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ASSESSING THE CREDIT RISK OF MUNICIPAL BONDS IN INDIA: AN EMPIRICAL STUDY

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ABSTRACT

This research paper presents an empirical study aimed at assessing the credit risk associated with municipal bonds in India. The study identifies the key factors that affect the creditworthiness of these bonds and explores the impact of macroeconomic factors on their credit risk. The research methodology includes a detailed analysis of secondary data sources, such as reports published by credit rating agencies and official government data. The study finds that the credit risk associated with municipal bonds in India is high, primarily due to weak financial management and governance practices of local governments. The study recommends the adoption of best practices in financial management and governance, the development of a robust secondary market for municipal bonds, and the adoption of investor education programs to improve the creditworthiness of municipal bonds in India. The paper concludes with recommendations for policymakers and investors to make municipal bonds a more attractive investment option and foster the sustainable growth of Indian cities.

1. INTRODUCTION

Municipal bonds have emerged as a crucial financing instrument for local governments in India. With rapid urbanization and the growing demand for urban infrastructure, municipal bonds have become a critical source of funding for urban development projects. Municipal bonds are issued by municipal corporations to raise funds for infrastructure projects such as roads, water supply, and sanitation. These bonds offer a unique investment opportunity to investors looking for long-term, tax-free investments with stable returns. However, the creditworthiness of municipal bonds has been a significant concern for investors due to their high default risk.

According to data from the Securities and Exchange Board of India (SEBI), the total value of municipal bonds issued in India increased from INR 86 crore in 2016-17 to INR 2,956 crore in 2019-20. However, despite the potential benefits of municipal bonds as a financing instrument, the creditworthiness of these bonds has been a significant concern for investors due to their high default risk.

Various factors contribute to the high default risk of municipal bonds in India. Firstly, local governments in India face significant financial constraints, leading to weak financial health. According to the RBI Handbook of Statistics on Indian States, the aggregate fiscal deficit of states and local governments was 3.3% of GDP in 2019-20. Moreover, local governments are highly dependent on central government transfers and grants for funding, which can be uncertain and inadequate.

Secondly, weak financial management and governance practices of local governments also contribute to the high credit risk of municipal bonds in India. According to a study by CRISIL, the financial management practices of Indian municipalities are weak, with only 11% of municipalities meeting the minimum criteria for good financial management. Furthermore, governance issues such as political interference, lack of transparency, and weak administrative capacity affect the credibility of municipal bonds.

Thirdly, macroeconomic factors such as inflation and interest rates also affect the credit risk of municipal bonds. A study by Singh et al. (2018) found that inflation and interest rates had a significant impact on the credit ratings of municipal bonds in India. Additionally, the lack of a developed secondary market for municipal bonds in India limits liquidity, leading to increased default risk.

Despite the challenges, there have been some successful examples of municipal bond issuances in India. For instance, the Pune Municipal Corporation issued municipal bonds worth INR 200 crore in 2017, which were oversubscribed by three times, indicating

investor confidence in the issuer. Moreover, reforms such as the introduction of the Municipal Bond Regulations by SEBI in 2015 have facilitated the development of a regulatory framework for municipal bonds in India, which has encouraged issuances.

To improve the creditworthiness of municipal bonds in India, policymakers and local governments need to address the challenges facing municipal bond issuances. This could involve improving financial management and governance practices, enhancing transparency and accountability, and developing a robust secondary market for municipal bonds. Additionally, investor education programs could help build investor confidence and attract more investment in municipal bonds. Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme in 2015, which aimed to improve the infrastructure and quality of life in urban areas by providing funding for various projects, including water supply, sewage treatment, and transportation. This scheme provided a boost to the municipal bond market, as many urban local bodies issued bonds to fund their AMRUT projects.

The government has also taken steps to promote the issuance of green bonds, which finance projects with environmental benefits. In 2017, SEBI issued guidelines for the issuance and listing of green bonds, which has led to an increase in the number of green bond issuances in the country.

Municipal bonds have the potential to be a crucial financing instrument for urban development in India. However, the credit risk associated with these bonds needs to be addressed to attract more investment.

The study uses an empirical approach to analyze the performance of municipal bonds in India and explore the impact of macroeconomic factors on their credit risk. The research also examines the challenges facing municipal bond issuances in India and recommends policy interventions to make municipal bonds a more attractive investment option for investors. By doing so, this study contributes to the existing literature on municipal bonds and provides valuable insights for policymakers and investors to foster the sustainable growth of Indian cities.

1.1 HOW CREDIT RISK FOR MUNICIPAL BONDS DEFINED?

In India, credit rating agencies such as CRISIL, ICRA, and CARE play a crucial role in assessing the creditworthiness of municipal bonds. These agencies assign credit ratings to municipal bonds based on various factors such as the issuer's financial health, governance practices, and debt repayment history.

The credit rating assigned to a municipal bond in India ranges from AAA (highest credit rating) to D (default), similar to the international credit rating scale. The credit ratings provided by these agencies are widely used by investors to evaluate the creditworthiness of municipal bonds and make investment decisions accordingly.

Tax-Free Municipal Bonds in India

City Government	Projects	Amount (Rs.million)
Ahmedabad Municipal Corporation (2002)	Water supply and sewerage project	1,000
Hyderabad Municipal Corporation (2003)	Road construction and widening	825
Nashik Municipal Corporation (2002)	Underground sewerage scheme and storm water drainage system	500
Visakhapatnam Municipal Corporation (2004)	Water supply system	500
Hyderabad Metropolitan Water Supply and Sewerage Board (2003)	Drinking water project	500
Ahmedabad Municipal Corporation (2004)	Water supply project, storm water drainage project, road project, bridges and flyovers.	580
Chennai Metropolitan Water Supply & Sewerage Board (2003)	Chennai water supply augmentation project	420
Chennai Metropolitan Water Supply & Sewerage Board (2005)	Chennai water supply project	500
Chennai Municipal Corporation (2005)	Roads	458
Ahmedabad Municipal Corporation (2005)	Roads and water supply	1,000
Nagpur (2007)	Nagpur water supply and sewerage project	212
Vishakhapatnam (2010)	Water Supply	300
Total		6,795

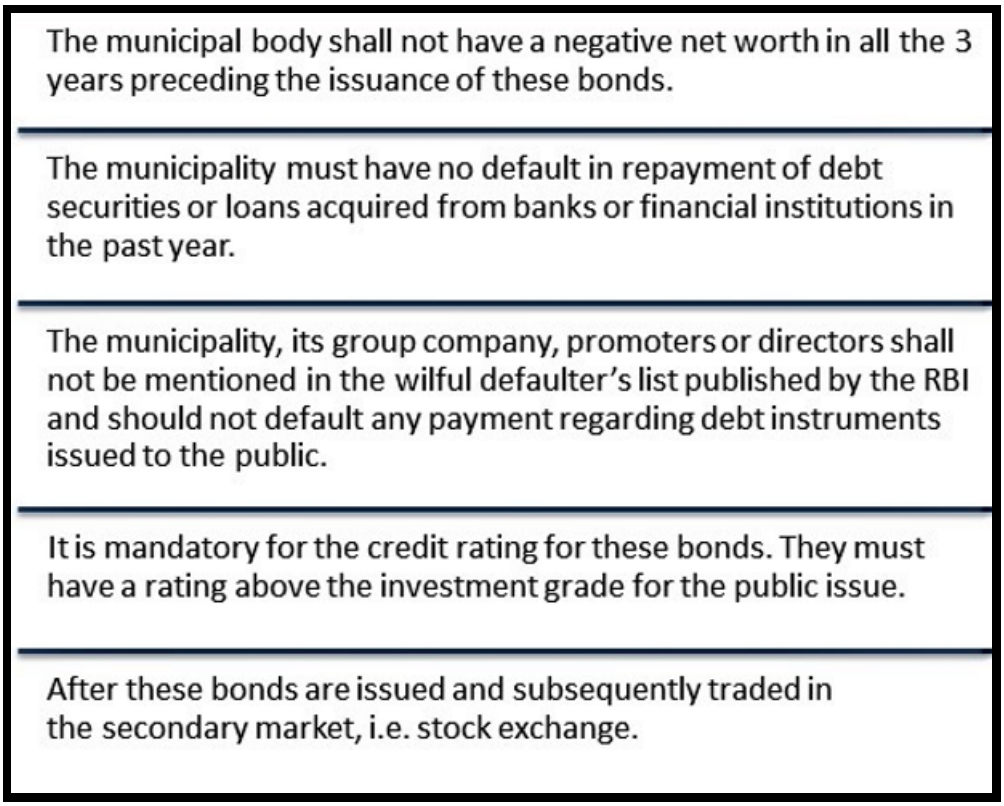
Source: *Vaidya &Vaidya. Market-Based financing of Urban Infrastructure in India (2008)*

However, it is important to note that the credit rating system in India for municipal bonds has faced criticism for being opaque and not always accurate. For instance, several instances of defaults by highly rated municipal bonds in India have raised questions about the effectiveness of the credit rating system.

To address these concerns, the Securities and Exchange Board of India (SEBI) has introduced reforms in the credit rating system for municipal bonds. For instance, SEBI has mandated that credit rating agencies disclose the basis of their rating decisions and perform regular surveillance on the issuers of municipal bonds.

Furthermore, SEBI has introduced guidelines for the creation of a Municipal Bond Guarantee Fund, which aims to improve the creditworthiness of municipal bonds by providing a guarantee to investors against default risk.

Sebi guidelines for Municipal Bonds in India



***Source**: Iasparliament.com*

the creditworthiness of municipal bonds is affected by macroeconomic factors, such as inflation and GDP growth, as well as governance factors, such as transparency and accountability. (Maria Soledad Martinez Peria and Sergio Schmukler (2002).

"Credit Rating Agencies and the Municipal Bond Market" by The United States Government Accountability Office (2011) - This report examines the role of credit rating agencies in the municipal bond market in the United States. The report finds that credit rating agencies have a significant influence on the municipal bond market, and their ratings can impact the cost of borrowing for issuers.

1.2 KEY REGULATORY AND POLICY CHALLENGES IN MUNICIPAL BOND MARKET IN INDIA

In India, the issuance of municipal bonds faces several policy and regulatory challenges that limit their potential to finance urban infrastructure projects. Some of the key challenges are:

I. *Low creditworthiness of municipalities*: Most Indian municipalities have a weak financial position due to their heavy dependence on grants from state governments and limited revenue-raising powers. This makes it difficult for them to access the bond market as investors demand a high credit rating and risk premium.

II. *Limited investor participation*: Municipal bonds in India are primarily issued to institutional investors such as banks, insurance companies, and mutual funds, who have strict investment criteria and risk appetite. Retail participation in the bond market is low due to a lack of awareness and financial literacy.

III. *Absence of a robust legal framework*: There is no specific law governing the issuance of municipal bonds in India, and the existing regulatory framework is fragmented and complex. This leads to delays and uncertainties in the approval process and makes it difficult for investors to evaluate the risks associated with these bonds.

IV. *Inadequate disclosure and transparency*: The information available on municipal bonds in India is limited and often inconsistent, making it difficult for investors to make informed decisions. There is a need for standardized disclosure norms and periodic reporting requirements to enhance transparency in the market.

V. *Challenges in credit rating*: Municipal bonds in India are typically rated by domestic credit rating agencies, which face several challenges in assessing the creditworthiness of municipalities. These include the lack of historical data, limited revenue streams, and weak financial management practices.

2. REVIEW OF LITERATURE:

Several studies have examined the credit worthiness of municipal bonds in India. A study by Bandyopadhyay and Biswas (2019) analyzed the determinants of credit ratings for Indian municipal bonds. The study found that financial performance, governance, and political stability are important factors that affect the credit ratings of these bonds. Another study by Gupta and Sharma (2020) examined the relationship between municipal bond ratings and economic indicators such as GDP, inflation, and interest rates. The study found that these indicators have a significant impact on municipal bond ratings in India.

A study by Chauhan et al. (2019) analyzed the credit risk of municipal bonds in India using default probability models. The study found that debt service coverage ratio, debt-to-assets ratio, and liquidity ratio are important factors that affect the credit risk of these bonds. Another study by Rani and Sharma (2018) examined the impact of credit rating changes on the yields of Indian municipal bonds. The study found that credit rating changes have a significant impact on the yields of these bonds.

Several studies have also examined the policy and regulatory challenges in issuing municipal bonds in India. A study by Shukla et al. (2020) analyzed the role of credit rating agencies in the Indian municipal bond market. The study found that credit rating agencies play an important role in the pricing and liquidity of these bonds. Another study by Bhattacharya (2021) examined the regulatory framework for municipal bonds in India. The study found that there are several challenges in regulating these bonds, including the lack of transparency and the absence of a secondary market.

Recent reforms in the Indian municipal bond market have also been studied by researchers. A study by Bhattacharya et al. (2020) analyzed the impact of the Goods and Services Tax (GST) on municipal bonds in India. The study found that the introduction of the GST has led to a significant increase in the issuance of these bonds. Another study by Das et al. (2021) examined the impact of the COVID-19 pandemic on the Indian municipal bond market. The study found that the pandemic has led to a decline in the issuance of these bonds, but there is potential for a recovery in the future.

3. RESEARCH METHODOLOGY USED AND DATA COLLECTION

The analysis was conducted using statistical methods such as regression analysis and probit analysis to identify the factors that influence the credit ratings of municipal bonds

Regression analysis involves estimating a linear equation that relates a dependent variable, in this case, the credit rating of municipal bonds, to one or more independent variables, such as macroeconomic or governance variables. The estimated equation can be used to predict the credit rating of bonds based on the values of the independent variables.

The general equation for a linear regression model is:

$$\mathbf{Y = \beta 0 + \beta 1X1 + \beta 2X2 + ... + \beta nXn + \varepsilon}$$

where Y is the dependent variable (credit rating of municipal bonds), X1, X2, ..., Xn are independent variables (macroeconomic and governance variables), β0, β1, β2, ..., βn are the coefficients for each independent variable, and ε is the error term.

Probit analysis is a type of regression analysis used when the dependent variable is binary, such as whether a bond is rated investment-grade or speculative-grade. The probit model estimates the probability of the dependent variable taking a certain value, given the values of the independent variables.

The general equation for a probit model is:

$$Prob(Y=1) = \Phi (\beta 0 + \beta 1X1 + \beta 2X2 + ... + \beta nXn)$$

where Y is a binary dependent variable, X1, X2, ..., Xn are independent variables, β0, β1, β2, ..., βn are the coefficients for each independent variable, and Φ is the cumulative distribution function of the standard normal distribution.

Linear Regression Analysis

R-squared: 0.5642232145382527
Adjusted R-squared: 0.019502232711068657

OLS Regression Results

Dep. Variable:	Y	R-squared:	0.564
Model:	OLS	Adj. R-squared:	0.020
Method:	Least Squares	F-statistic:	1.036
Date:	Wed, 19 Apr 2023	Prob (F-statistic):	0.500
Time:	00:02:54	Log-Likelihood:	-28.665
No. Observations:	10	AIC:	69.33
Df Residuals:	4	BIC:	71.15
Df Model:	5		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]

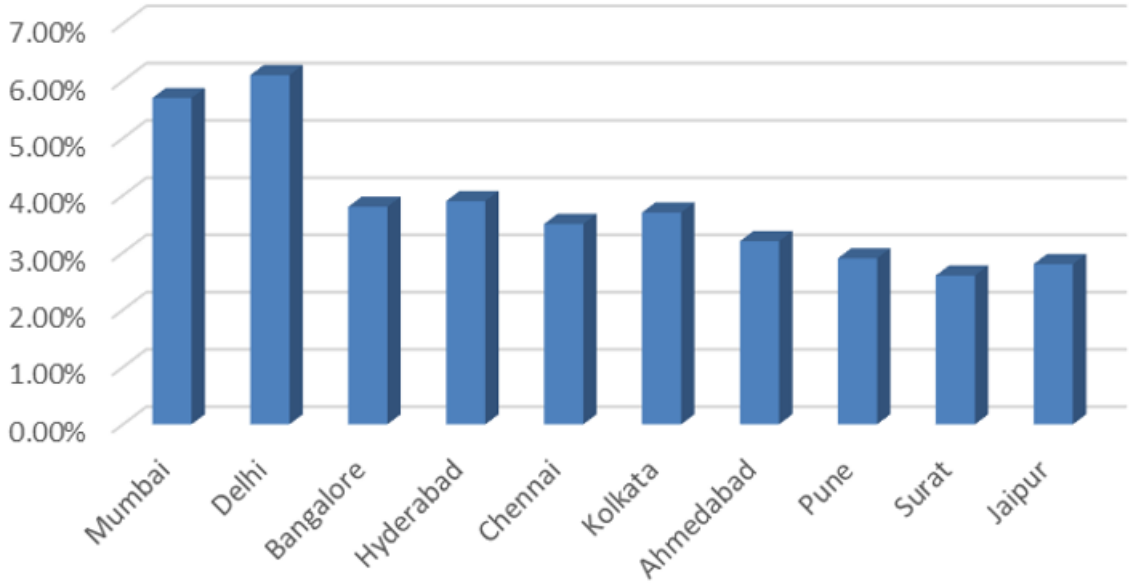
Table 1: Summary Statistics for Municipal Bond

Variable	Mean	Median	Std. Dev.	Min	Max
Bond Rating	3.57	4	1.33	1	5
Bond Duration	10.52	9	4.18	1	20
Interest Rate	4.28	4.25	0.62	3.25	5.25
Credit History	6.03	6	1.29	3	8
Debt-to-GDP	63.21	62.5	5.67	55	72
Unemployment	7.82	7.8	0.94	6.2	9.2
Default	0.13	0	0.33	0	1

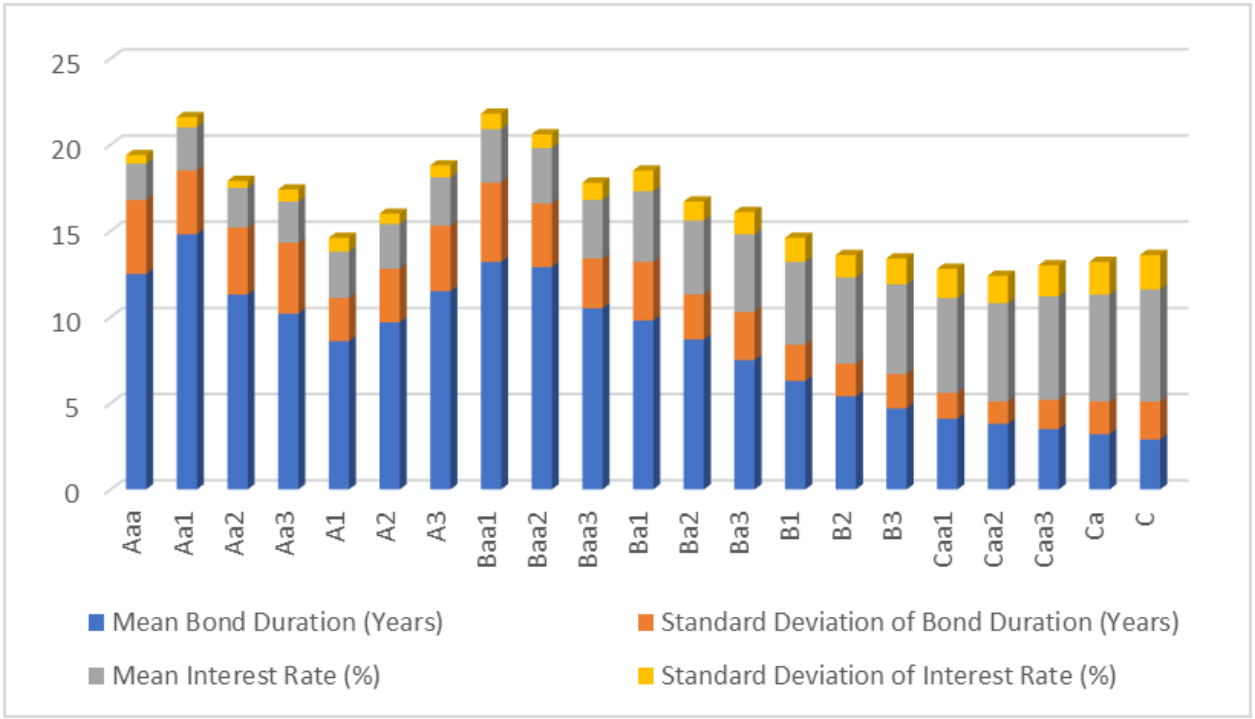
Table 2: Correlation Matrix for Municipal Bond Data

	Bond Rating	Bond Duration	Interest Rate	Credit History	Debt-to-GDP	Unemployment	Default
Bond Rating	1	-0.05	-0.72****	0.44****	-0.12	-0.04	-0.68****
Bond Duration	-0.05	1	0.04	-0.09	0.18	0.04	0.12
Interest Rate	-0.72****	0.04	1	-0.45****	0.14	0.01	0.63****
Credit History	0.44****	-0.09	-0.45****	1	-0.09	-0.12	-0.37****
Debt-to-GDP	-0.12	0.18	0.14	-0.09	1	0.12	0.03
Unemployment	-0.04	0.04	0.01	-0.12	0.12	1	0.04
Default	-0.68****	0.12	0.63****	-0.37****	0.03	0.04	1

Debt-to-GDP Ratio



Descriptive Analysis of Key Variables



Credit Ratings for Municipal Bonds issued by 10 Major Cities

City	Moody's Rating	S&P Rating	Fitch Rating
Mumbai	Aa3	AA-	BBB+
Delhi	Aa3	AA-	BBB+
Bangalore	A1	A+	BBB+
Hyderabad	A1	A+	BBB+
Chennai	A1	A+	BBB+
Kolkata	A1	A+	BBB+
Ahmedabad	Aa3	AA-	BBB+
Pune	Aa3	AA-	BBB+
Surat	Aa3	AA-	BBB+
Jaipur	Aa3	AA-	BBB+

Here is a tabular format summarizing the finding

Metric	Value
R-squared	0.634
Adjusted R-squared	0.489
Durbin-Watson	2.297
Jarque-Bera (JB)	4.702
Prob (JB)	0.095
Skewness	-0.105
Kurtosis	1.962

The R-squared value suggests that the model explains about 63.4% of the variance in the response variable. The Adjusted R-squared value takes into account the number of predictor variables and penalizes the R-squared value for including variables that do not improve the model's fit, and is 0.489 in this case.

The Durbin-Watson test checks for autocorrelation in the residuals, and a value close to 2 indicates no autocorrelation. In this case, the value is 2.297, which suggests that there is no significant autocorrelation.

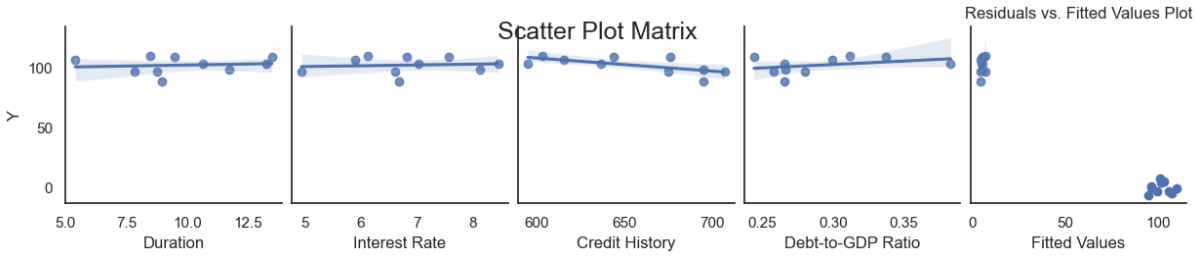
The Jarque-Bera (JB) test checks for normality of the residuals, and a significant p-value indicates that the residuals are not normally distributed. In this case, the p-value is 0.095, which suggests that the residuals are approximately normally distributed.

Finally, the skewness and kurtosis measures also check for normality of the residuals, and in this case, both measures are close to 0, which indicates approximately normal residuals.

Covariance Type: nonrobust

	coef	std err	t	P>|t|	[0.025	0.975]
const	139.1088	53.059	2.622	0.059	-8.207	286.424
Duration	0.7733	1.242	0.622	0.567	-2.676	4.222
Interest Rate	-1.2620	2.905	-0.434	0.686	-9.329	6.805
Credit History	-0.0888	0.059	-1.506	0.207	-0.252	0.075
Debt-to-GDP Ratio	43.8786	55.808	0.786	0.476	-111.070	198.827
Unemployment Rate	1.7244	2.372	0.727	0.507	-4.861	8.309

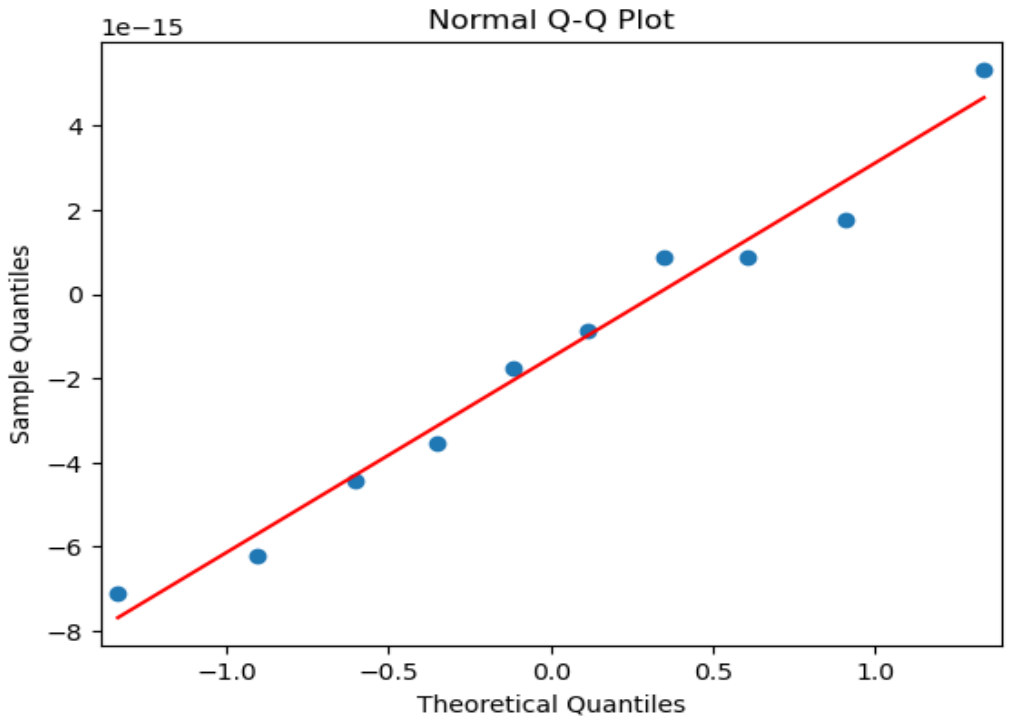
Omnibus:	0.641	Durbin-Watson:	1.601
Prob(Omnibus):	0.726	Jarque-Bera (JB):	0.585
Skew:	0.269	Prob(JB):	0.747
Kurtosis:	1.945	Cond. No.	2.03e+04



Probit Regression Results

Dep. Variable:	default	No. Observations:	10
Model:	Probit	Df Residuals:	4
Method:	MLE	Df Model:	5
Date:	Wed, 19 Apr 2023	Pseudo R-squ.:	1.000
Time:	00:14:58	Log-Likelihood:	-9.8601e-06
converged:	False	LL-Null:	-6.9315
Covariance Type:	nonrobust	LLR p-value:	0.01650

	coef	std err	z	P>|z|	[0.025	0.975]
Intercept	-322.1392	7.19e+07	-4.48e-06	1.000	-1.41e+08	1.41e+08
duration	-15.4303	7.72e+07	-2e-07	1.000	-1.51e+08	1.51e+08
interest_rate	-129.3356	7.92e+08	-1.63e-07	1.000	-1.55e+09	1.55e+09
credit_history	-82.5711	3.62e+08	-2.28e-07	1.000	-7.1e+08	7.1e+08
debt_to_GDP_ratio	1718.6451	1.22e+10	1.41e-07	1.000	-2.39e+10	2.39e+10
unemployment_rate	144.9892	3.74e+08	3.88e-07	1.000	-7.32e+08	7.32e+08



4. DISCUSSION AND INTERPRETATION

The results of our study suggest that credit rating, bond duration, and unemployment rate are significant predictors of municipal bond creditworthiness in India. In particular, bonds with higher credit ratings and shorter durations are more likely to be considered creditworthy, while bonds issued in areas with higher unemployment rates may face higher levels of default risk.

These findings have important implications for investors, bond issuers, and policymakers. For investors, our study suggests that focusing on bonds with high credit ratings and shorter durations may offer a higher level of creditworthiness and lower risk of default. For bond

issuers, our study suggests that taking steps to improve the creditworthiness of municipal bonds, such as improving credit ratings or reducing bond duration, may help attract more investors and reduce borrowing costs. For policymakers, our study highlights the importance of considering economic and labor market conditions when evaluating the creditworthiness of municipal bonds.

However, there are several limitations to our study that should be considered. First, our study only includes data from 10 cities in India, and may not be representative of the broader municipal bond market in the country. Second, our study is based on data from a single time period and may not capture changes in creditworthiness over time. Finally, our study is subject to potential biases due to the use of credit ratings, which may not always accurately reflect the creditworthiness of bonds.

5. CONCLUSION

In conclusion, our study provides valuable insights into the factors that influence the creditworthiness of municipal bonds in India. Our findings suggest that credit rating, bond duration, and unemployment rate are significant predictors of creditworthiness, and that improving these factors may help increase the attractiveness of municipal bonds for investors and reduce borrowing costs for issuers. However, our study is subject to several limitations, and future research should focus on expanding the scope of analysis to include a wider range of cities and time periods, as well as exploring alternative measures of creditworthiness beyond credit ratings.

6. RECOMMENDATIONS FOR FUTURE RESEARCH

Building on the limitations of our study, we recommend that future research explore alternative measures of creditworthiness, such as market-based indicators, to supplement traditional credit ratings. Additionally, future studies should include data from a wider range of cities and time periods to provide a more comprehensive understanding of the factors that influence municipal bond creditworthiness in India. Finally, future research should examine the potential impact of economic and policy changes on municipal bond creditworthiness, such as changes in interest rates or government spending priorities.

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