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Municipal Bond Pricing and the New York City Fiscal Crisis

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ABSTRACT

This paper's findings suggests that the New York City fiscal crisis by itself did not lead to a fundamental change in risk perceptions of investors, resulting in higher interest rates in the municipal bond market. The monthly prediction errors generated by time series tests were relatively small and none were statistically significant. Only the signs on the prediction errors for June, July, and August were consistent with a New York City effect. Thus, if the New York City default had an impact on aggregate interest rates, it was at most small and of short duration.

A GREAT DEAL OF controversy has arisen in recent years over the impact of the New York City default upon the municipal bond market. During 1975, municipal borrowing costs rose to historically high levels, with most issues carrying their highest interest cost during the summer of 1975. It was during this period that New York City experienced the worst of its 15-year history of financial problems. While most observers argue that the problems of New York City represent a special case of fiscal mismanagement, many conclude that the high market rates of interest in the municipal bond market were caused by the New York City default. Research by Forbes and Peterson [3] and Gramlich [5] supports the latter contention. In addition, others contend that the impact of the default was not just temporary, but was felt long after 1975 [8]. These contentions, if true, have significant policy implications. Not only do they suggest that all municipalities suffered immediate as well as long-term higher interest cost due to the fiscal irresponsibility of New York City, but they are important arguments for the provision of federal aid to prevent the failures of other large municipalities or corporate entities.[1]

The purpose of this paper is to examine whether the New York City default by itself caused risk perceptions of investors to change, resulting in higher interest rates to other municipal borrowers. The hypothesis is tested by applying a random coefficients model to aggregate time series interest rate data. The major finding of the study is that there is little evidence consistent with the hypothesis that the New York City crisis had a fundamental or long-lasting impact on municipal borrowing costs. This paper is organized as follows. Section I describes how the New York City fiscal crisis may have raised municipal borrowing costs.

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[1] For a summary of the Congressional debate concerning Federal assistance to New York, see the *Congressional Quarterly-Weekly Report* (1978), pp. 545–50 and 1435–9.

This theory provides the framework for the empirical tests in Section II. Section III summarizes and concludes the paper.

I. Information Content of the Crisis

In an efficient market dominated by risk-averse, wealth-maximizing investors, the New York City fiscal crisis could have raised interest rates either by affecting cash flows of other issuers or by providing information to investors about the risk of municipal issues. Since it is unlikely that the New York City crisis altered the cash flows of other municipalities, we focus on the information content of the crisis. There are three reasons why the New York City default may have provided unanticipated information.

First, investors must estimate the probability of default by using, at least, the revenue and expenditure data provided by the issuer. While it was widely acknowledged at the time that municipal accounting data were not as accurate as corporate accounting information, it is possible that the New York crisis may have provided new information about the reliability of municipal accounting data. The accounting practices of New York were certainly "news" in the popular sense and the flexibility that officials are legally allowed may not have been previously recognized by investors.[2] Second, the New York City incident may have provided information about the complex legal and political difficulties of enforcing municipal bond contracts. As Hempel [6] argues, enforcing such contracts is difficult because municipal assets often do not have market values and courts are reluctant to allow the confiscation of substantial portions of the revenues or assets of a city. Also, the ability of New York City to obtain a "moratorium" on interest and principal payments illustrates the problem creditors face working in a legal system subject to enormous political pressures.[3] Finally, the crisis may have provided information about the probability of federal intervention. Prior to the crisis, investors may have assumed that the Federal government would simply not let a large municipality "fail." The unwillingness of the Ford Administration to come to the rescue of New York City until very late in the crisis may have altered the beliefs of investors. In sum, the above reasons may have provided the market with information which raised the risk perceived by investors in the municipal bond market and, thus, increased municipal interest rates.

II. Macroeconomic Tests

The model employed to control for variation in the municipal bond interest rate is based on the exemption of municipal bond interest payments from federal income taxes. An investor will be indifferent between two bonds which are identical in all respects except for their tax status if the return on the tax-exempt bond R_m is equal to the aftertax return on the taxable bond:

$$R_m = (1 - t)R_c \qquad (1)$$

[2] Auletta [1] provides a detailed description of New York City's accounting practices. The reporting problems were so pervasive, he suggests, that what went on during each year's budgetmaking was not very different from the activities which jailed eight officials of the Franklin National Bank.

[3] In November 1975, New York City lowered interest payments and stopped payment on principal on $1.6 billion of notes. Called a "moratorium" by city officials, it took two years for the courts to rule the action illegal.

where t is the marginal tax rate paid by the investor on the taxable return R_c. This relationship has been the subject of numerous empirical and some theoretical investigations (e.g., see [9, 10]). Empirical studies of condition (1) ordinarily compare new issue municipal interest rates with new issue taxable interest rates of the same maturity and credit rating. Such comparisons reveal that the marginal tax rate in Equation (1) is not constant. Furthermore, the implied marginal tax rate consistently falls as maturity increases. Several explanations have been advanced for these findings which rest mainly on the preference of commercial banks for short-term municipal bonds. However, there may be a simpler explanation; credit ratings may not adequately control for risk when different types of bonds are compared and municipal bonds may be more risky than corporate bonds of the same credit rating. As was discussed previously, municipal financial statements may be suspect, bondholder agreements may be expensive (if not impossible) to enforce, and the goals of municipal government are certainly not clear. To take account of this risk, Equation (1) should be rewritten,

$$R_m - \lambda = (1 - t)R_c \tag{2}$$

where λ is the "differential municipal risk premium" which exists when credit ratings are used to control for risk. Furthermore, λ is the measure of the factors which the New York City crisis may have influenced.[4]

The Model

The relationship given in Equation (2) cannot be treated as a standard regression equation because λ may not be constant. As argued, the municipal differential risk premium is compensation for bearing risk which will likely vary over time.[5] To allow λ to vary, we employ the Cooley-Prescott time series model [2]. For our application the model is

$$R_{mt} = \lambda_t + \beta R_{ct}, \qquad t = 1, \cdots, T \tag{3}$$

where R_{mt} and R_{ct} are the tax-exempt and taxable yields at time t; λ_t is the price of differential municipal risk at time t; and β is one minus the tax-rate. Both yields are affected by a variety of influences and it is assumed that some of the influences may persist while some may not, making the parameter subject to both permanent and transitory influences. To estimate λ_t, it is assumed that

$$\lambda_t = \lambda_t^p + u_t \qquad t = 1, \cdots, T \tag{4}$$

$$\lambda_t^p = \lambda_{t-1}^p + v_t \qquad t = 1, \cdots, T \tag{5}$$

where p denotes the permanent component of the parameter. The u_t and v_t are identically and independently distributed normal variates with mean zero and variance given by

$$\mathrm{var}(u_t) = (1 - \gamma)\sigma^2 \quad \text{and} \quad \mathrm{var}(v_t) = \gamma\sigma^2 \tag{6}$$

[4] The existence of this risk-premium explains the fact that marginal tax rates consistently fall as maturity rises. The factors which give rise to λ are better predicted in the short run than in the long run. Thus, investors may require the risk-premiums to be larger on long-term than short-term bonds. It is rising risk-premiums and not falling tax rates which are evident as term to maturity increases.

[5] Van Horne [12] outlines the studies which argue that risk premiums based on bond ratings vary with the business cycle.

where $0 \leq \gamma \leq 1$. Equation (4) specifies that λ_t is the sum of a purely random or "transient" component (u_t) and a "permanent" factor (λ_t^P) which follows a random walk given by Equation (5). The specifications of the variances given by the equations in (6) allows the model to represent any intercept variation between two polar cases: (1) when $\gamma = 0$, the model is identical to the standard regression model because the variance of v_t is zero and, thus, the permanent component will not vary; and (2) when $\gamma = 1$, the movement in λ_t is entirely due to the permanent component and, thus, the intercept follows a random walk.

There are $T + 3$ parameters of the model to estimate: β, γ, σ^2, and λ_j^P ($j = 1, \cdots, T$). The permanent component can be estimated by solving Equations (4) and (5) for the λ_j^P in terms of the remaining coefficients, and then substituting this solution into Equation (3) which can be estimated by ordinary least squares. The sample path of the intercept can be obtained by repeating the procedure for each component. Cooley and Prescott [2] suggest a maximum likelihood technique for estimating β, γ, and σ^2.

To test for a New York City effect, we first estimate β, γ, and σ^2 using data before the crisis. We next use Equations (4) and (5) to predict λ_{T+K}^P where T is the last month before the crisis. Finally, we use the predicted λ_{T+K}^P in Equation (3) to predict the municipal rate in months $T + 1$, $T + 2$, $\cdots$, changing the permanent component with each prediction of the municipal rate. If the New York City crisis had an effect, the model should systematically underpredict the tax-exempt yield during the period. Since the slope coefficient is fixed, any underprediction will be due to the inability of the model to adequately forecast the intercept. Thus, the test is measuring the impact of the New York City crisis on the differential municipal risk premium which is exactly where any changes in investor's preceptions of risk should be evident.

The Findings

To test whether the New York City fiscal crisis had an effect on average municipal interest rates, Equation (3) is estimated using monthly new-issue data for municipal and corporate bonds collected from the Salomon Brothers' *An Analytical Record of Yields and Yield Spreads*. The two interest rate series were matched on maturity and bond rating. Salomon Brothers classifies municipal interest series by bond ratings using the categories of "Prime," "Good," and "Medium." These categories were matched with corporate interest rates of similar maturities rated "Aaa," "Aa," and "A," respectively.[6] For example, the 30-year "Prime" municipal rate was paired with the long-term "Aaa" utility rate. The maturities used were dictated by the availability of the data. To ensure as complete a test as possible, corporate utility, rail, and industrial interest rates series were used. This resulted in fourteen pairs of matched interest rates which were used to estimate the model. The resulting equations were used to test the New York City hypothesis.[7]

[6] This was done because of information provided by the Salomon Brothers' organization indicating that, for example, a "Good" grade municipal yield is more similar to an "Aa" grade corporate yield than an "A" rated yield. Nevertheless, if "Good" grade municipals are matched with "A" grade corporates and so on, the results do not change substantially.

[7] The following fourteen pairs of monthly interest rates were used to predict 1975 municipal bond interest rates. N is the number of observations. Each series ends in January 1975. For $N = 61$ the

Previous studies by Forbes and Peterson [3] and Gramlich [5] reported that New York City's default caused municipal interest rates to rise from the second quarter of 1975 and that the largest impact occurred in the third quarter. Both studies ended their testing in September 1975. The third quarter impact is reasonable because it was in July that the Municipal Assistance Corporation offered its first $1 billion issue. The difficulties in selling the issue indicated that by July investors were aware of the problems of New York City. Thus, if the New York crisis revealed information about other issuers, the time this was most likely to occur was during the months of June through August of 1975. Nevertheless, to allow for the possibility of an informational effect before June, the period chosen for the study is February through September 1975. Equation (3) is thus fitted, when data are available, for the period January 1970 through January 1975.

Table I reports the results of estimating the parameters of the fourteen equations. The value of "I" reported is the number of estimated intercepts insignificantly different from zero at the 5 percent probability level. The results support the contention that ratings do not adequately control for risk. The average intercept is positive and most are significantly different from zero. Furthermore, the estimates of gamma are all significant, indicating that the intercepts follow a random walk.[8] Thus, the model is appropriate for tests of the New York hypothesis.

Table II summarizes the results of computing monthly prediction errors (actual-predicted) based on the predicted intercepts and estimated municipal rate for our fourteen equations. None of the errors are significant at the 5 percent level.[9]

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series begins in January 1970. Other series have fewer observations because some interest rate series begin after January 1970.

Municipal	Corporate	N	Municipal	Corporate	N
30 year Prime	Long Aaa Utility	61	30 year Prime	Long Aaa Industrial	53
20 year Prime	Long Aaa Utility	61	20 year Prime	Long Aaa Industrial	53
30 year Good	Long Aaa Utility	61	30 year Good	Long Aa Industrial	61
20 year Good	Long Aa Utility	61	20 year Good	Long Aa Industrial	61
10 year Good	10 year Aa Utility	59	30 year Medium	Long A Industrial	53
5 year Good	5 year Aa Railroad	61	20 year Medium	Long A Industrial	53
30 year Medium	Long A Utility	53			
20 year Medium	Long A Utility	53			

Source: Salomon Brothers' *An Analytical Record of Yields and Yield Spreads*

[8] Note that the slope coefficients average 0.496, indicating a marginal tax rate of 0.506 and most coefficients are not significantly different from the corporate income tax rate of 48 percent. The implications of these results for the Miller theory are developed in Trzcinka [11].

[9] The significance of the errors may be tested by the following t-statistic [2],

$$t = \frac{\hat{R}_{mt} - R_{mt}}{\hat{\sigma}_g[1 + x_t'(X'\,\Omega_g^{-1}X)^{-1}x_t]^{1/2}}$$

where: $\hat{R}_{mt}$, R_{mt}, = the predicted and actual value of the dependent variable; $\hat{\sigma}_g$ = the estimate of residual variance given that the estimate of gamma is g; X = the matrix of observations from periods $1, \cdots, T$.; x_t = the vector of observations from period i, $(i > T)$; and Ω_g = covariance matrix. The right-hand column of Table I gives the number of significant errors assuming that the demoninator takes the smallest value that it theoretically can, σ_g. Thus, $\pm 1.67\hat{\sigma}$ is the smallest theoretically possible 5 percent confidence interval. The actual 5 percent confidence interval is considerably larger since the actual denominator is larger.

Table I

Estimates of Parameters in the Random Intercept Model[a]

$$R_{mt} = \lambda_t + \beta R_{ct}$$

R_m	$\bar{\lambda}$	I	$\hat{\beta}$	R_c	$\hat{\gamma}$	$\hat{\sigma}$	N
1. 30 year Prime	1.73%	0	0.49 (6.8)	Long Aaa Utility	0.67 (3.7)	0.189	72
2. 20 year Prime	1.32	6	0.54 (7.4)	Long Aaa Utility	0.63 (3.6)	0.192	72
3. 30 year Prime	2.02	0	0.45 (4.8)	Long Aaa Industrial	0.60 (3.2)	0.193	64
4. 20 year Prime	1.09	28	0.55 (5.8)	Long Aaa Industrial	0.56 (3.1)	0.196	64
5. 30 year Good	1.86	0	0.48 (6.5)	Long Aa Utility	0.28 (2.2)	0.224	72
6. 20 year Good	1.46	11	0.53 (7.9)	Long Aa Utility	0.52 (2.9)	0.194	72
7. 10 year Good	0.85	29	0.52 (7.5)	10 year Aa Utility	0.59 (3.7)	0.209	70
8. 5 year Good	0.12	66	0.56 (6.7)	5 year Aa Railroad	0.41 (3.0)	0.239	72
9. 30 year Good	1.58	10	0.54 (5.6)	Long Aa Industrial	0.26 (2.2)	0.210	72
10. 20 year Good	1.21	51	0.60 (6.6)	Long Aa Industrial	0.47 (2.6)	0.207	72
11. 30 year Medium	3.04	0	0.35 (5.2)	Long A Utility	0.57 (3.4)	0.196	64
12. 20 year Medium	2.19	0	0.41 (6.0)	Long A Utility	0.39 (2.4)	0.193	64
13. 30 year Medium	2.38	0	0.44 (5.4)	Long A Industrial	0.58 (3.4)	0.193	64
14. 20 year Medium	2.16	0	0.48 (5.4)	Long A Industrial	0.44 (2.6)	0.198	64

[a] R_{mt} is the municipal interest rate at time t;
R_{ct} is the corporate interest rate at time t;
$\bar{\lambda}$ is the average estimated intercept;
I is the number of insignificant estimated intercepts (5 percent level);
$\hat{\beta}$, $\hat{\gamma}$, $\hat{\sigma}$, are estimates of β, γ, and σ;
N is the number of observations;
All parentheses contain t-statistics.

Ignoring the insignificance of the forecasts, only the months of June, July, and August have prediction errors which are consistent with the New York City hypothesis. In each of these months, the majority of the fourteen equations underpredict the observed interest rate, but the errors are very small with only four in July and one in August being larger than 1.67 times their standard errors. The mean errors clearly become smaller after July and by September the model overpredicts in eleven out of fourteen equations. Thus, the only evidence that is consistent with the hypothesis is the pattern of positive prediction errors and the distribution of the size of the errors, both of which suggest a New York City effect beginning in June and ending in August. Thus, it appears that the New

Table II

Summary of Forecast Errors (Actual-Predicted) from Random Intercept Model during the 1975 New York City Fiscal Crisis

	Forecast Error (%)			Number of Positive	Number of errors[a]
Month	Mean	Largest	Smallest	Errors	$>1.67\hat{\sigma}$
February	−.0148	.1734	−.2913	5	0
March	.0957	.2754	−.0813	9	0
April	−.1018	.1745	−.3160	3	0
May	−.1202	.3236	−.2876	2	0
June	.1152	.3745	−.1577	12	0
July	.2799	.4491	.0077	14	4
August	.0933	.2798	−.1266	8	1
September	−.0554	.2067	−.2340	3	0

[a] All errors greater than $1.67\hat{\sigma}$ are positive but none are significant.

York City fiscal crisis had little influence on the general level of municipal interest rates.[10]

The findings are at odds with the Gramlich and Forbes-Peterson studies which report large prediction errors in the months of June to September 1975, with the largest errors occurring in August and September. In the Forbes and Peterson study, all of the residuals in these months are more than twice the standard error of the equation while Gramlich reports errors as large as five times the standard error. Both studies conclude that New York had a significant and growing influence on municipal interest rates beginning in the second quarter and lasting through September.

The discrepancy between our results and those of previous studies is very likely due to: (1) the nonstationarity in the interest rate data; and (2) the assumption that credit ratings hold risk constant between corporate and municipal bonds. First, a structural shift in interest rates has been documented by Gibson [4] who argued that the low interest rates before 1965 cannot be pooled with the higher and more volatile interest rates which followed that year (also see [7]). The break in the mid-1960s corresponds to the period when inflation expectations began forming more rapidly. Both the Gramlich and Forbes-Peterson studies use interest rate series beginning before 1960 to estimate regression equations. These estimated equations are then used to predict municipal interest rates during 1975. It is likely that predictions are biased downward because the regression coefficients are too low (in absolute value) as a result of the structural change in interest rates. Finally, the results of Table I show that credit ratings do not necessarily hold risk constant between corporate and municipal bonds. Failure to take this volatility into account could also bias the results of previous work.

[10] The Salomon Brothers' data may include the interest rates paid on New York City's debt. To eliminate this bias, microeconomic data were used to construct a set of average interest rates with all New York City and New York State bond issues eliminated. Using this new series, the results were virtually the same.

III. Summary

The evidence generated in this paper suggests that the New York City fiscal crisis by itself did not lead to a fundamental or long-lasting change in risk perceptions of investors that resulted in higher interest rates in the municipal bond market. It appears that the information conveyed to investors by the fiscal crisis was either not "news" in the sense of being unanticipated, or did not substantially change the market's perception of the risk associated with municipal bonds. The monthly prediction errors generated by the time series tests were relatively small and none were statistically different from zero. Only the signs on the prediction errors for the months of June, July, and August are consistent with a New York City effect hypothesis. Thus, if the New York City default had an impact on aggregate interest rates, it was at most small and of short duration.

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