

# **The GLTD:GCA Ratio: A Tool for Public Financial Management**

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## **Abstract**

This paper investigates the ratio of general long-term debt to general capital assets' influence on municipal credit ratings – signals of risk to investors – and coupon rates. Given current uncertainty levels in credit markets, it is paramount that low risk be signaled to sell debt and maintain the lowest possible debt costs for municipalities. It has been found that the GLTD:GCA ratio significantly influences credit ratings, but not coupon rates. Because this research and prior studies indicate that credit ratings affect coupon rates, findings suggest that management should explore using this ratio as a metric for municipal financial condition. It also shows that unrestricted cash and cash equivalents, the ratio of bonded debt outstanding to taxable assessed valuation, and local economic conditions are significant factors for both points of interest. By monitoring these variables and developing strategies to control and influence them, favorable credit ratings will be obtained leading to lower coupon rates and debt service requirements. The expected end result is increased available funds for critical public services.

## **Introduction**

Due to the limited availability of cash to finance large capital projects, debt issuance is essential to government operation. As governments issue debt, various costs are incurred with the most significant being the debt service costs required for repayment. Debt issued for general purposes in the form of general obligation bonds is repaid from general tax revenues thus drawing on public funding streams and impacting requisite tax rates. A sample of thirteen

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metropolitan and consolidated governments revealed that, on average, municipalities are dedicating approximately nine percent, or \$113 million, of their 2007 annual operating budgets for debt service. It is critical that finance managers minimize borrowing costs. For this minimization to occur there must be a method to analyze the variables contributing to borrowing costs. Implicit in this is the rating on debt issues assigned by the following credit rating agencies. These ratings indicate the relative financial risk assumed by bondholders. This risk is seemingly higher now given uncertainty in national credit markets thus making ratings more important. Assuming that investors are risk averse, they will require higher interest rates on riskier bonds to compensate them for the increased loss probability. By understanding credit rating and coupon rate determinants, public financial managers may develop strategies to enhance their respective governments' financial positions and ultimately reduce debt service burdens.

One method of monitoring financial risk is the use of debt ratios. Three commonly-used ratios exist in public finance: debt service payments to total operating expenditures; outstanding debt per capita; and outstanding debt to assessed valuation. Absent from this sequence is a measure of government's independent collateral and ability to support debt with current assets. This paper explores such a measure, the ratio of general long-term debt (GLTD) to general capital assets (GCA), and determines whether or not it is a significant predictor of borrowing costs, credit ratings, or both. Should this value prove to be significant, then it may be used to show if a government has adequate capital to support its debt.

This research benefits numerous stakeholders. For analysts, it may serve as a measure of government default risk. The public could use this information to hold government finance officials accountable for their management of public funds and asset accumulation. Further,

comparable municipalities may utilize the ratio and the remainder of the analysis to better influence debt management policies and thereby reduce borrowing costs. This will ultimately allow them to utilize the previously restricted dollars for other purposes.

### **Review of Literature**

Financial ratios and indicators have widely been used to monitor overall financial position with the ratio of total debt to total assets determined by financial analysts to be the second most significant debt ratio for private sector finance (Gibson, 1987). Private entities are permitted to freely use assets largely as managers and shareholders see fit. In government finance, assets are restricted based on funding source; those held in enterprise or special purpose funds, for example, may not be used for general government operations. This study has limited its scope to general long-term debt held in the form of general obligation debt and general capital assets, those held for general purposes. Therefore, the ratio of general long-term debt to general capital assets (GLTD:GCA) is assumed to be a comparable measure to that used in corporate finance and is the topic of key interest. The proposed GLTD:GCA ratio does not appear in any of the literature surveyed by the author.

In addition to the GLTD:GCA ratio, other factors known to contribute to interest rates and credit ratings must be analyzed. Previous studies have been surveyed to determine which factors to include. Rubinfeld (1973) and Capeci (1991) both illustrate the importance of credit ratings in determining the cost of borrowing. Rubinfeld notes an increase of 34 basis points in borrowing costs being attributable to a downgrade from an Aaa rating to a Baa rating; Capeci shows a decline of 115 basis points for an upgrade from Baa to Aaa.<sup>2</sup> Therefore, it is essential that financial managers understand factors contributing to ratings since investors are using ratings to make decisions.

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<sup>2</sup> A basis point is defined as one one-hundredth of a percentage point.

Moody's, the oldest and most conservative of the major rating agencies, proclaims that municipal ratings are a function of four primary areas: the local economy, debt, financial condition, and administrative/managerial strategies (Moody's, 2007). Specific determinants and characteristics of each area are not provided, however. Wagner (2004) addresses the economic assessment issue for state governments by using three variables: unemployment rate, real per capita personal income, and state general fund surplus. Each of these regressors is found to be statistically significant.

The second general area outlined by Moody's, debt, is of primary consideration. This category embodies nominal debt levels and financial policies regarding debt administration practices. Vogt (1996) summarizes three standard debt measures: the ratio of debt service payments to total operating expenditures; outstanding debt per capita; and the ratio of outstanding debt to appraised valuation. Johnson and Kriz (2005), Rubinfeld (1973), and Wagner (2004) show that public sector debt ratios are influential factors in predicting credit ratings and coupon rates. Although none of the researchers evaluated the ratio of debt outstanding to appraised valuation, this measure is clearly relevant as it is the only one of the commonly used metrics that appears frequently in statutory debt provisions.

The third component, finances, has been monitored over time by multiple factors and ratios; one significant measure has been cash flows. Cash flows figure into the debt conversation because dollars remaining following the payment of current liabilities are available to fund capital projects, service debt, or other priorities. These dollars are regarded as free cash flows (FCF). Thus, as indicated by Bush (2005), cash flow forecasting is essential. These forecasts thereby influence credit ratings and borrowing costs by presenting evidence regarding an entity's ability to meet its obligations and its capacity to accumulate additional long-term obligations.

However, Mills et al (2002) illustrate the riskiness of using free cash flow analysis due to uncertainty regarding its definition. No studies were found that address the role of free cash flows in government operation, or their definition.

The final major category considered by Moody's is administrative and managerial strategies. O'Toole and Meier (1999) show that management is important in public organizations as it influences organizational performance by altering system structure and developing strategies to address environmental threats and opportunities. However, no studies have been found addressing managerial strategies in public finance.

Beyond Moody's explicit criteria, researchers have identified fiscal instruments that influence credit ratings and coupon rates. Hsueh and Chandy (1989) examined the yield spread between insured and uninsured municipal debt and discovered that insurance is a significant factor in coupon rate determination. Nanda and Singh (2004) later found that insurance is more beneficial for long-term bond issues than short-term issues; general obligation bonds are typically issued with long maturities.

Beyond insurance, Johnson and Kriz (2005) examined a comprehensive listing of financial controls, or fiscal institutions, and their influence on the bond market. They determined that balanced budget requirements and spending limits positively influence credit ratings. Further, they found that debt restrictions have an inverse impact on ratings and popular vote requirements are insignificant. Johnson and Kriz (2005) also quantitatively demonstrated that interest costs are lowered indirectly by increasing credit ratings.

Wagner (2004) further contributed to the body of knowledge with his examination of budget stabilization funds (BSF's) and the political environment unique to each state. He notes that states realized a 9.5 basis point reduction in long-term tax exempt bond yields after

instituting a BSF policy or law. This evidence also shows that states with Democratic control of both the legislature and governorship pay more to borrow possibly due to investors' fear of government obligations increasing under Democratic leadership.

### **Empirical Methodology**

When studying municipal credit ratings, it is useful to determine which variables contribute most to attaining the highest possible rating for each bond issue. An ordered logit model will be generated to estimate the cumulative probability of obtaining each of the following credit ratings: Baa; A; Aa; Aaa. This is beneficial because the ratings are inclusive of their subordinates; that is, a rating of "A" encompasses a rating of "A2" and "Baa" as well. This method was utilized by Johnson and Kriz (2005) for a similar study. TABLE 1 outlines each variable included in the credit ratings model and the applicable data sources. Of the independent variables included, all but three are pulled directly from the literature: the GLTD:GCA ratio; cash and cash equivalents; and administrative and managerial strategies. Unrestricted cash and cash equivalents at year-end (hereafter referred to as "cash") serves as a proxy for free cash flows because this amount is unencumbered as of the reporting date. Administrative and managerial strategies reflect historic approaches to tight fiscal and environmental conditions. This measure is inherently qualitative. For modeling purposes, a dummy variable reflecting changes in senior financial leadership will serve as a proxy.<sup>3</sup> It is necessary to lag six variables one full time period (equating to one fiscal year): the GLTD:GCA ratio; cash and cash equivalents; debt outstanding per capita; change in state gross domestic product; change in local unemployment; and the change in local per capita income. The ratio and cash values, because they are acquired from annually presented comprehensive annual financial reports (CAFR's),

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<sup>3</sup> Senior financial leaders include directors or commissioners of finance, budget officers, treasurers, and chief accountants, or comparable persons. Within the model, a "1" is entered if there is a change in leadership.

must be lagged. Those measures used to assess local economic conditions are also lagged as they are released on an annual basis as well.

**TABLE 1**  
**Variables Used in the Analysis**  
**Model One: Credit Ratings**

Variable	Description	Source
GLTD:GCA	Ratio of General Long-Term Debt to General Capital Assets	Manual computation utilizing data from municipal CAFRs
ΔSGDP	Change in State Gross Domestic Product	Bureau of Economic Analysis
ΔLUNEM	Change in Local Unemployment Rate	Bureau of Labor Statistics
ΔLPCI	Change in Local Per Capita Income	Bureau of Economic Analysis
BDEBTOUT	Bonded Debt Outstanding Per Capita	Municipal CAFRs
BDEBTASSVAL	Bonded Debt Outstanding to Assessed Valuation	Municipal CAFRs
CASH	Cash and Cash Equivalents for general government and proprietary type funds at fiscal year end	Manual summation utilizing data from municipal CAFRs
ΔFINLEADERS	Change in financial leadership	Municipal CAFRs and communications with city personnel
DEFSPENDING	Deficit Spending permitted (1 = Yes; 0 = No)	Survey of city personnel
DEBTLIM	Legal limitation on debt amount (1 = Yes; 0 = No)	Survey of city personnel
PUBLICREF	Public referendum required for property tax increases (1 = Yes; 0 = No)	Survey of city personnel
STATEIDEO	State Political Ideology	Medoff (1997)
BSF	Budget Stabilization Fund required (1 = Yes; 0 = No)	Survey of city personnel

An ordinary multiple linear least squares regression model is used to estimate coupon rates. Some past researchers utilized an alternative method – two-stage least squares, or 2SLS (Wagner, 2004; Johnson and Kriz, 2005). Due to the variables selected and their covering each of the major areas of financial analysis, one may reasonably assert that all necessary variables have been included. Thus, there is no reason to believe that the third assumption of ordinary least squares (that the explanatory variables are uncorrelated with the error term) has been violated; this violation is commonly used to determine if 2SLS is the necessary procedure.

TABLE 2 details the variables included in Model Two and the applicable data sources. As with Model One, all but three variables were pulled from the literature and the same six

variables will be lagged. The other variables will either be determined simultaneously and immediately available for analysts and investors' use.

**TABLE 2**  
**Variables Used in the Analysis**  
**Model Two: Coupon Rates**

Variable	Description	Source
GLTD:GCA	Ratio of General Long-Term Debt to General Capital Assets	Manual computation utilizing data from municipal CAFRs
CRATING	Moody's credit rating assigned to a given G.O. debt issue series	Municipal CAFRs; Official Statements for bond issues; Moody's official website
CASH	Cash and Cash Equivalents for general government and proprietary type funds at	Manual summation utilizing data from municipal CAFRs
BDEBTOUT	Bonded Debt Outstanding Per Capita	Municipal CAFRs
BDEBTASSVAL	Bonded Debt Outstanding to Assessed Valuation	Municipal CAFRs
ΔSGDP	Change in State Gross Domestic Product	Bureau of Economic Analysis
ΔLUNEM	Change in Local Unemployment Rate	Bureau of Labor Statistics
ΔLPCI	Change in Local Per Capita Income	Bureau of Economic Analysis
BONDINS	Bond Insurance Utilized (1 = Yes; 0 = No)	Survey of city personnel
BSF	Budget Stabilization Fund in existence (1 =	Survey of city personnel
MBI	Municipal Bond Index Annual Value corresponding to issuance year	Lehman Brothers, Inc.

### Research Findings

Each model was determined to be a reliable estimation equation for the applicable dependent variable. Between the models, however, there are substantial differences regarding which independent variables are reliable and significant predictors for credit ratings and coupon rates. TABLE 3 displays the coefficient values within each model as well as overall model significance measures.

Model One, which estimates credit ratings, was found to be significant overall based on a chi square test. The policy variable, the GLTD:GCA ratio, was found to be statistically significant within the model. Thus, the GLTD:GCA figure is determined to contribute strongly to various assigned credit ratings. With each one percent increase in the ratio, a given



**TABLE 3<sup>4</sup>**  
**Regression Model Outputs**

	<u>MODEL ONE</u>	<u>MODEL TWO</u>	<u>MODEL THREE</u>
Estimation Technique:	Ordered Logit	OLS	OLS
Software:	SPSS	Eviews	Eviews
Dependent Variable:	Credit Ratings	Coupon Rates	Spread
<u>Threshold</u>			
Baa	-17.058* (3.281)	-	-
Aa	-11.756* (2.679)	-	-
Aaa	-2.466 (2.129)	-	-
<u>Independent Variables</u>			
C	- -	2.764* (1.144)	2.537* (1.085)
GLTD:GCA	0.024* (0.012)	1.77E-06 (9.84E-06)	0.004 (0.003)
DAaa	- -	0.358 (0.764)	-0.232 (0.765)
DAa	- -	-0.598 (0.778)	-0.714 (0.621)
DA	- -	-0.183 (0.756)	-0.651 (0.714)
Cash	2.55E-006* (0.000)	-1.97E-06* (2.76E-07)	-1.96E-06* (2.92E-07)
BDebtOut	1.64E-005 (0.000)	-0.0001 (0.0002)	-2.80E-06 (0.0002)
BDebtAssVal	-1.359* (0.331)	0.251* (0.061)	0.198* (0.051)
Δ SGDP	2.09E-005 (0.000)	-3.13E-05* (6.57E-06)	-2.95E-05* (6.65E-06)
Δ LUNEM	0.157 (0.411)	0.104 (0.147)	0.122 (0.149)
Δ LPCI	0.000	0.0004*	0.0004*

<sup>4</sup> Coefficients for Model One reflect logged values as computed in the logit estimation. TABLE 4 displays these figures converted to probabilities.

	(0.000)	(0.0001)	(0.0001)
Bondins	-	-0.305	-0.156
	-	(0.315)	(0.275)
Debtlim	-0.295*	-	-
	(0.061)		
Defspending	9.905*	-	-
	(2.517)		
BSF	-0.601*	-0.231	0.062
	(0.186)	(0.391)	(0.047)
Publicref	-1.020	-	-
	(1.198)		
MBI	-	0.371	-0.635*
	-	(0.225)	(0.239)
State Ideology	-0.100*	-	-
	(0.033)		
Δ Financial Leadership	-0.642	-	-
	(0.845)		
F-statistic	-	29.113	29.800
R <sup>2</sup>	0.736***	0.776	0.780
Adjusted R <sup>2</sup>	-	0.750	0.754

\* An (\*) Denotes significance at the .05 level.

\*\* Standard errors are in parenthesis.

\*\*\* Represents the Nagelkerke R<sup>2</sup> value.

municipality is 50.6 percent more likely to obtain the next highest credit rating (e.g., a rise from an "Aa" rating to an "Aaa" designation).<sup>5</sup> Additionally, cash and the ability to finance current operating expenditures with debt are both shown to positively contribute to credit rating improvement. The former is expected to be true as greater unrestricted cash amounts provide for more funds to be available for debt financing. However, the latter must be rejected on theoretical and practical grounds. Empirical research fails to validate such a coefficient sign and, practically, the option to use debt for operational funding encourages fiscal irresponsibility and spending beyond one's means.

<sup>5</sup> Appendix A contains a table displaying probability transformations from the initial ordered logit output.

Of the remaining independent variables, four are statistically significant: debt limit; budget stabilization fund requirements; state political ideology; and the ratio of outstanding debt to assessed valuation. All of the aforementioned variables are accompanied by negative coefficients indicating that the likelihood of improving one's credit rating declines as the values increase. In terms of policies, one can see that lower debt limits and required budget stabilization fund balances as a percent of total general fund budget are beneficial for municipalities. Furthermore, containing debt to lower percentages relative to total taxable assessed valuation figures is fiscally prudent and beneficial. Lastly, fiscal conservatism appears to be looked upon favorably by credit rating agencies; this is evidenced by the negative coefficient on the state ideology variable. Thus, regardless of political preferences and party patterns, in terms of public financial management, it is in municipal governments' best interest to act conservatively.

Like Model One, Model Two, which estimates coupon rates, is found to be significant and reliable as a predictor based on an F-test and 77.6 percent of total variation being explained by the model. This model shows the GLTD:GCA ratio as being statistically insignificant, unlike in the credit rating model. Credit ratings, contrary to prior research findings, are also shown to be insignificant factors. To delve deeper into both the policy variable and the credit ratings' insignificance, tests were conducted to see if the representation within the models cause the insignificance. When considered collectively, GCA's and GLTD are found to be jointly significant in coupon rate determination although the ratio of the two is not. The same is true of credit ratings. Therefore, it is reasonable to assume that ratings in and of themselves are not influential, but when viewed as a group and compared to other municipalities' ratings, they contribute to the interest rates earned.

While the credit rating dummy variables show statistical insignificance in disagreement

with previous studies, other variables in the model are generally consistent with other researchers' findings. The ratio of outstanding debt to assessed valuation and changes in state gross domestic product and local per capita income are all deemed to be significant and influential factors on observed coupon rates. As expected, improvements in the ratio and state GDP contribute to lower coupon rates and ergo to lower debt service costs. Unlike previous findings, however, the models generated within revealed that improvements in local per capita income result in higher coupon rates while local unemployment is statistically insignificant in all models. Each of these results requires further investigation to determine if the results are brought forth due to measurement methodologies or other factors. Finally, cash, the proxy for free cash flow, is found to be significant; higher cash stocks contribute to lower bond interest rates.

### **Conclusions**

Two models have been provided to determine what, if any, influence the ratio of general long-term debt to general capital assets has on metropolitan governments' bond credit ratings and coupon rates. These models also produced figures showing the degree of influence that other relevant factors have on the two aforementioned categories. The analysis reveals that the GLTD:GCA ratio is significant in determining credit ratings, but not in coupon rate assignments directly. Thus, it follows that GLTD and GCA levels should be monitored closely and controlled so as to aid in obtaining favorable ratings. These ratings should then yield lower debt service costs for metropolitan governments and ultimately allow funds to be appropriated for non-debt financing purposes. The ideal outcome is that additional public initiatives may be funded or increased funding designated to successful programs and those in need.

Further, higher levels of unrestricted cash and cash equivalents, the proxy for government free cash flow, are beneficial for metropolitan governments. These deposits guarantee that funding is available to finance operating expenses in the event of crisis or unforeseen circumstances. Budget stabilization fund requirements and debt limits follow a similar pattern; both are negative and significant in regard to credit rating determination. As the legally required levels rise, the likelihood of obtaining a higher rating declines. Additionally, it is shown that rating agencies favor fiscal conservatism. Therefore, public managers are encouraged to develop minimum general fund balance policies and to be conservative in their behavior.

Similarly, metropolitan governments should adopt policies that regulate changes in ratios of debt to assessed valuation. Increases in the ratio are found to be correlated with coupon rate increases, with a one percent increase in three Metro Nashville bond issues causing a debt service cost increase of \$559,368.<sup>6</sup> Finally, municipalities should continue funding economic development efforts when justified by solid benefit-cost analyses. These practices should reduce debt service costs and provide for more unrestricted public funds as local economic conditions improve.

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<sup>6</sup> This calculation assumes that each issue has 30 years to maturity; interest is payable semi-annually; that the issues will not be called, refunded, or retired prior to the initial maturity date; and that the interest rate is fixed.

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**Appendix A**

***Probability Estimates: Model One***

<b><u>Variable</u></b>	<b><u>Estimate</u></b>	<b><u>Probability Transformation</u></b>
<b><u>Threshold</u></b>		
Baa	-17.058	0.0000
Aa	-11.756	0.0000
Aaa	-2.466	0.0783
<b><u>Independent Variables</u></b>		
GLTD:GCA	0.024	0.5060
Cash	2.55E-006	0.5000
BDebtOut	1.64E-005	0.5000
BDebtAssVal	-1.359	0.2044
Δ SGDP	2.09E-005	0.5000
Δ LUNEM	0.157	0.5392
Δ LPCI	0.000	0.5000
Debtlim	-0.295	0.4268
Defspending	9.905	1.0000
BSF	-0.601	0.3541
Publicref	-1.020	0.2650
State Ideology	-0.100	0.4750
Δ Financial Leadership	-0.642	0.3448