Certification Model." *Public Budgeting & Finance*, 23(1), 73–95.
- Robbins, M.D. (2002). "Testing the Effects of Sale Method Restrictions in Municipal Bond Issuance: The Case of New Jersey." *Public Budgeting & Finance*, 22(2), 40–56.

- Simonsen, W., and M.D. Robbins (1996). "Does It Make Any Difference Anymore? Competitive Versus Negotiated Municipal Bond Issuance." *Public Administrative Review*, 56(1), 57–64.
- Simonsen, W., M.D. Robbins, and L. Helgerson (2001). "The Influence of Jurisdiction Size and Sale Type on Municipal Bond Interest Rates: An Empirical Analysis." *Public Administration Review*, 61(6), 709–717.
- Smith, R.L. (1987). "The Choice of Issuance Procedure and the Cost of Competitive and Negotiated Underwriting: An Estimation of the Impact of Rule 50." *Journal of Finance*, 42(3), 703–720.
- Sorenson, E.H. (1979). "Negotiated Municipal Bond Underwritings: Implications for Efficiency: Note." *Journal of Money, Credit, and Banking*, 11(3), 366–370.