European Economic Letters
ISSN 2323-5233
Vol 14, Issue 1 (2024)
https://doi.org/10.52783/eel.v14i1.1180
http://eelet.org.uk

Infrastructure Sector as An Inducement Determinant Propelling The Incredible Economic Growth Story Of Bharat

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1.0 Introduction

'India will be world's third largest economy in four years' forecasted by IMF chief economist Ms Gita Gopinath and mentioned in her interview to India Today. India's economy is among the fastest growing in the world. With a $3.7 trillion GDP, India's economy is currently ranked as the fifth largest. India's GDP is predicted to surpass that of Germany and Japan by 2030, according to a number of estimations. According to S&P, a rating organisation, India's nominal GDP is expected to increase from $3.4 trillion in 2022 to $7.3 trillion by 2030.

This economic development is possible because of the infrastructure development of India in past 2 decades. Ministry of Road Transport and Highways was formed in 2009 by bifurcating the erstwhile Ministry of Shipping, Road Transport and Highways into two independent Ministries, i.e., Ministry of Road Transport and Highways and Ministry of Shipping (MORTH). The ability of National Highways to manage both passenger and freight traffic must keep up with the expansion of the economy. With 63.32 lakh km of roads, India has the second largest road network in the world (MORTH).

The goal of the Infrastructure Connectivity Vertical is to provide a modern, clean, congested free, common, connected transport system. Highways and Roads, Railroads, Ships and Ports, Waterways inland, Transport of goods and logistics (includes MMLPs, ICDs, CFSs, and IL), Airports and Commercial Aircraft, Public transportation (including regional rail, intercity bus transportation, etc.), Infrastructure development takes into account the urban transport sector, which includes municipal buses, metro, light rail/urban trains, BRTS, ropeways, and IPT, and others (Niti Ayog 2023).

India is building largescale infrastructure projects, such the Chenab Bridge in the union territory of of Jammu and Kashmir, which is one of the world's tallest arch railway bridgs and is connected to a broad-gauge Indian Railway line at its whole length.
This bridge is a testament to the extraordinary potential of Indian engineers and shows that, given the correct guidance, this talent can be used to develop creative and long lasting infrastructure that would support India's economic development.

The advancement of society depends on the participation of numerous stakeholders in infrastructure development. Thus, the Public-Private Partnership (PPP) strategy is mainly used in the Indian infrastructure industry.

According to the Department of Economic Affairs, India has developed a strong PPP program for the purpose of "delivering high priority public utilities and infrastructure" through a mechanical process at terms of PPP projects at various phases of execution, India has one of the largest programs globally, according to the World Bank, with close to 2000 projects. The 'Build-Operate Transfer (BOT)' model is used to develop infrastructure under PPP, and th private sector in encouraged to construct and maintain if efficiently so that more people utilize it and the sector may generate income.

Nitin Gadkari, the minister of road transport, has recommended a prudent financial move for
the middle class, pensioners, and salaried class. He advises investing in NHAI Invit Bonds, which have an enticing 8.5% interest rate much higher than the 5.5% to 7.5% interest rates offered by conventional bank fixed deposits (Business Today). Chapter VI A of the Income Tax Act provides for deductions to be made from gross total income. Section 80C has a broad list of deductions. Section 80CCF is a subsection under Section 80C. Section 80CCF provides a deduction to the taxpayer with respect to the amount invested by him in specific infrastructure bonds, as approved by Government. The maximum amount of deduction that can be availed by an individual under this section is INR 20,000 per annum. A deduction shall

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be for specified infrastructure bonds and other tax saving bonds. This benefit is over and above the deduction claimed under Section 80C. It helps the taxpayer to reduce his statutory tax liabilities.

1.1 Stock Exchanges: Centre-stage of all Capital Market Participants

Many researchers have opined that the utility of the exchanges can be summarized as:
National level :- i) Accelerated economic development ii) Optimum and suitable utilization of source financial resources.
Company level :- i) Listed companies have greater good will and credit standing in the market.
ii) Wider and ready market. iii) Higher bargaining power in the event of growth.

Investor level :- i) marketability and liquidity. ii) Security of loan.
The Bombay stock exchange (BSE) is the oldest stock exchange of India. Its index is the Sensex or the Bombay stock exchange Sensitive index. It is composed of 30 of the largest and most actively traded stocks on the BSE. Nifty is the index of the National Stock Exchange (NSE). It is a well-diversified 50 stock index accounting for 23 sectors of the economy and is owned and managed by India Index Services and products Ltd. (IISL), a joint venture between NSE and CRISIL.

1.2 Taxonomy of Indices

The pattern of Stock market indices across the globe has two different distinct categories viz indices that focus on robustness measured through the sheer number of stocks included in the specific index (S&P 500, BSE 200, FTSE 100, Nikkei 225, KOSPI 200 and others) and thematic indices which are based upon a sector or on any other indicator (BSE BANKEX, S&P BSE Metal, NYSE Energy Index, NYSE Healthcare Index, NSE Auto, NSE Pharma and others). These thematic indices not only track the market sentiments of the economies but also provide valuable information for existing and prospective investors. Further, as a barometer of measuring economic progresses these sensitive indices give insights to the prevailing sectors on which it is based and indirectly to the economy as a whole.
The larger will be the variety of indices the higher can be the outreach of the stock market and its penetration among the masses.
This research paper studies sectoral (thematic) indices NSE of infrastructure category.

2.0 Review of Literature

Azimova and Mollaahmetoglu (2017), The major factors influencing savings in twenty highincome and upper-middle-income nations between 2005 and 2014 were examined in this paper. In this study, researcher constructed panel data analyses to examine how financial market innovation affects domestic and savings saves. The degree of financial innovation and financial accessibility are significant factors that impact gross domestic savings as well as gross savings. Higher domestic and financial innovation translates into higher savings. Both the banking crisis and the net interest margin have a detrimental impact on savings. A rise in capital formation raises both the gross domestic savings and the gross savings. This study's conclusion supported the "liberalization of financial market" theory by showing that financial innovation and diversification were significant levers for raising savings.

Thorsten Beck, Tao Chen, Chen Lin, and Frank M. Song (2012) gathered data at the bank, industry, and national levels for 32 nations, the majority of which are high-income ones, between 1996 and 2006 for a research titled Financial Innovation: 'The Bright and Dark Sides', concluded that higher growth volatility in sectors more reliant on outside funding, as well as higher levels of idiosyncratic bank fragility, volatile bank profits, and larger bank losses, are all associated with increasing financial innovation.

Ramakrishnan (2015) The fundamentals of PPP and its operation in India are covered in this essay. Infrastructure financing is one of the main problems. This essay discusses the problems that plague infrastructure finance in India, including an excessive reliance on commercial banks for debt repayment, insufficient funding from infrastructure finance firms, difficulties with external commercial borrowing, a lack of mezzanine financing, the partial availability of insurance, pension, and provident funds, and non-financing issues. Recent advancements such debt bonds for infrastructure, loosened regulations for external commercial borrowing, and fair exit strategies are also examined. The study makes several recommendations for financial reforms that are necessary for PPP finance in India, including raising the maximum on viability gap funding, permitting foreign direct investment, and tapping into savings.

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Agarwal (2020), The study reviews India's infrastructure development and financing in the 11th and 12th Five Year Plan, examining sources and government actions. It reveals a significant gap between supply and demand for infrastructure financing. Recommendations include evolving innovative business models, leveraging diaspora potential, revisiting liquidity ratio norms, evolving the municipal bond market, and boosting regional integration through corridors.

Canning, Pedron (2008) Between 1950 and 1992, examined into the effects of different infrastructure providing models in a group of nations. They devise novel assessments that allow them to discern the polarity and orientation of enduring impacts with resilience against the existence of unclear and diverse short-term causal connections. Researchers found that while long-term economic growth is often attributed to infrastructure, there is significant national variance in this relationship. The researchers also presented data showing that, while overall, the availability of each form of infrastructure is near to the level that maximizes growth, there are differences between under- and oversupplied infrastructure in different nations.

The policy paper by Bhattacharya, Romani, and Nicholas (2012) said that infrastructure projects will significantly influence environmental sustainability. Making the necessary infrastructure investment sustainable by assuring reduced emissions, increased efficiency, and climate change resistance might account for between 10% and 15% of the total required investment. Although there is an initial cost increase, there may be a significant return on investment from these additional investments due to increased efficiency and broader advantages (such as energy security, safety, cleaner practices, biodiversity, technological advancement, and significantly lower risk associated with climate change). Currently, developing nations spend between $0.8 and 0.9 trillion year on infrastructure, with the majority of that amount coming straight from domestic budgets. A combination of private sector organizations developed country ODA, MDBs, and, more lately, emerging nations like the BRICS supply the remaining annual financing. Infrastructure development requirements will demand an increase in infrastructure spending of more than double on an annual basis by 2020.The function of domestic budgets will not diminish; however, their borrowing capacity will always be limited by macroeconomic factors pertaining to affordable and sustainable debt levels.

Fay, Toman, Benitez (2010), Infrastructure investment is crucial for economic progress and poverty reduction, but it also impacts environmental sustainability. Limited progress in developing countries is needed, and undervaluation of environmental benefits and international agreements are needed. Actions include increasing public and private financing, providing technical and financial assistance, and promoting collaborative efforts to improve data collection and sharing on infrastructure investment.

3.0 Objectives of study

To study infrastructure development in India from 2018 to 2023. (NIFTY INTRA Data collected is from 2018 Nov)

1. Analyse the funding sources India uses for infrastructure
2. Assess the status of infrastructure financing in past 8 years.

4.0 Hypothesis of the study

Over the period from 2018 to 2023, there has been a significant growth in infrastructure development in India.

1. Infrastructure development in India has relied on a diverse range of funding sources, including government allocations, public-private partnerships (PPPs), foreign direct investment (FDI), and infrastructure bonds.
2. The status of infrastructure financing in the past (2018-2023) has witnessed a notable shift, with a growing emphasis on innovative financing mechanisms, including infrastructure bonds and public participation, to address funding challenges

5.0 Research Methodology

The research will be using the concept of Ordinary Least Square method for arriving at the relationship between the variables. The volatility of the both the major indices of India viz BSE 30 and NSE 50 will be measured by using the descriptive statistics. A brief description of the OLS model used has been given below:

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A matrix formulation of the multiple regression model

In the multiple regression setting, because of the potentially large number of predictors, it is more efficient to use matrices to define the regression model and the subsequent analyses. Here, we review basic matrix algebra, as well as learn some of the more important multiple regression formulas in matrix form. yi=β0+β1xi+ϵifor i=1,...,n

If we actually let $i = 1, ..., n$, we see that we obtain n equations:

y1y2⋮yn=β0+β1x1+ϵ1=β0+β1x2+ϵ2=β0+β1xn+ϵn

formulation of the above simple linear regression function in matrix notation:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} 1 & x_1 \\ 1 & x_2 \\ \vdots & \vdots \\ 1 & x_n \end{bmatrix} \begin{bmatrix} \beta_0 \\ \beta_1 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix}$$

$$Y = X\beta + \varepsilon$$

linear regression function reduces to a short and simple statement:

Y=Xβ+ϵ

Meaning of the notations used:

- $\boldsymbol{X}$ is an $n \times 2$ **matrix**.
- $\boldsymbol{Y}$ is an $n \times 1$ **column vector**, $\boldsymbol{\beta}$ is a 2×1 column vector, and $\boldsymbol{\varepsilon}$ is an $n \times 1$ column vector.
- The matrix $\boldsymbol{X}$ and vector $\boldsymbol{\beta}$ are multiplied together using the techniques of **matrix multiplication**.
- And, the vector $\boldsymbol{X\beta}$ is added to the vector $\boldsymbol{\varepsilon}$ using the techniques of **matrix addition**.

5.1 Research data

This research paper is based upon secondary data that will be extracted from the various websites of institutions like National Stock Exchange (NSE), Bombay Stock Exchange (BSE), Reserve Bank of India (RBI), Securities Exchange Board of India (SEBI), The Multi Commodity Exchange of India (MCX), The World Bank, Directorate General of Foreign Trade (DGFT), Directorate General of Commercial Intelligence and Statistics, Centre for Monitoring Indian Economy (CMIE), Ministry of Labour and Employment, Ministry of Commerce and Industry, Ministry of Statistics and Programme Implementation (MoSPI).

5.1 Sources of Data and Period of data

The data that will be used are in sync with the research objectives of the paper. It will be the historical data belonging to past 5 years (roughly 20 quarters) from 2018. The historical data will be put into Ordinary Least Squares (OLS) model with an assumption of **homoscedasticity** in the occurrence of variances of the independent variables. The empirical evidences will be the secondary data. The research does not apply the concepts of reliability of data because of the reason that the sources from where data has been collected are stock exchanges, regulators, government publications and such reliable sources.

5.2 Data Analysis and Interpretations

5.2.1 The results of the OLS model have been given below:

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Regression Statistics
Multiple R
0.573860771
R Square Adjusted R
0.329316185
Square Standard
0.328278777
Error
717.3151956
Observations
1296

ANOVA

Regression Statistics	
Multiple R	0.573860771
R Square	0.329316185
Adjusted R Square	0.328278777
Standard Error	717.3151956
Observations	1296

	df	*SS*	*MS*	*F*	*nificance F*
Regression	2	326673447.5	163336723.7	317.4416	6.9787E-113
Residual	1293	665301629.2	514541.0899		
Total	1295	991975076.7			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4067.090319	51.75141504	78.58896837	0	3965.564374	4168.616	3965.564	4168.616
Volume	-4.12271E-06	2.02464E-07	-20.36268966	3.6E-80	-4.5199E-06	-3.7E-06	-4.5E-06	-3.7E-06
Value	0.115610349	0.00540348	21.39553519	3.45E-87	0.105009799	0.126211	0.10501	0.126211

5.2.2 Descriptive Statistics

Closing	
Mean	3863.373
Standard Error	24.31157
Median	3408
Mode	3155.75
Standard Deviation	875.2165

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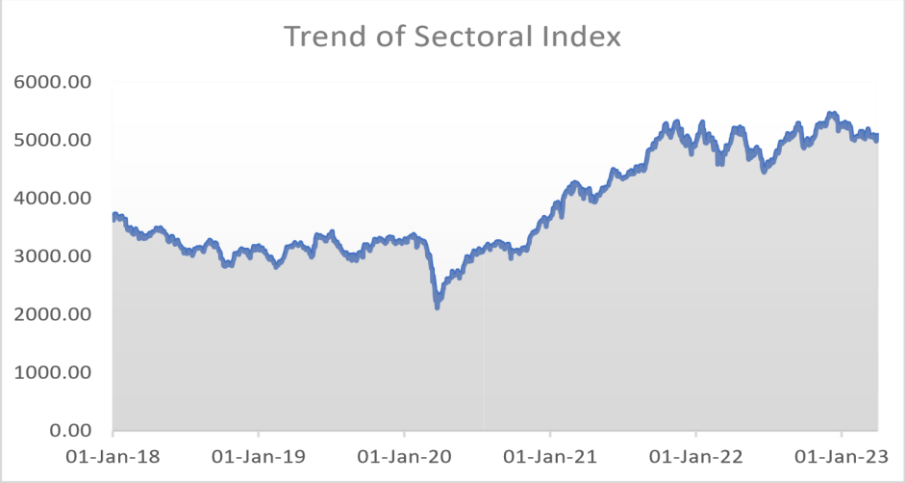
Sample Variance	766003.9
Kurtosis	-1.37671
Skewness	0.395168
Range	3364.55
Minimum	2107.95
Maximum	5472.5
Sum	5006931
Count	1296
Confidence Level(95.0%)	47.69438
Coefficient of Variation	22.65421

Sectoral	3636.65		01-01-2018
Index	5090.95		31-03-2023
ROC Calculation			
P1-P0	1454.3		
P0	3636.65		
(P1-P0)/P0	0.399901		
	39.9901		

5.2.3 The sectoral growth index has a phenomenal growth rate of nearly 40% (refer the descriptive statistics). The following chart clearly depicts this growth rate.



6.0 Interpretations and conclusions

The growth rate of infrastructure sector has been very high in India. The data collected from the NSE suggests that considerable portion of the development has happened due to Public Private Participation (PPP) model. This strategy has yielded the desired results and it can be said the hypothesis mentioned above stands accepted and justified.

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The following are the conclusions based upon the hypothesis framed:

Over the period from 2018 to 2023, the growth rate is nearly 40% which can be considered as a significant growth in infrastructure development in India.

1. The PPP model has been quite successful in Bharat and Infrastructure development in has a diverse range of funding sources including government allocations, public-private partnerships (PPPs), foreign direct investment (FDI), and infrastructure bonds. Hence this hypothesis also gets justified.
2. The budgetary allocation of infrastructure is on continuous rise and hence it can be very well stated that infrastructure financing in the past (2018-2023) has witnessed a notable shift, with a growing emphasis on innovative financing mechanisms, including infrastructure bonds and public participation, to address funding challenges

7.0 Further scope of research

Infrastructure is a vibrant segment and majority of the pillars of the economy remain
Dependent up on the sound infrastructure. In the modern world the meaning of infrastructure also includes digital infrastructure however, the paper has dealt with only the physical part of the infrastructure. Hence, there exists a scope of further research on infrastructure as impacting factor of rapid economic growth encompassing both physical as well as digital infrastructure as envisaged in the digital India initiatives.

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