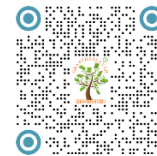


Original Article

EVALUATION OF STATISTICAL TRENDS OF THE COST OF DEBT CAPITAL IN INDIA FOR ENERGY AND INFRASTRUCTURE PROJECTS

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ABSTRACT

Debt financing is a core component of energy and infrastructure finance in most countries of the world and has direct impact on project valuation, feasibility, and profitability. This work analyses openly available data from the last one decade on the costs of debt finance in India, focusing on two major instrument classes - bank loans and debt securities like bonds issued over the last one decade. Bank loan rate data from the Reserve Bank of India from 2014 to 2025 show that loan interest rates have ranged from $8.75 \pm 1.33\%$ per annum to $11.18 \pm 0.88\%$ per annum, depending on type of bank considered, with private sector bank interests showing the highest range of values. The analysis of 10-, 15-, 30- and 40-year government bonds as a form of debt security shows that the annualized bond yields have been $7.25 \pm 0.80\%$, $7.36 \pm 0.60\%$, $7.43 \pm 0.55\%$ and $7.18 \pm 0.28\%$ respectively. Thus, in general, the bond yields have been lower than the bank lending rates. Comparison with 10-year bond yield data from 14 economies shows that developed economies have typically had bond yields much lower than that for India and other developing markets, indicating that infrastructure finance is costlier to access in developing nations where most infrastructure build out is needed to support their development objectives.

Keywords: Banks, Debt Finance, India, Interest Rate, Lending Rate, JEL Classification: C1, C8, E4, E5, G1, G2

INTRODUCTION

IMPORTANCE OF DEBT FINANCE AND LITERATURE REVIEW

Debt financing is a kind of fixed income financial mechanism. It represents a form of legally binding, contractual obligation between the debt issuer/lender and the receiver/borrower of debt capital. It forms an important part of the capital structure of most infrastructure projects including energy, road transportation, telecom, waterworks, railways, airports, etc. [Srivastava and Rajaraman \(2017\)](#). Debt typically is obtained in the form of loans by banks for various tenures or it is raised from capital markets in the form of bonds of various maturity durations [Bhole and Mahakud \(2017\)](#). Both the public sector and private sector seek recourse to debt financing for various kinds of infrastructure projects.

The importance of debt finance and the cost of debt can be clearly understood by noting the following aspects generally relevant to infrastructure finance:

- 1) For a rapidly growing economy like India, debt finance can be expected to be a crucial driver of its physical, energy and digital infrastructure building initiatives as it tries to attain a high level of development in the coming decades. This becomes even more important as project finance gains greater importance in infrastructure creation, especially for projects where public-

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private partnerships are envisaged. The total Indian debt capital market size has been estimated to be USD 2.6 trillion at the end of year 2024 [GoldenPi \(2025\)](#).

- 2) Past debt finance trends are often recommended in India as the basis for assuming debt financing costs for future projects, by looking at recent cost of debt figures (average bond yields or bank lending rates over a recent time frame, like last 6 months) and adding a premium (such as 200 or 250 basis points) to it. This is the approach taken for example, in the tariff calculation policies issued by the Central Electricity Regulatory Commission (CERC) for electric power projects [Central Electricity Regulatory Commission \(2024\)](#). These policies also often provide an indicative ratio of debt-to-equity finance to be used to derive the weighted average cost of capital (WACC) for the project to calculate life cycle financial figures like discounted cash flows, net present costs and levelized costs of products or services from the project. The WACC for a project is defined as

$$WACC = \frac{D}{D+E} (1 - t) \times k_D + \frac{E}{D+E} \times k_E \quad (1)$$

where, D and E refer to market values of debt and equity finance used in the project, t is the prevailing tax rate, and k_D and k_E are the costs of debt finance and equity finance, respectively.

- 3) Interest rates are also universally used as critical inputs for pricing risky financial instruments like equity through models like the capital asset pricing model i.e., CAPM, which uses the risk-free interest rate as the basis of understanding and quantifying the excess returns generated by the risky equity instrument [Damodaran \(2015\)](#) and financial derivatives like forwards, futures, swaps, and options, which are used for hedging financial risks [Hull and Basu \(2022\)](#).
- 4) Interest rates like repo rates and reverse repo rates are baseline figures of macroeconomic significance for a country. They are key instruments of monetary policy used by the central banks like Reserve Bank of India to influence economic growth, control inflation and ensure financial stability of the country – these interest rates directly affect the lending rates offered by banks at various times and the savings and consumption patterns of the people [Shetty \(2013\)](#).
- 5) In the context of climate change mitigation and adaptation and to support India's clean energy transition by build-out of sustainable, low carbon infrastructure across all sectors of the economy, debt capital is again a significant requirement, underscoring the need for understanding the cost of debt for these emerging projects (**climate finance report**). As many of the low carbon projects have high upfront capital investment requirements and low operating or marginal costs, the initial fixed capital cost and associated debt servicing form a large chunk of its life cycle cost – this is why the cost of debt assumes great significance for analysis of such projects and its actual successful implementation and operation. Most green finance instruments to provide capital to projects with environmental and social benefits are also essentially debt instruments, like green bonds [Bhattacharyya \(2022\)](#). It has been reported that Indian firms have issued about USD 10 million in green bonds in 2024 alone [GoldenPi \(2025\)](#). The cumulative issuance of green debt in India has been USD 55.9 billion, in the form of green, social, sustainability, and sustainability-linked debt, with energy and transport sector being the biggest beneficiaries of the use of proceeds of these instruments [Climate Bonds Initiative \(2025\)](#).

Previous academic research on debt financing cost trends in India have focused on aspects like the influence of financial reputation of a firm and the inverse relation with the cost of debt for it, using Indian firm level data [Kaur et al. \(2024\)](#). Sector wise cost of debt has been reported by agencies like [RBSA Advisors \(2020\)](#) for the pre-COVID 19 phase and the range is stated to be 6.2% to 11.7%, with consumer goods sector having the least and automobiles sector the highest cost of debt capital. [Rastogi and Rao \(2011\)](#) report that most infrastructure debt finance is raised in India in the form of bank loans and this has raised banks' exposure to infrastructure sector to 40%. They also argue that infrastructure loans are less risky than corporate loans due to more predictable cash flows from the projects. [Pratap and Aggarwal \(2021\)](#) discuss various forms of bank loans that are made available to Indian infrastructure projects and describe many of the policy measures of the Government of India to support the deployment of these projects in the context of national development. The sector-wise infrastructure funding allocation in India during the XI and XII plan period has been reviewed in a recent study and methods to breach the gap between demand and supply of infrastructure funds have been suggested [Agrawal \(2020\)](#). The need for long term debt markets for infrastructure finance has also been emphasized in another study [Garg et al. \(2024\)](#). Most of these studies address the importance of debt for infrastructure but do not specifically analyse cost of debt trends (especially recent data from India) for application to infrastructure projects analysis and valuation. This is the gap area which this study tries to address by providing data-driven statistical insights into this theme.

MOTIVATION AND STUDY OBJECTIVES

From an application point of view, an analysis of past data on the trends in cost of debt is crucial to formulate initial assumptions about the expected costs of debt and its variability or volatility for future projects when evaluating project feasibility and forming investment decisions. It is also essential for deriving the pricing of financial risk hedging instruments like options. This fundamental importance of interest rates in financial systems forms the motivation for carrying out this work. The objective is to report results

and insights drawn from interest rate data driven analysis for the purpose of applying them to the feasibility studies, particularly studies to account for uncertainties, on infrastructure projects in various sectors. This analysis must be specifically performed for each country because the debt costs are influenced by the broader macroeconomic conditions prevailing in the economy. It is also time frame sensitive – the dynamics of the cost of debt are ever changing in response to the overall economic environment. That is why market-based aggregate data of cost of debt finance over a decade-long time frame have been chosen for analysis in this work. The focus is not on interest rate forecasting, or proposing or testing economic or financial theories about interest rate evolution. The emphasis is on creating a review-cum-analysis based work, providing a ready compilation of debt cost data from multiple sources and the analysis in the form of a set of realistic reference figures of the applicable range of values, applicable to present day analysis. The work and its outcomes are intended to be used by analysts to establish project feasibility under different economic regimes or for researchers/academics to perform techno-commercial studies for various emerging technological solutions.

DATA SET DESCRIPTION

This work mainly focuses on openly available debt financing data for India over the period from February 2012 to present time, i.e., for a slightly longer time frame than the last one decade. This represents a time of varying economic conditions and business cycles, including phases of major economic shocks like that brought about by the COVID 19 pandemic. For banks, the average lending rates across a group of similar banks are taken as the indicator of the cost of debt. In case of the debt capital market, only medium to long term debt securities are included in the analysis, as short term or overnight debt securities are not relevant for the case of financing of large and long-term infrastructure projects (though they may have relevance in the operational phase of the project in the context of working capital finance and cash management and also in the estimation of the cost of equity). Instruments like debt mutual funds are also not considered in this work. For a comparison of the debt costs in India, data on 10-year bond yields from 14 other economies are also analysed. Table 1 shows the data types and data sets on cost of debt used for the assessments in this work.

Table 1

Table 1 Types and Sources of Debt Finance Data Considered in This Study	
Type of debt finance	Data type and source
Bank lending (bank group wise)	1) Monthly weighted average lending rates and 2) monthly marginal cost of funds-based lending rates (MCLR) for each bank group, which are derived from the Reserve Bank of India data portal (Link: https://www.rbi.org.in/rbi-sourcefiles/lendingrate/LendingRates.aspx#) 3) Monthly secured overnight financing rates (SOFR) for international borrowing by Indian firms, with data derived from Federal Reserve Economic Data (FRED) portal of the Federal Bank of St. Louis Database (Link: https://fred.stlouisfed.org/series/SOFR)
Government bond securities (issued in India and in 14 other economies)	Government bond yields over various maturity tenures like 10, 15, 30 and 40 years at monthly intervals, with data derived from online financial data portals like Investing.com (Link: https://www.investing.com/)
Corporate bonds, green bonds	1) Data available from SEBI (Link: https://www.sebi.gov.in/statistics/greenbonds.html) 2) Data available on NSE portal (Link: https://www.nseindia.com/products-services/indices-fixed-income-corporate-bond-indices) 3) Data available on India INX platform (Link: https://www.indiainx.com/static/gssustainablebonds.aspx)

The analytical tasks performed include interest/lending rate data visualization over time and in the form of statistical distributions, deriving the key statistical attributes of the distributions to quantify their expected values and the associated uncertainties, and performing their intercomparisons and correlation coefficient analyses.

RESULTS AND ANALYSIS

ANALYSIS OF BANK LENDING RATES IN INDIA

Figure 1 shows the time-dependent trends in lending rates on outstanding loans for 4 major groups of banks operating in India, while Figure 2 represents the same data set in the form of histograms for characterizing the key statistics of the lending rates data. Figure 3 and Figure 4 present the corresponding data for the case of fresh rupee loans issued in India over a similar time frame, while

Figure 5 and Figure 6 represent data for 1-year marginal cost of funds-based lending rates (MCLR) which is the minimum lending rate offered by a bank. This is thus an indicator of lowest bank lending rate available to finance a project. Table 2, Table 3, Table 4, Table 5, Table 6, and Table 7 present calculated values of key statistics from the original data sets for each type of lending, such as means, standard deviations and pair-wise linear correlation coefficients. Figure 7 shows the difference (in basis points) between the fresh loan lending rate and the outstanding loan lending rate at a given time for different bank groups. Figure 8 shows the trends in values of SOFR which is a benchmark rate related to the cost of overnight borrowing in the repurchase agreement markets of USA, secured by treasury securities. It is thus a measure of a risk-free interest rate in US markets. It is also used by Indian banks as an indicative rate for loans raised in foreign markets.

The major observations from the data analysis of bank lending rates in India are as follows:

- 1) General trends: Across all 4 major groups of banks operating in India, the lending rates over the last one decade have been $8.75 \pm 1.33\%$ per annum to $11.18 \pm 0.88\%$ per annum, for outstanding and fresh loans (it is to be noted that these data are not disaggregated by the loan repayment duration). The MCLR lies between $7.59 \pm 0.94\%$ per annum to $9.18 \pm 0.54\%$ per annum. Trends and periodic variations of lending rates are noted in all 4 groups; this clearly indicates the non-stationary nature of the bank lending rate data series.
- 2) Key statistics: Lending rates charged by the private sector banks show the highest average values out of all the 4 groups. The dispersion about the mean lending rate (i.e., the volatility in lending rates) is seen to be the highest for the foreign banks.
- 3) Correlations: The trends in interest rates across time show strong linear correlation among each pair of bank types, from 0.79 to 1.00 depending on bank pair and loan type. The difference between fresh and outstanding loan lending rates is negative for public sector, private and scheduled commercial banks from the September 2014 to July 2025 timeframe; but it does show positive values for the foreign banks in some specific months in this interval. This may be attributed to the influence of economic conditions in India as well as the home countries of these banks that decide the interest rate to be charged by them.
- 4) Distributional nature: The distribution of the interest rate values shows bi-modal or even tri-modal characteristics over the time frame of interest. Thus, they cannot be represented by unimodal distributions like Gaussian distributions. This may be interpreted as arising from the initially falling trend of interest rates up to December 2021, followed by a structural break in the data and the rising trend in the post-COVID 19 recovery period from January to June 2022 onwards. This has bifurcated the data into at least two sections or interest rate regimes, as seen from the distributions of Figure 2, Figure 4 and Figure 6.
- 5) Spread in MCLR: For MCLR, which is a benchmark interest rate for the whole economy, the average values are seen to be lower than that of the corresponding bank lending rates for all bank groups, with a lowest value of -240 basis points. Additionally, the highest spread between maximum and minimum MCLR is seen to occur for the scheduled commercial banks. However, MCLR is found to be much less volatile compared to the actual bank lending rates.
- 6) SOFR: These rates have shown substantial volatility over the period of analysis, lying in the broad range of $2.53 \pm 2.01\%$ per annum (with coefficient of variation being 79.4%). A rising trend existed in SOFR between April 2018 to July 2019 followed by a down ward trend till about February 2020. A sharp drop occurred due to the onset of economic disruptions and policy measures during COVID 19 pandemic, starting from March 2020. Rates remained almost stagnant at very low values till about May 2022, followed by a generally rising trend after that. Current rates are seen to be almost double that of the pre-COVID high values in early 2018.

Figure 1

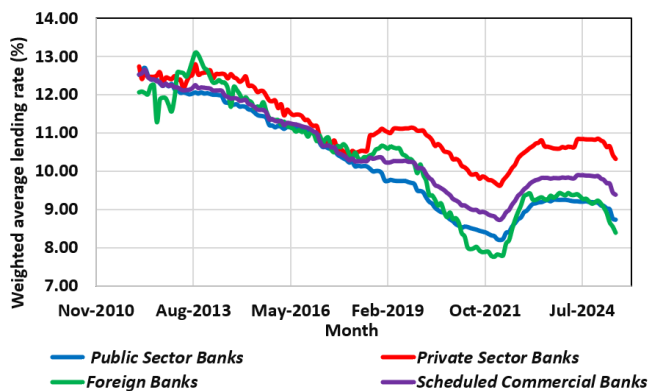


Figure 1 Bank Group Wise Weighted Average Lending Rate on Outstanding Rupee Loans (February 2012 – July 2025)

Figure 2

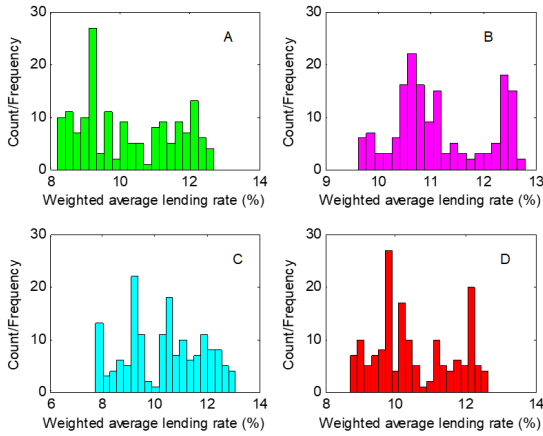


Figure 2 Distribution of Lending Rates on Outstanding Rupee Loans (A = Public Sector Banks, B = Private Sector Banks, C = Foreign Banks, D = Scheduled Commercial Banks)

Figure 3

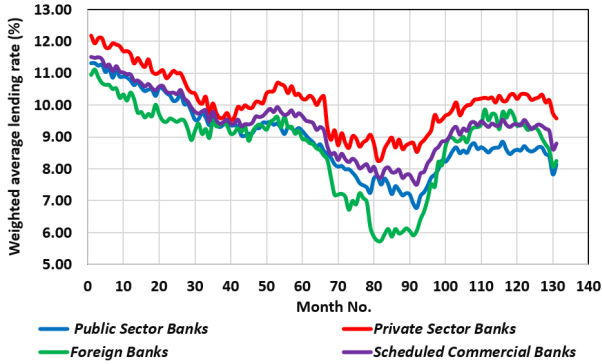


Figure 3 Bank Group Wise Weighted Average Lending Rate on Fresh Rupee Loans (September 2014 – July 2025)

Figure 4

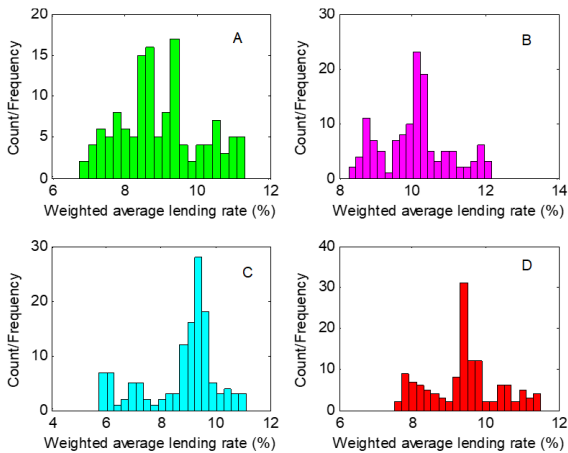


Figure 4 Distribution of Bank Lending Rates on Fresh Rupee Loans (A = Public Sector Banks, B = Private Sector Banks, C = Foreign Banks, D = Scheduled Commercial Banks)

Table 2

Table 2 Key statistics of bank lending rates on outstanding rupee loans

Parameter	Public sector banks	Private sector banks	Foreign banks	Scheduled commercial banks
Mean (%)	10.21	11.18	10.34	10.56
Standard deviation (%)	1.33	0.88	1.45	1.12
Coefficient of variation (%)	13.03	7.87	14.02	10.61

Table 3

Table 3 Pair-Wise Correlation Coefficients Between Bank Lending Rates on Outstanding Rupee Loans

Public sector – private sector = 0.94	Private sector – foreign = 0.94
Public sector – foreign = 0.97	Private sector – scheduled commercial = 0.97
Public sector – scheduled commercial = 0.99	Foreign – scheduled commercial = 0.97

Table 4

Table 4 Key statistics of bank lending rates on fresh rupee loans

Parameter	Public sector banks	Private sector banks	Foreign banks	Scheduled commercial banks
Mean (%)	8.98	10.08	8.75	9.41
Standard deviation (%)	1.12	0.92	1.33	0.97
Coefficient of variation (%)	12.47	9.12	15.2	10.31

Table 5

Table 5 Pair-Wise Correlation Coefficients Between Lending Rates on Fresh Rupee Loans

Public sector – private sector = 0.92	Private sector – foreign = 0.89
Public sector – foreign = 0.86	Private sector – scheduled commercial = 0.97
Public sector – scheduled commercial = 0.98	Foreign – scheduled commercial = 0.92

Figure 5

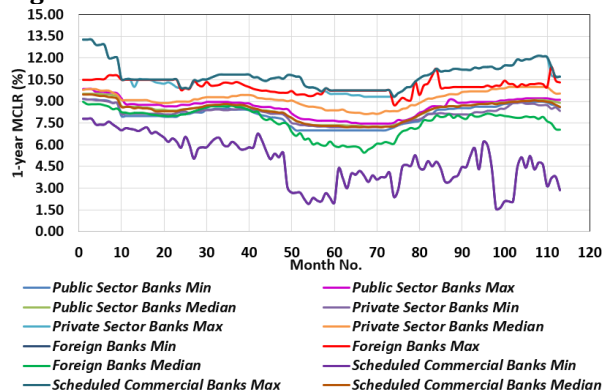


Figure 5 Bank Group Wise 1-year MCLR in India (April 2016 – August 2025)

Figure 6

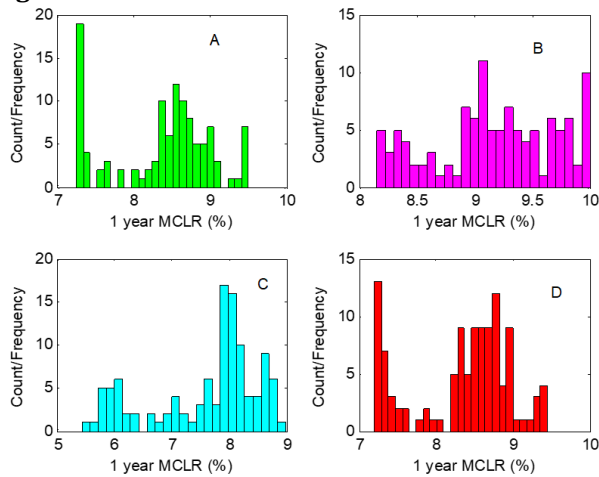


Figure 6 Distribution of Median Values of 1-year MCLR in India (A = Public Sector Banks, B = Private Sector Banks, C = Foreign Banks, D = Scheduled Commercial Banks)

Table 6

Table 6 Key Statistics of Median 1-Year MCLR in Various Banks of India

Parameter	Public sector banks	Private sector banks	Foreign banks	Scheduled commercial banks
Mean (%)	8.37	9.18	7.59	8.34
Standard deviation (%)	0.67	0.54	0.94	0.65
Coefficient of variation (%)	8	5.88	12.38	7.79

Table 7

Table 7 Pair-Wise Correlation Coefficients Between Median 1-Year MCLR in Various Banks of India

Public Sector – Private Sector = 0.93	Private Sector – Foreign = 0.77
Public sector – foreign = 0.89	Private sector - scheduled commercial = 0.93
Public Sector – Scheduled Commercial = 1.00	Foreign – Scheduled Commercial = 0.91

Figure 7

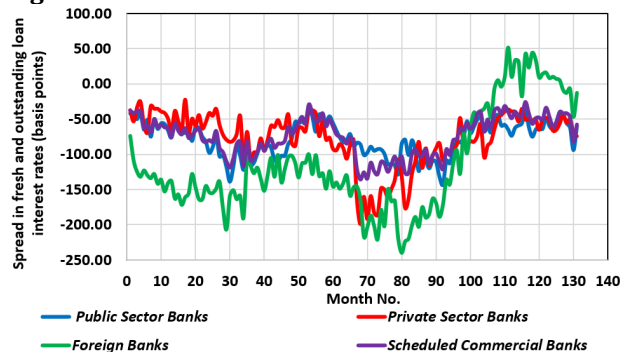
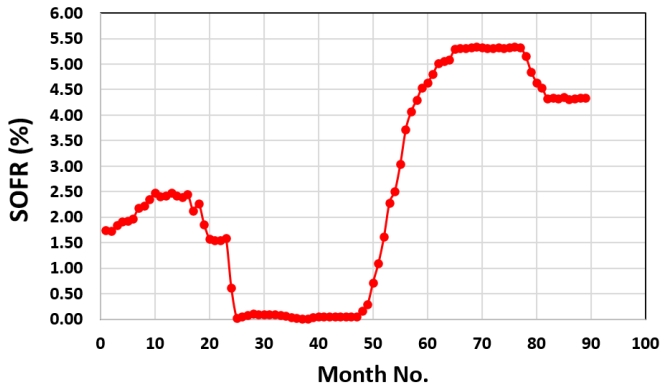


Figure 7 Bank Group-Wise Spread Between Fresh and Outstanding Loan Rates in India (September 2014 to July 2025)

Figure 8**Figure 8 Secured Overnight Financing Rates (SOFR) from April 2018 to July 2025**

ANALYSIS OF GOVERNMENT BOND SECURITIES IN INDIA

Figure 9 shows the time varying trends of yields of government bond securities with maturity time of 10, 15, 30 and 40 years. Figure 10 shows the histograms of the yield values for bonds of each of these tenures and Table 8a-Table 8b presents the key statistics of the distributions.

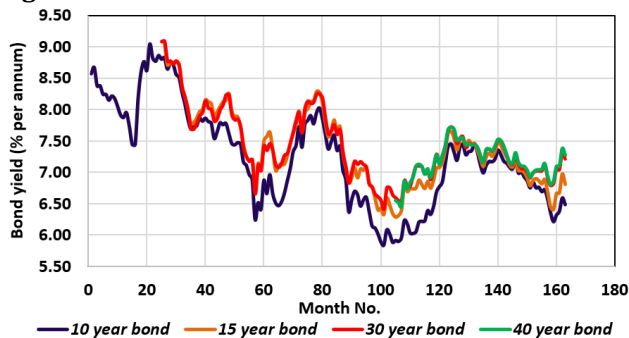
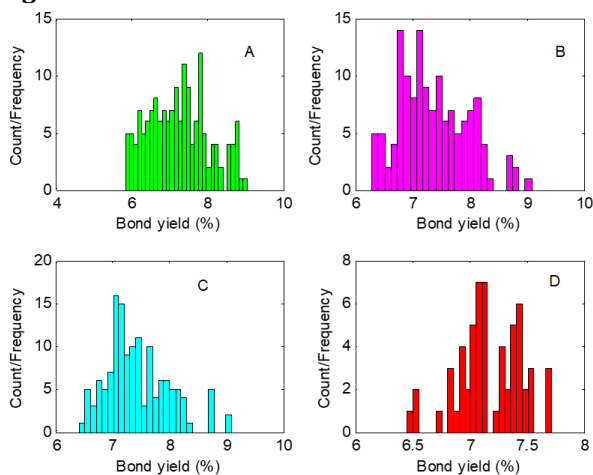
Figure 9**Figure 9 Government Bond Yields Over Various Maturity Tenures (Month 1 = April 2012)****Figure 10****Figure 10 Distributions of annualized government bond yields over various maturity tenures (A = 10-year bonds, B = 15-year bonds, C = 30-year bonds, D = 40-year bonds)**

Table 8

Table 8 Key statistics of government bond yields in India				
Parameter	10-year bond	15-year bond	30-year bond	40-year bond
Mean yield (% per annum)	7.25	7.36	7.43	7.18
Standard deviation (% per annum)	0.8	0.6	0.55	0.28
Coefficient of variation (%)	10.98	8.17	7.45	3.91

Table 9

Table 9 Pair-wise correlation coefficients between Indian government bond yields over various maturity tenures	
10 year – 15 year = 0.93	15 year – 30 year = 0.95
10 year – 30 year = 0.87	15 year – 40 year = 0.94
10 year – 40 year = 0.86	30 year – 40 year = 0.99

The general inferences drawn from the analysis of the government bond yield data of India are as follows:

- 1) A clearer cyclic component is seen in the bond yield values over time, compared with the bank lending rates.
- 2) The term structure of bond yield is seen in the form of increasing yield with increasing bond maturity duration progressively for the 10-, 15- and 30-year bonds. But the limited data for the 40-year bond do not support this structure.
- 3) The cost of debt is expected to be lower with bonds than with bank loans. This is significant from the point of view of long-term infrastructure asset creation.
- 4) The volatility in bond yields is also somewhat lower than that for bank lending rates, when volatility is defined by the coefficient of variation.
- 5) The bond yield distributions do not appear to be multi-modal, and they roughly approximate some form of symmetrical, unimodal distribution. Bond yields for bonds of different maturities are also quite highly positively correlated.

Figure 11 is a correlogram which shows the extent of linear correlation existing between lending rates and bond yields in India over the last few years (2020 to present, as data for the 40-year bond yield are available only for this time frame). It is seen that while lending rates from different bank groups or bonds of different durations (i.e., bank to bank correlation or bond-to-bond correlation) are highly correlated, they are poorly positively or even negatively correlated across one another i.e., for bond yield-bank lending rate data sets. This is quantitative empirical evidence of the typically inverse relation between interest rates and bond yields in an economy over a given time frame.

Figure 11

	10 year bond	15 year bond	30 year bond	40 year bond	Public Sector Banks	Private Sector Banks	Foreign Banks	Scheduled Commercial Banks
10 year bond	1.000	0.919	0.847	0.839	0.165	0.038	0.247	0.132
15 year bond	0.919	1.000	0.945	0.929	-0.140	-0.265	-0.040	-0.181
30 year bond	0.847	0.945	1.000	0.995	-0.200	-0.310	-0.156	-0.229
40 year bond	0.839	0.929	0.995	1.000	-0.181	-0.293	-0.150	-0.209
Public Sector Banks	0.165	-0.140	-0.200	-0.181	1.000	0.957	0.948	0.993
Private Sector Banks	0.038	-0.265	-0.310	-0.293	0.957	1.000	0.938	0.982
Foreign Banks	0.247	-0.040	-0.156	-0.150	0.948	0.938	1.000	0.950
Scheduled Commercial Banks	0.132	-0.181	-0.229	-0.209	0.993	0.982	0.950	1.000

Figure 11 Heatmap of linear correlation coefficients of costs of various debt financing mechanisms in India (based on data from November 2020 to July 2025)

A brief mention is also made of corporate bond yields in this section, based on the data available from the performance of corporate bond indices created by National Stock Exchange of India (NSE). Most corporate bonds have been issued by public sector units, statutory bodies, banks and government-owned non-banking financial corporations (as per data provided by SEBI at <https://www.sebi.gov.in/statistics/corporate-bonds/outstandingcorpbond-finnonfincorp-apr-2024.html>). In the recent times, the medium to long duration (i.e., 4 to 7 years maturity) and long duration (i.e., with 7 or more years to maturity) corporate bond yields (for the highest or AAA rated bonds, based on their credit risk profile) have been estimated to be 7.03 and 7.11 % per annum respectively on average (as of August 2025, data from https://www.niftyindices.com/Factsheet/Factsheet_NIFTY_AAA_Corporate_Bond_Indices.pdf). For the AA rated corporate bonds, the corresponding figures are reported to be 8.17 % and 8.86 % per annum. For AA+ rated corporate bonds, the values are 7.76 % and 9.15 % and for AA- rated bonds, the values are 10.43 % and 8.05 %, respectively. Thus, the corporate bond yields are somewhat higher but not drastically different from the yields of government bonds; government securities may therefore be used in financial analyses as the lower end of the benchmark cost of medium to long term debt derived from India's capital markets.

The Securities and Exchange Board of India (SEBI), which is the capital market regulator in the country has also provided some information on sustainable debt raised recently by specific corporate entities (mainly energy and infrastructure companies) in India in the form of green, sustainable and sustainability linked bonds (data available at <https://www.sebi.gov.in/statistics/greenbonds.html>). Sustainable debt issuance in India has reached over USD 55 million by the end of 2024 [Climate Bonds Initiative \(2025\)](#). The use of proceeds has been towards renewable energy, energy efficiency and clean mobility projects. As of end of August 2025, a total of 8203 crore has been raised; the tenures of these instruments are seen to lie between 1 and 10 years and the associated coupon rates are found to be between 6.35 % to 11.25 %.

COST OF DEBT FROM SPECIALIZED INFRASTRUCTURE FINANCING AGENCIES IN INDIA

Specific debt financing schemes (often in the forms of loans at concessional rates compared to prevailing bank rates for projects of similar size and risk profile) for various kinds of infrastructure projects are offered by specialized infrastructure and development finance organizations in India. The loan size may cover between 50 to 90% of the required investment, depending upon type of project and project developer. Project refinancing options are also provided by most such firms.

[Table 10](#) presents the most recently available data on the cost of debt offered by these agencies to various kinds of projects, gathered from the respective public websites of the organizations. These lending rates for loans are seen to lie in the range like that of bank lending rates discussed in Section 3.1.

Table 10

Table 10 Cost of Debt from Infrastructure Finance Organizations in India

Organization, URL	Cost of debt finance offered by organization
National Bank for Financing Infrastructure and Development (NABFID) https://www.nabfid.org/	Year 2022: 1 year lending rate = 7.75% Year 2023: 1 year lending rate = 7.80-8.00% Year 2024: 1/3/5-year lending rate = 8.00-8.20% Year 2025: 1 year lending rate = 7.75-8.15% 3-year lending rate = 7.90-8.15% 5-year lending rate = 8.05-8.15%
Indian Renewable Energy Development Agency Limited (IREDA) https://www.ireda.in/home	As of July 2025, long term loan rates to i) Central and state sector renewable energy project developers = 8.45-9.20% ii) Generation, transmission, and distribution companies = 8.45-10.25% iii) Private sector borrowers = 8.65-11.80% Short term and medium-term loan rates are 50 to 150 basis points higher than the corresponding long-term rates; Rates also vary depending on the credit rating of the borrowers and type of projects

Power Finance Corporation Limited (PFC) https://www.pfcindia.co.in/	As of May 2025, long term loan rates to
India Infrastructure Finance Company Limited (IIFCL) https://www.iifcl.in/BaseRate	i) Conventional power generation projects of the Central or State Government, including transmission, distribution, and pollution control systems, with A++, A+ or A ratings = 9.50-11% ii) Conventional power generation projects of private sector borrowers with IR-1, 2 or 3 ratings = 9.75-11.15% iii) Solar and wind energy projects = 8.95-9.70%, hydro/biomass/waste to energy projects = 50 basis points higher than that for solar or wind projects For Government firms with B, C, D ratings or private firms with IR-4 or IR-5 ratings, the corresponding rates are higher by 25, 50 or 75 basis points. These ratings are based on PFC's own internal assessment. Between 2019 and August 2025, the base rate has varied between 7.10% to 9.20%. The actual cost of lending is adjusted on a project-to-project basis, starting with this base rate.

COMPARATIVE ANALYSIS OF COSTS OF DEBT FINANCING IN INDIA WITH SOME OTHER ECONOMIES

Figure 12 shows representative data on 10-year government bond yield trends from selected developing and highly developed countries as a benchmark for the cost of debt in these countries. This bond yield figure is also often used as the risk-free rate in financial calculations; hence it is chosen as the benchmark for country-wise comparative analysis. Figure 13 shows the key statistics derived from these trends. The most important observations are as follows:

- 1) Bond yields in developing nations have typically been higher than those in the developed nations, in line with the differences in economic growth prospects and inflation expectations. However, this makes it more expensive to fund infrastructure projects through debt capital in these countries, even though infrastructure build-out is much more important to these emerging economies and their development aspirations.
- 2) ii) work, countries like Sri Lanka and Kazakhstan have shown very high bond yields due to recent economic crisis and instability, which is not conducive for infrastructure creation. The bond yields in Bangladesh and Indonesia have been of comparable magnitude to the range experienced in India over the same timeframe. For the other countries, the corresponding values are substantially higher or lower than the statistical averages for India.
- 3) Even though bond yields are lower, the volatility in bond yield over time (expressed by the coefficient of variation calculation) is seen to be greater for many of the developed nations than that seen in India over an identical time frame. This is based on the calculation of the coefficients of variation of bond yields for all the countries.

EVALUATION OF THE STOCK BOND CORRELATION IN INDIA

Stocks and bonds are typically expected to be two broad asset classes whose returns are negatively correlated over time Roncalli (2025). This forms the basis for diversification of financial portfolios. This veracity of this feature is tested for the case of India using 10-year Government bond yields as the proxy for the bond asset class and the values of Nifty 50 equity market index as the representative of the equity asset class. Daily data of bond yields and Nifty index values (derived from Investing.com) from January 2000 to May 2026 are used for this purpose (constituting about 6800 data points per asset). Rolling linear correlation coefficients over 25-day horizons are calculated between these two assets over the time frame from January 2000 to May 2026 and the results are shown in Figure 14, Figure 15, Figure 16, Figure 17.

It is seen that the rolling correlation between stock index returns and bond yields has been negative over certain time intervals, while it has been positive over other time blocks. The value ranges from -0.62 to +0.63. The number of occasions with positive correlations is almost similar to that with negative correlations, showing that over a given time horizon, it is equally likely to show a positive or negative correlation. Considering the entire time frame of analysis, the correlation coefficient is seen to be -0.226. The evolution of the rolling correlation coefficient values with time appears to be random; no trends are discernible and the dynamics follow a white noise process very closely.

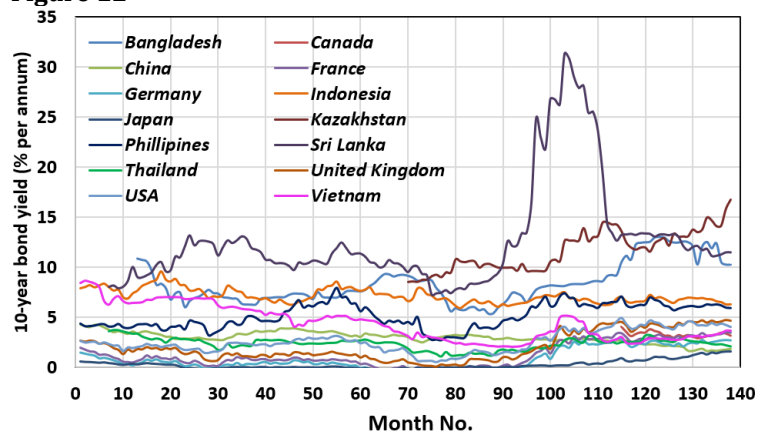
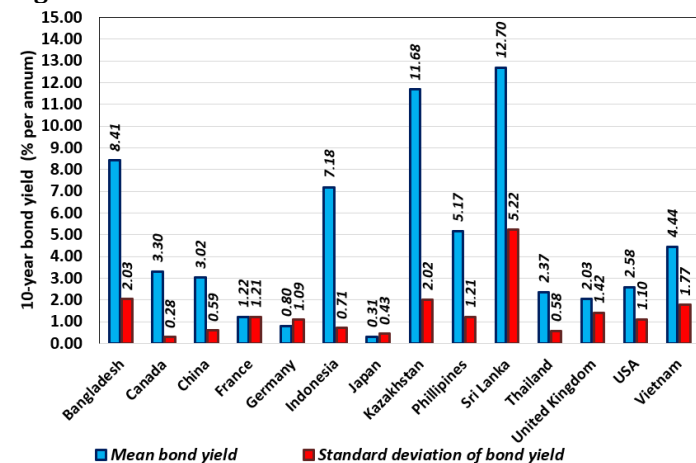
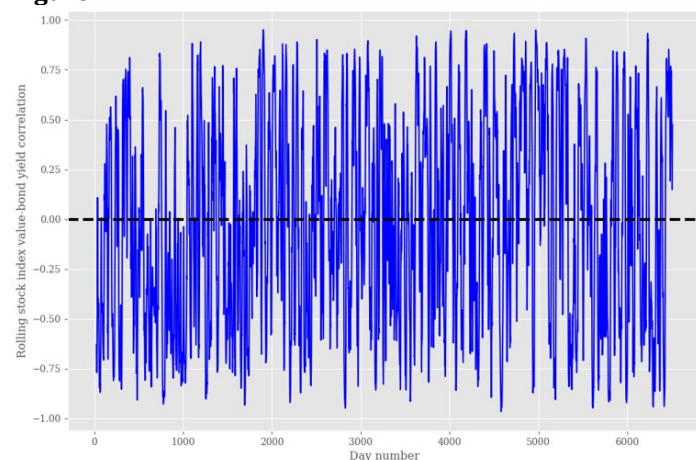
Figure 12

Figure 12 Trends of 10-year government bond yields in 14 economies (April 2014 to August 2025)
Figure 13

Figure 13 Key Statistics from the Distributions of 10-Year Government Bond Yields in 14 Economies (April 2014 to September 2025)
Figure 14

Figure 14 Rolling Stock Index-Bond Yield Correlation Coefficient in India (Jan 2000-May 2026)

Figure 15

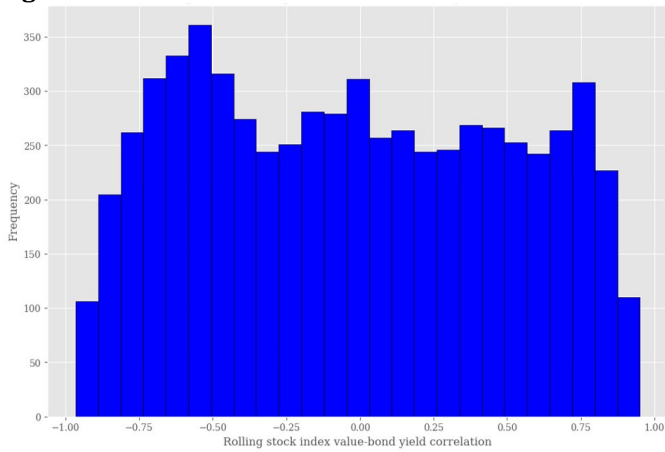


Figure 15 Histogram of Stock Index-Bond Yield Correlation Coefficient in India (Jan 2000-May 2026)

Figure 16

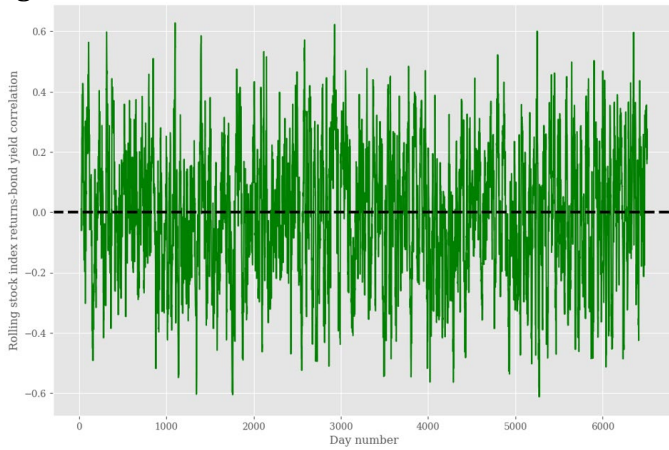


Figure 16 Rolling stock index returns-bond yield correlation coefficient in India (Jan 2000-May 2026)

Figure 17

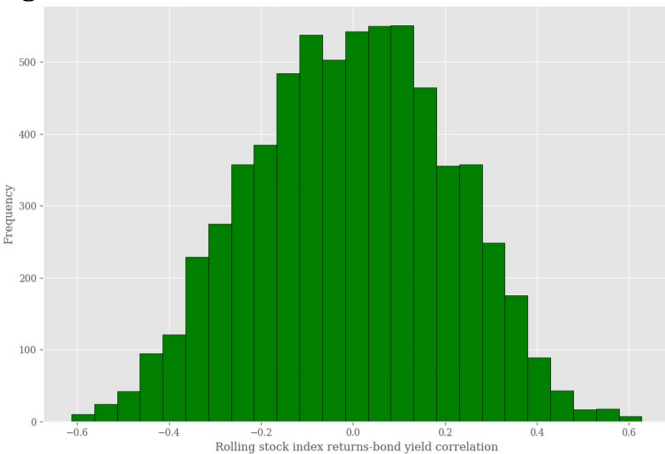


Figure 17 Histogram of Stock Index Returns-Bond Yield Correlation Coefficient in India (Jan 2000-May 2026)

CONCLUSIONS

Debt finance is a critical component of the capital structure of energy and infrastructure projects and has direct impact on project feasibility and profitability, especially in cases of projects with high upfront capital intensity. The study analyses openly available data on the costs of various kinds of debt financing in India over the last one decade. It is mainly focused on bank loan interest rates and medium to long-term government bond yields as the key measures of the cost of debt applicable to financing of various infrastructure projects.

- 1) Across 4 major bank groups currently operational in India, costs of debt are found to be linearly correlated and varying from $8.75 \pm 1.33\%$ per annum to $11.18 \pm 0.88\%$ per annum from 2014 to the present time. A clearly rising trend of bank lending rates is seen from year 2022 onwards, in the recovery from the effects of COVID 19 pandemic and associated economic disruptions.
- 2) For the government bonds, issued during the same time frame, the annualized yields have been between $7.25 \pm 0.80\%$, $7.36 \pm 0.60\%$, $7.43 \pm 0.55\%$ and $7.18 \pm 0.28\%$ for 10-, 15-, 30- and 40-year bonds respectively. Generally falling bond yields have marked the post COVID 19 recovery phase in India and a duration-based term structure of bond yields is also seen.
- 3) Specialized infrastructure financing firms in India also make debt finance in the form of loans available at various cost levels to different kinds of projects and types of lenders (private or public, credit rating), with the range varying from a lower end figure of 7.75% to over 12% per annum.
- 4) Bonds appear to be the source of lower cost debt capital for energy and infrastructure projects in India compared to loans.
- 5) Comparison of bond yields with equity market returns shows that the overall correlation coefficient is slightly negative at -0.226. The 25-day rolling linear correlation coefficients have been positive or negative in different time blocks with nearly equal probability, with values ranging from -0.62 to +0.63.

As an extension of the work reported in this study, the following possible directions of study may be considered in future:

- 1) time series characteristics of the lending rate and bond yield data can be evaluated for stationarity and autocorrelations,
- 2) forecasting methods may be used to predict future values of yields and interest rates,
- 3) econometric and machine learning methods may be used to express interest rates and bond yields as functions of other macroeconomic variables for forecasting,
- 4) WACC projections for various kinds of infrastructure projects in future may be made using the sector specific costs of equity derived separately from market data analysis (analysis of sectoral equity indices or stock prices of specific companies),
- 5) impact of different costs of debt over different project phases can be studied,
- 6) impact of cost of debt from different sources on project feasibility may be studied for specific project examples in various sectors.

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