

The Effectiveness of Debt Insurance As a Valid Signal of Bond Quality

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ABSTRACT

This article examines the signaling role of private debt insurance in the tax-exempt bond market. Specifically, the validity of a popular theory which states that the purchase of debt insurance constitutes a valid signal of borrower's credit quality in a market with information asymmetry is investigated. Contrary to the view that private bond insurance provides signaling values to borrowers, it is shown that signaling equilibrium does not exist and the net interest cost savings from the purchase of bond insurance, if any, should not be attributed to its signaling effect.

The role of private bond insurance in financial markets has generated considerable research (see Cole and Officer, 1981; Braswell, Nosari and Browning, 1982; and Kidwell, Sorensen and Wachowicz, 1987). Previous work focuses mainly on the benefits of insurance to borrowers. This third-party credit enhancement improves the quality of a debt issue and increases its marketability, thereby reducing the borrower's interest cost. However, outside credit assistance is not free. Any interest cost savings due to the purchase of bond insurance must be weighed against the out-of-pocket premium expenses incurred by borrowers. Unfortunately, available empirical studies provide no conclusive evidence as to the net effect of purchasing insurance on bond interest cost. On the one hand, Braswell, Nosari, and Browning (1982) find little or no net benefit to borrowers who use bond insurance. Cole and Officer (1981), on the other hand, report significant net interest cost savings to borrowers as a result of purchasing bond insurance.

While the answer to the question of whether a net insurance benefit exists for bond issuers still awaits further empirical investigation, a more fundamental issue deserves attention; What theoretical basis supports the existence of bond insurance? In other words, what induces bond issuers or

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investment bankers to continue buying debt insurance? In an efficient and competitive market, the premium charged by the insurer should exactly offset any potential interest savings to borrowers from the purchase of bond insurance. Consequently, no excess or net benefits should exist for borrowers purchasing bond insurance. Thakor (1982) argues that even in an efficient and competitive market, net interest cost savings to borrowers may still exist, due to the signal conveyed by insurance coverage about the default probability of insured debt issues. This signaling hypothesis suggests that, although the direct benefits of bond insurance purchase such as enhanced credit quality and marketability may be offset by the premium incurred, borrowers may enjoy indirect benefits through the signaling function of debt insurance, and this debt insurance signaling provides a basis for a positive net insurance benefit. Kidwell, Sorensen, and Wachowicz (1987) examine the benefits of insurance purchase and attribute the net interest cost savings observed in their data to the signaling function of debt insurance.

The signaling argument of debt insurance provides a plausible explanation for why borrowers acquire bond insurance when the market is in equilibrium. Its implication that debt insurance is a valid signal of bond quality in the tax-exempt market, however, is debatable. In the current article, the authors find that complete debt insurance is not an informative signal and the purchase of debt insurance in and of itself cannot provide any signaling benefit to borrowers.¹ Therefore, any net interest cost savings due to the purchase of bond insurance should not be viewed as a result of signaling.

Debt Insurance As a Quality Signal

Thakor (1982) argues that third-party information producers provide unambiguous signals of seller quality. Such information producers expend resources efficiently to produce information about the quality of a product seller and recover the information production costs by selling their services to the product seller. Investors take the level of services purchased by a seller as a quality signal of the product, and pay a market price that reflects the true quality of the product.

Viewing private bond insurers as third-party information producers, Thakor suggests that a properly designed premium schedule will induce a borrower to obtain the right amount of insurance coverage which signals exactly the borrower's true probability of default, so that a priori imperfectly informed investors will be well informed in equilibrium. Put another way, a borrower of low default risk will purchase only a small amount of coverage for its debt issue, while high-risk borrowers will purchase much larger amounts of coverage. The level of insurance coverage, therefore, reveals the equilibrium price a debt issue should command in line with its quality.

¹ In this context, complete insurance coverage provides protection against any loss of interest or principal repayment in case of default by bond issuer. In contrast, partial coverage provides less than 100 percent protection.

Needless to say, a valid signal must be observable in the market. A closer look at the working of private municipal bond insurance, however, suggests that the level of insurance coverage may not function as an informative quality signal. This is because all municipal bond insurers provide complete coverage against default on principal and interest payments, and borrowers do not have a choice as to how much coverage to purchase for their debt issues.² Consequently, investors do not observe different levels of insurance coverage. Since investors in the market can only differentiate between bond issues with and without insurance, the information conveyed by the signal (i.e., complete insurance coverage) about bond quality must be the same for all insured borrowers. In other words, holding other things constant, investors cannot differentiate between municipal borrowers of different quality based only on the amount of debt insurance coverage.

Does a Pooling Equilibrium Exist?

The signaling equilibrium in which the same type of signal (e.g., complete insurance coverage) is employed by all borrowers is called a pooling, or nonseparating, equilibrium.³ According to the insurance signaling hypothesis, investors identify a debt issue's default probability by observing its insurance coverage. For a pooling equilibrium to exist, therefore, investors must have the same assessment of credit quality for all insured bonds, since they observe the same insurance coverage for all insured debt.

Specifically, there are two necessary and sufficient conditions that must be satisfied for a pooling equilibrium in debt insurance signaling to exist. First, all insured debt must sell at the same yield, say i , and i must equal the risk-free rate, r . Second, the insurance premium charged must reflect the insurer's information production cost and the default probability of the insured. These two conditions suggest that a pooling equilibrium requires private insurers to repack all insured bonds into risk-free debt and charge a premium to recover all the costs incurred. While private insurers are capable of charging premiums to recoup their operating costs, none has the ability to make insured bonds free of default risk. The underlying probability of default on insured bond issues does not go away with the purchase of complete insurance coverage — it simply shifts to the insurer who has its own default risk. Hence, it is obvious that the risk-free repackaging condition of pooling equilibrium cannot be satisfied.

Although private insurers are not themselves free of default risk, the pooling equilibrium of the insurance signal may still exist if one relaxes the first equilibrium condition that $i = r$. Specifically, the risk-free interest rate, r , can be interpreted as the risk-adjusted required rate of return for the private

² Municipal bonds are serial bonds, so in some cases only certain maturities of a bond issue are insured. For any maturity segment that is insured, however, the coverage is always complete.

³ In contrast, a separating equilibrium exists only for borrowers purchasing different insurance contracts (varying amount of coverage). Since municipal bond insurers offer complete insurance, the existence of separating equilibrium in debt insurance signaling is not examined in this article.

insurer. Thus, complete insurance coverage can still be a valid signal of bond quality if all insured bonds garner the same yield that reflects the default risk of the insurer. Therefore the following testable hypothesis is proposed: For debt insurance to be a valid signal of bond quality, bond issues with complete insurance coverage from a private insurer should command a default risk premium that reflects the default probability of the insurer.

Evidence from the Municipal Bond Insurance Market

Data

Data on all insured new-issue municipal bonds sold competitively during 1981 and 1983 are collected. Revenue bonds and bond issues sold through negotiated sales are excluded to avoid the data poolability problem as found in previous studies (see Kessel (1978) and Kidwell and Koch (1982)). In a small number of cases (nine bond issues), only certain maturities of a bond issue are insured. To avoid inconsistency in interest yield estimation, they also are excluded from the sample. All bonds in the sample, a total of 417 bond issues, are insured by a single insurer — Municipal Bond Insurance Association (MBIA). Over the test period, the insurer (MBIA) has maintained a stable default probability of triple-A credit rating as assessed by the Standard and Poor's.

All MBIA-insured bonds in the market receive the same credit rating (triple-A) as their insurer from the Standard & Poor's. Until June 1984, however, Moody's ignored the presence of bond insurance, and assigned credit ratings to MBIA-insured bonds according to their intrinsic credit risk. Therefore, Moody's ratings on insured bond issues are used as a measure of their underlying default probability. Table 1 presents the mean statistics and the distribution of underlying credit quality for insured bond issues in the sample. As can be seen, most of the insured bonds in the sample are of relatively low intrinsic credit quality, as measured by Moody's ratings. Also, there are only six insured bond issues with credit ratings in the top two rating categories (Aaa and Aa). They are excluded from later empirical tests to avoid a small sample testing problem. Thus, only those with single-A and Baa credit ratings, a total of 411 bond issues, are compared.

Methodology

A standard pricing model for new-issue long-term municipal bonds is employed. Following Kessel (1978), Benson (1979), Sorensen (1980), and Joehnk and Kidwell (1984), bond interest cost is determined by a set of variables representing bond issue characteristics and market conditions at the time of sale. The model estimated by the ordinary least squares can be expressed in matrix form as

$$\begin{matrix} Y \\ nx1 \end{matrix} = \begin{matrix} X \\ nxk \end{matrix} \begin{matrix} B \\ kx1 \end{matrix} + \begin{matrix} U \\ nx1 \end{matrix}$$

Table 1
Mean Statistics of MBIA-Insured Bond Issues

Characteristics	Mean	Standard Deviation
Number of issues	417	—
Maturity (years)	16.1	4.93
Number of bids	3.26	1.46
Net interest cost (%)	9.72	1.44

*Underlying credit quality:**

	Number
Aaa	1
Aa	5
A	255
Baa	156

* All insured bonds are rated Aaa by Standard & Poor's.

where n is the number of bond issues, k represents the number of explanatory variables plus the intercept term, and the definitions of variables are presented in Table 2. Since all the variables included in the model are discussed extensively in previous studies, they are not repeated here.

The test in the current study focuses on the yield differential between insured bonds with different intrinsic credit quality. Thus, the test variable is the credit rating dummy SINGLEA. If the intrinsic default risk of an insured bond is still priced by investors, the null hypothesis that complete bond insurance acts as a valid signal in the municipal bond market is rejected. It should be pointed out also that the interaction variable ($RS \cdot SINGLEA$) serves as a secondary test of the hypothesis. This is because if the changes in the relative supply of insured Baa and single-A bond issues affect the bond interest costs between them, it would suggest that investors do differentiate the two types of bonds, holding other things constant.

Empirical Results

Table 3 presents the regression results of the interest cost difference between insured Baa and single-A bonds. Of interest, the interactive relative supply variable, $RS \cdot SINGLEA$, has a negative sign, suggesting that an increase in the supply of Baa insured bonds would widen the interest cost difference between the two types of issues. The relative supply effect, however, is not statistically significant. It is suspected that the variation of the changes in the relative supply of Baa and single-A insured bonds during the testing period for this study is not large enough to add any explanatory power to the bond interest costs.

Turning to the main test variable, SINGLEA. The results indicate that insured bonds of single-A credit quality sell, on average, at 24 basis points

Table 2
Definitions of Variables Used in Bond Pricing Estimation

Dependent Variable	
Y	= issuer net interest cost (NIC), defined as: [total interest payment + bid discount (or - bid premium)] / [(par value of the issue) x (average maturity of issue)].
Explanatory Variables	
X_{n1}	= intercept term.
X_{n2}	= issue size (SIZE) in natural logarithms.
X_{n3}	= years to maturity (MAT) in natural logarithms.
X_{n4}	= a zero-one dummy variable (CALL) that equals one if the issue is callable, zero if otherwise.
X_{n5}	= number of competitive bids (NBIDS).
X_{n6}	= prevailing market interest rate (INT) at the time of sale, as measured by the weekly Salomon Brothers' ten-year new issue reoffered yield index for prime-rated bonds.
X_{n7}	= interest rate volatility (VOL) at the time of sale, as measured by the eight-week standard deviation of market interest rates prior to the bond issue sale date.
X_{n8}	= slope of the term structure (SLOPE) at the time of sale, as measured in natural logarithms by the product of final maturity times the spread between the 20-year and one-year bond yields on Salomon Brothers' good-grade municipal bond yield index.
X_{n9}	= a zero-one credit quality dummy variable (SINGLEA), which reflects the underlying default probability of the insured bond issues. That is, SINGLEA = 1 if an insured bond has single-A underlying quality, and SINGLEA = 0 if otherwise. (As only bonds with single-A and Baa ratings are used in the test, all Baa bonds will have a value of zero for this variable.)
X_{n10}^*	= interaction (RS*SINGLEA) between relative supply (RS) of insured bonds at the time of sale and credit quality dummy variable (SINGLEA). RELSUP is defined as the ratio of the amounts of Baa- and single-A insured bonds during the month of sale.

lower interest yield than insured bonds of Baa credit quality, and the difference is statistically significant at the 1 percent level. This finding strongly suggests that insured bonds with differing intrinsic default risks are not priced equally as they should be if the complete insurance coverage is a valid signal of bond quality.

To provide more convincing evidence on whether debt insurance is a valid signal of bond quality, two additional empirical tests are performed. The first additional test concerns the flight to quality behavior in the market. It has been suggested that the impact of market uncertainty on new issue borrowing cost varies systematically across bond rating classes. Specifically, higher

Table 3

Interest Cost Difference Between Single-A and Baa Insured Bond Issues
(Net Interest Cost as the Dependent Variable)

Variable	Coefficient	t value
Constant	-1.06	-3.47**
SIZE	-0.83	-1.44
MAT	0.31	2.12*
CALL	0.44	7.08**
NBIDS	-0.08	-4.55**
INT	1.02	39.87**
VOL	0.34	2.08*
SLOPE	0.41	3.07**
SINGLEA	-0.24	-3.16**
RS*SINGLEA	-0.03	-0.33
Adjusted R ²	0.8501	
F value	310.2	
Prob. > F	0.0001	
Sample size	411	

** Significant at the 1 percent level.

* Significant at the 5 percent level.

quality issues are less sensitive to changes in market uncertainty than lower quality issues due to the flight to quality investor behavior. For complete bond insurance to be a valid bond quality signal, insured bonds of different quality should be priced as if they all have the same default risk as the insurer. Hence, a flight to quality phenomenon should not exist among insured bond issues in this study where default risk for the insurer is held constant. Following the testing method of Hays, Kidwell and Marr (1984), the interest rate volatility (VOL) is used as the test variable for market uncertainty and the sample is partitioned into two rating classes (Baa and single-A). Since Baa and single-A bond issues are estimated separately, the interaction variable in the model, RS*SINGLEA, is replaced by the raw relative supply variable, RS. Table 4 presents the estimation results.

Since changes in market uncertainty may have a differing impact on insured Baa and single-A bonds, focus is placed on the VOL variable. As can be seen in Table 4, the interest cost of insured Baa bond issues are much more sensitive (VOL = 0.44) to changes in market uncertainty than that for single-A insured issues (VOL = 0.26). Using a standard test for the mean difference between the estimated coefficients of VOL in the two equations, however, no significant difference (t value = 0.71) is found. This result is not surprising because the default risk differences between Baa and single-A bond issues probably is not large enough to make any flight to quality behavior detectable. However, the larger coefficient of VOL for Baa insured bonds is at least

Table 4

Flight to Quality Test Between single-A and Baa Insured Bond Issues
(Net Interest Cost as the Dependent Variable)

Variable	Regression 4.1		Regression 4.2	
	(Baa bonds)		(Single-A bonds)	
	Coeff.	t-value	Coeff.	t-value
Constant	-1.13	-3.04**	-1.01	-2.96**
SIZE	-0.84	-1.57	-0.69	-1.32
MAT	0.32	2.11*	0.29	2.03*
CALL	0.32	5.39**	0.45	6.14**
NBIDS	-0.07	-4.23**	-0.08	3.88**
INT	1.09	36.34**	0.89	32.96**
VOL	0.44	2.03*	0.26	1.98*
SLOPE	0.33	2.87**	0.39	2.60**
RS	0.04	0.73	-0.02	-0.45
Adjusted R ₂	0.7363		0.7632	
F value	217.9		248.3	
Prob. F	0.0001		0.0001	
Sample size	156		255	

** Significant at the 1 percent level.

* Significant at the 5 percent level.

consistent with the flight to quality hypothesis and can be viewed as secondary evidence that debt insurance is not a valid signal of bond quality.

An additional test examines the relationship between bond default risk and maturity. Previous results show that bond interest costs are positively related to bond maturity (MAT). The interest cost difference between insured Baa and single-A issues, as indicated by the SINGLEA estimates in Table 3, may be biased by the intrinsic maturity differences between the two groups. Therefore, the interest cost difference between Baa and single-A insured bonds for each of the 5-, 10-, 15-, and 20-year maturities, is examined using bond reoffer yields for each maturity as the dependent variable. Due to missing reoffer yield data for some issues in the sample, a total of only 402 bonds is included in this test. Also, as bond maturity increases, the sample size decreases, reflecting the exclusion of shorter-term bond issues.

The results are reported in Table 5, where for brevity only the estimated coefficients for SINGLEA are presented. The default risk premia for Baa insured bonds are consistently higher than that for single-A insured issues, ranging from 22 to 27 basis points, and are all statistically significant. In short, the evidence in Table 5 reinforces the previous findings that investors differentiate insured bonds by their intrinsic credit quality. Hence, debt insurance should not be viewed as a valid signal of bond quality.

Table 5
Interest Cost Differences Between Single-A
and Baa Insured Bonds of Various Maturities
(Reoffer Yield as the Dependent Variable)

Regression Equation	Bond Maturity	Estimated Coefficient on SINGLEA [†]	Summary Statistics		
			N	R ²	F-value
(5.1)	5 years	-0.22(-2.71)	402	0.844	296.5
(5.2)	10 years	-0.24(-2.99)	373	0.825	277.3
(5.3)	15 years	-0.25(-3.13)	319	0.788	254.7
(5.4)	20 years	-0.27(-2.84)	241	0.752	236.6

[†] t-values are in parentheses.

Conclusions

This article examines the existence of signaling equilibrium in the municipal bond market where the purchase of bond insurance coverage has been suggested by some researchers as a signal of debt issues credit quality. Because all insured municipal bonds receive complete insurance coverage, a pooling equilibrium exists only if all insured bonds garner the same level of interest yield that reflects the default probability of the insurer. The empirical results of the current study show no evidence that a pooling equilibrium exists.

Holding the default probability of the insurer constant, the findings of the current study suggest that even for insured bond issues, their intrinsic default probability is still priced in the market. This is because bond insurance only reimburses investors in case of bond default. It does not prevent the default from taking place. It is reasonable to argue that investors are still concerned about the costs associated with default by original borrowers. These costs may include the costs of filing a claim, possible delays in receiving payments, and the decrease in marketability of defaulted insured bonds. These expected costs will be higher, the higher the default probability of original borrowers.

In summary, it is doubtful that the purchase of bond insurance generates signaling benefits to municipal borrowers. The positive net interest savings from the purchase of bond insurance as found by some previous studies, therefore, should not be attributed to the signaling effect of debt insurance. Future research on the sources of net insurance benefit needs to be focused on other possible factors such as imperfections in the financial markets and competition among private insurers.

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