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Infrastructure Investment Status in BRICS Nations: An Empirical Evaluation

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Abstract:

Purpose: The purpose of the paper is to investigate the status of infrastructure investment deficit situation among BRICS nations and make an attempt to establish bonds as a source of financing infrastructure and analyze bonds being traded in the Capital market in India.

Design/Approach: The research employs a quantitative method, Trend Analysis. Infrastructure investment deficit data were obtained from Global Infrastructure Outlook, Gross domestic savings rate data were collected from the World Bank database, Bonds maturity and corresponding yields were obtained from investing.com, Bonds traded in the capital market were accessed from NSE website.

Findings: The study finds that infrastructure investment deficit is rising in BRICS nations and at the global level, the Gross domestic savings rate is high which can be channelized to suffice the infrastructure investment deficit status. The average yield of bonds being traded in BRICS nations is much higher than the yield of other major economies. From the analysis of Bonds traded in capital market (India), we observe that only those bonds are traded which have investment-grade credit Rating.

Practical Implications: The research presents that there is huge opportunity prevalent in global arena where gross domestic savings rate is high due to lack of viable investment opportunities and adding to the agony is that yields in major economies are on the lower side whereas yields on bonds in BRICS nations offer higher yields a prominent feature to attract investment opportunities both from domestic and foreign long-term investors.

Originality: The originality of the research can be attributed to the investigation of Infrastructure financing deficit status among BRICS nations and highlighting the opportunity of channelizing the savings available towards infrastructure investments via Bonds.

INTRODUCTION:

Economic growth prospects necessitates huge investment towards Infrastructure development and despite demand India has a small Infrastructure Bond market(Hutchison et al., 2016). Infrastructure financing refers to the procurement of funds to finance infrastructure projects and in

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the wake of measures being imposed for strict capital and liquidity requirements (BASEL III) it requires stupendous effort for commercial banks to finance projects due to increased exposure and limited ability to provide funding for Infra projects(Vassallo et al., 2017). With the mounting pressure to suffice global infrastructure investment deficit as represented in Figure 1 governments can browse through eclectic sources of finance such as Bond Finance, PPP, Land-based Finance, Bridge Financing, Islamic finance (Sukuk) other than traditional procurement means (Bank Loan, Government Budgetary Support).

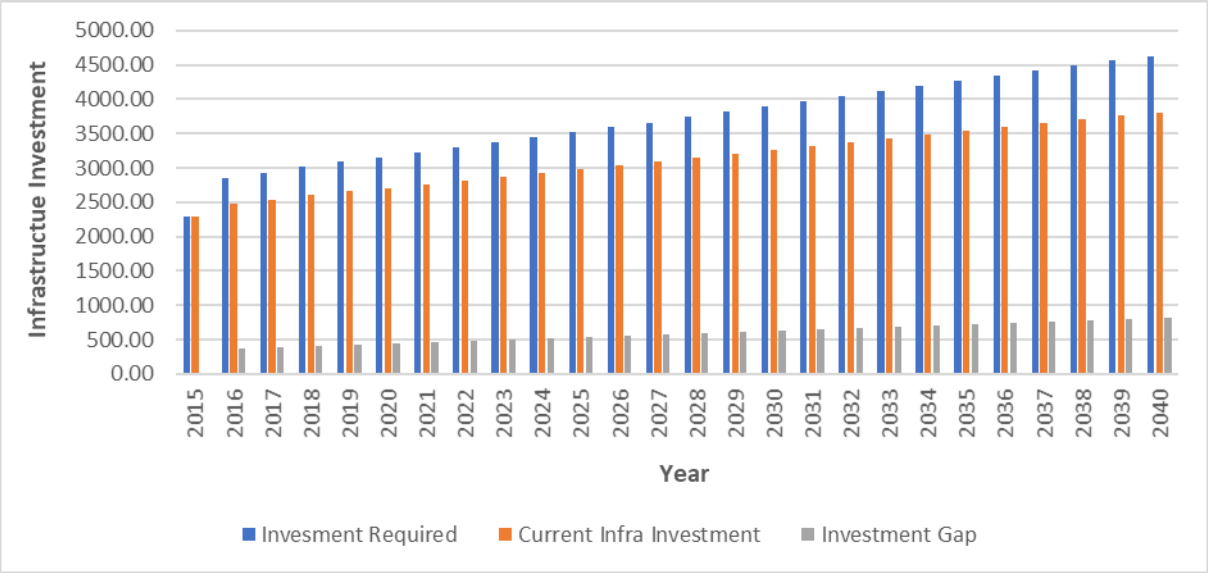

Figure 1: Global Infrastructure Investment Status(In Billion $)
Source: Global Infrastructure Outlook

Based on global forecasts by global Infrastructure outlook there is an investment gap of $15 trillion which poses as a challenge as well as an opportunity because gross domestic savings rate is on record high as world Gross Domestic Savings Rate is 25.27% (World Bank Data). Globally, there is a staggering infrastructure investment gap of approximately $15 Trillion from 2015 to 2040 assuming the current growth rate of economies (Global Infrastructure Outlook). India, the second-fastest growing economy with the growth rate of 5.8% suffers from the risk of deficit in infra investment and to upkeep, the growth rate, management of infra investment would be key. With the advent of rising investment deficit, it's necessary to promulgate private participation to harness the savings and channelize it to the infrastructure sector. Bond financing is the natural fit between demand and supply eliminating assets liability mismatch which is the case with most infrastructure projects provided their long tenure.

Against this backdrop of rising infrastructure investment deficit, this paper has two objectives. First, it strives to investigate the status of infrastructure financing deficit among BRICS nations and comparatively analyzing them concerning Bonds Maturities and their corresponding yields to make an attempt to establish Bond financing as an essential means of financing infrastructure.

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Second, to analyze Bonds being traded in the capital market in India based on data from NSE. The paper is organized as follows. Section 2 presents a brief literature review, Section 3 examines the status of infrastructure investment among BRICS nations and analysis of bonds traded in capital market at NSE, Section 4 deals with discussions and implications. Concluding opinions are provided in Section 5.

2. LITERATURE REVIEW

Several studies emphasize the rise of infrastructure investment deficit and put forward bonds as best foot forward to address the investment gap for funding infrastructure projects. Bonds financing turns out to be the most sophisticated source for financing infrastructure due to its merit of eliminating obvious opponent i.e. Asset-Liability mismatch faced by Infrastructure companies. Chen et al., (2018) investigates the factors responsible for issuing guaranteed bonds and emphasizes problem of debt overhang. Vassallo et al., (2017) provides a rationale for identifying innovative sources of infrastructure finance and utilize SWOT analysis to explain the attractiveness and limitations of project bonds to fund infra projects in Europe. Hutchison et al., (2016) observes that institutional investors are lured towards bonds because it serves as a natural fit between demand and supply of long-term debt to long term cash flows of the project. Bond financing is more attractive during the brownfield phase of Infra projects, especially projects seeking to lure risk-averse institutional investors(Ehlers, Packer, & Remolona, 2014). Purkayastha & Iyer, (2017) present the significance of credit ratings of Bonds and default probability based on historical data as well as attempt to compare actual default rates and expected default rates for corresponding ratings & default rates for infrastructure projects. Benson & Marks, (2017) evaluate government-wide information regarding infrastructure reporting practices and the impact on ratings made by agencies. Babatunde & Perera, (2017) assess the constraints to bond financing in Nigeria through empirical quantitative analysis and document innovative alternatives to finance long-term projects. Lam, Chiang, & Chan, (2011) compares suitability of bond financing with bank loans for infrastructure development. Brealey, Cooper, & Habib, (1996) analyze the rationale for using project finance and identify possible solutions to overcome agency problems and mitigate project risks and researchers make a valiant attempt to burst the “myth” of project finance being “expensive finance”.

Study suggests that bank loans are relatively more costly than direct finance(Bonds Finance) as low world interest rates increase demand for capital expenditure, raise their relative price & firms profitability for a given level of equity it raises pledged income and allows for growth in both corporate bonds and bank loans stocks & simultaneously reflecting its scarcity and slow pace of adjustment though the return of equity of banking sector goes up(Chang, Fernández, & Gulan, 2017). Hutchison et al., (2016) highlights the attractiveness of Bonds and the advantages of employing them as well as sheds light on pricing mechanism of Bonds and risk premium demanded by the market. Thumrongvit, Kim, & Pyun, (2013) establishes Bond market as the third key component of the financial system and finds that contributing role of Bank credit to economic growth diminishes with development of domestic bond market and sovereign bonds are positively related to economic growth whereas the impact of corporate bonds change from negative to

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positive with expansion of size and diversity of domestic financial structures. Chou, Ou, & Tsai, (2014) examines the significance of alliances in the Bond market and valuation of corporate alliance activities. Bele & Bele, (2015) investigates the present status and role of municipal bonds in urban infrastructure financing through urban local bodies in India. Greenwood & Vayanos, (2014) empirically investigates the impact of supply and maturity structure of government debt on bond yields and expected returns. It also examines the effect of stocks on long-term bonds and shorter maturity bonds. Chang et al., (2017) brings to attention the increased reliance over foreign financing & rebalancing from bank loans towards bonds as bank credit becomes relatively more expensive, indicating a scarcity of bank equity. Li, Abraham, & Cai, (2017) examine the usage of bonds and credit default swap in infrastructure financing and advocate pricing of guarantee undertaken by the sovereign to eliminate any contingent liability.

Macomber, (2016) proclaims that there's no infra financing gap rather there is a deficiency of bankable projects i.e. projects are not attractive to investors. Tortajada, (2016) reviews infrastructure financing and development from a policy perspective and conclude that it's not only limited financing but also policies and their implementation. Ehlers et al., (2014) represents phases of infra projects and marks the importance of the regulatory framework for bonds. Lam, Chiang, & Chan, (2011a) evaluate the usage of bonds in developed countries and factors responsible for the success of bond financing and explain the attractiveness of infra bonds among institutional investors due to its stable income. Nanda & Singh, (2004) explores the rationale of using insurance backed funds and their findings reveal that benefits are proportional to bond maturity.

Bhattacharyay, (2013) emphasizes the pressing need of long-term capital for developing infrastructure and development of the bond market facilitates mobilization of savings into productive investments. Arezki et al., (2017) focuses on means of channelizing savings of long-term institutional investors towards infra investments as these tend to have highest gains in productivity and generate higher social rates of return as well as identifies obstacles to flow of savings towards infrastructure investment and proposes solution to overpower them. Gokan (2008) evaluates the difference between money financing and bond financing and concludes that a higher ratio of bonds to money is utilized to finance public spending. Dias & Ioannou (1995) proclaim that usage of concession agreements by a sovereign as a measure of credit enhancement to induce private sector to develop and operate type of infrastructure projects which may ensure mobilization of savings. Though the above studies signify the gravity of mobilizing savings the global savings rate is on record highs as global gross domestic savings rate is 25.27%.

3. BRICS NATIONS - STATE OF INFRASTRUCTURE

In this section, research provides significant facts related to status of infrastructure finance deficit in BRICS nations and global status of investment deficit, comparison of BRICS nations on the parameters of GDP growth rate, Gross Domestic Savings rate, Bond maturities corresponding to their yields and Infrastructure Development Bank.

3.1 Infrastructure Investment Status

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Globally, there is an upward trend in infra investment deficit and the investment requirement to fund infrastructure projects exceeds the current investment trends as is evident from figure 2 which represents that there is deficit of $ 427.30 billion in the year 2019.

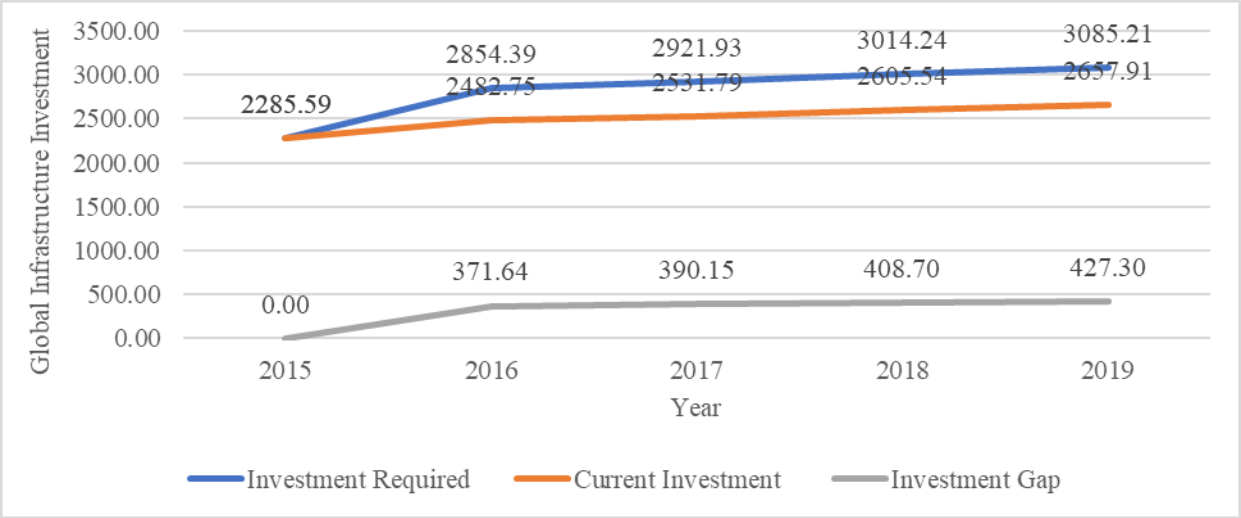

Figure 2: Global Infrastructure Investment Status (In Billion USD)
Source: Global Infrastructure Outlook

The paper intends to analyze the status of infrastructure financing deficits among BRICS nations and the basic reason being that BRICS represents approximately one-fourth of world's GDP and it's a blend of both developed and developing nations among which China and India are the fastest growing economies. The data collected from global infrastructure outlook for the past five years it represents that each BRICS member is strangled with the deficit situation though in year 2015 only Russia had financing deficit while others were able to suffice their infrastructural investment requirements but from 2016 to 2019 the infrastructure financing gap is increasing every year as we can see in the figure 3 that in 2019 China being the most affected by the evil of infra finance as it runs short of $53.44 billion, followed by Brazil which has deficit of $34.55 billion, Russia having deficit of $21.16 billion and India running short of $14.79 billion to meet its infra sector investment requirements and South Africa being 0.37 trillion dollar economy and combating from $4.36 billion devil of financing deficit is tough task.

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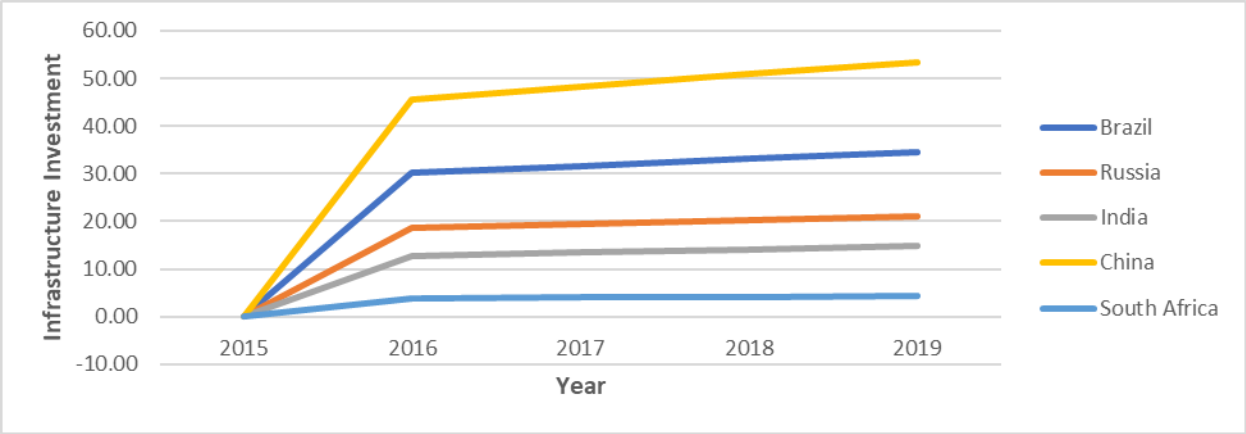

Figure 3: BRICS nations Infrastructure Investment Status (In Billion USD)
Source: Global Infrastructure Outlook

Figure 4 represents the key sectors contributing to the infrastructure investment deficit in Brazil. It is inferred that Transport: Road is the sector having the highest investment deficit followed by Transport: Rail, Energy, Transport: Ports, Telecommunication and Airport. While the water sector has the least deficit situation.

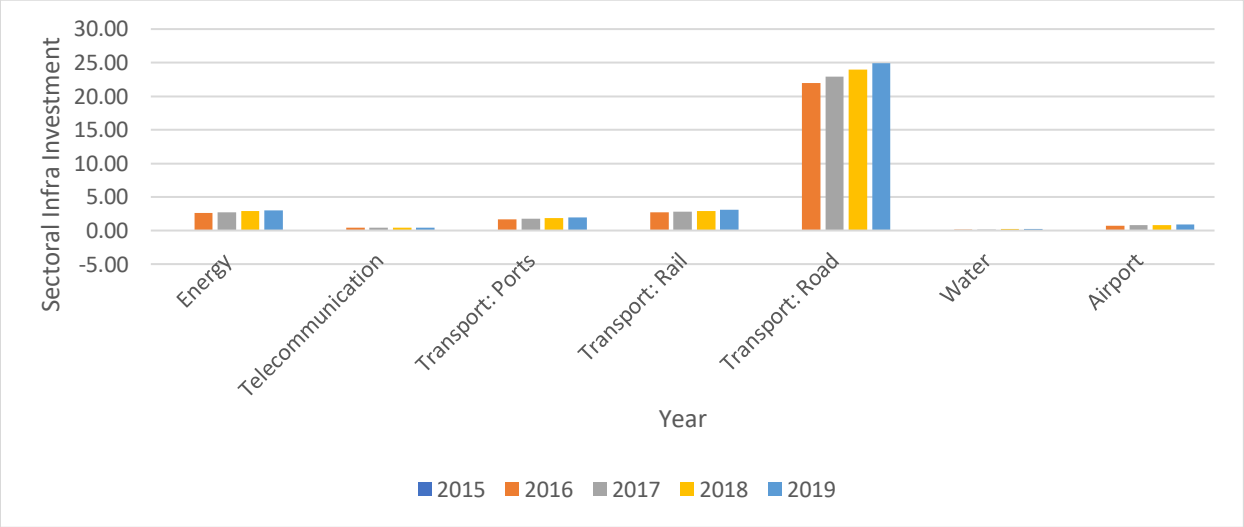

Figure 4: Sectoral Infra Investment Status in Brazil (In Billion USD)
Source: Global Infrastructure Outlook

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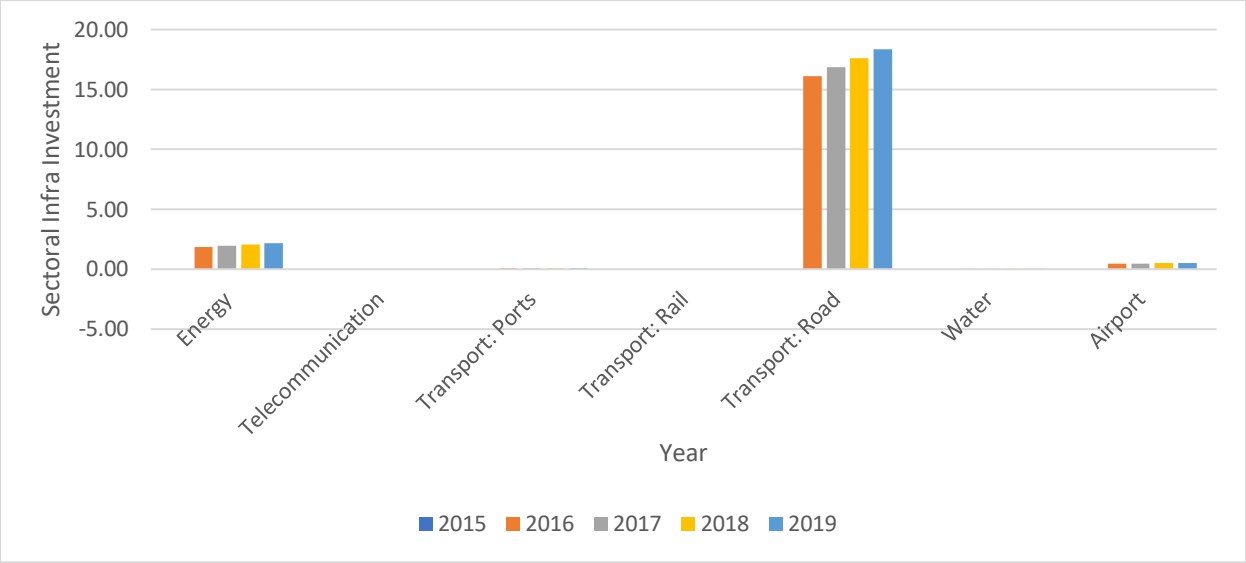

Figure 5: Sectoral Infra Investment Status in Russia (In Billion USD)
Source: Global Infrastructure Outlook

In figure 5, the study examines Russia's sectoral infrastructure financing gap which provides that Transport: Road is the most investment deficit sector among seven sectors being examined followed by Energy and Airport sector. In case of India, it appears that most of the sectors are stranded with investment deficit and the energy sector has the highest infra financing shortage followed by telecommunications, Water and Transport: Road sector as is apparent from figure 6.

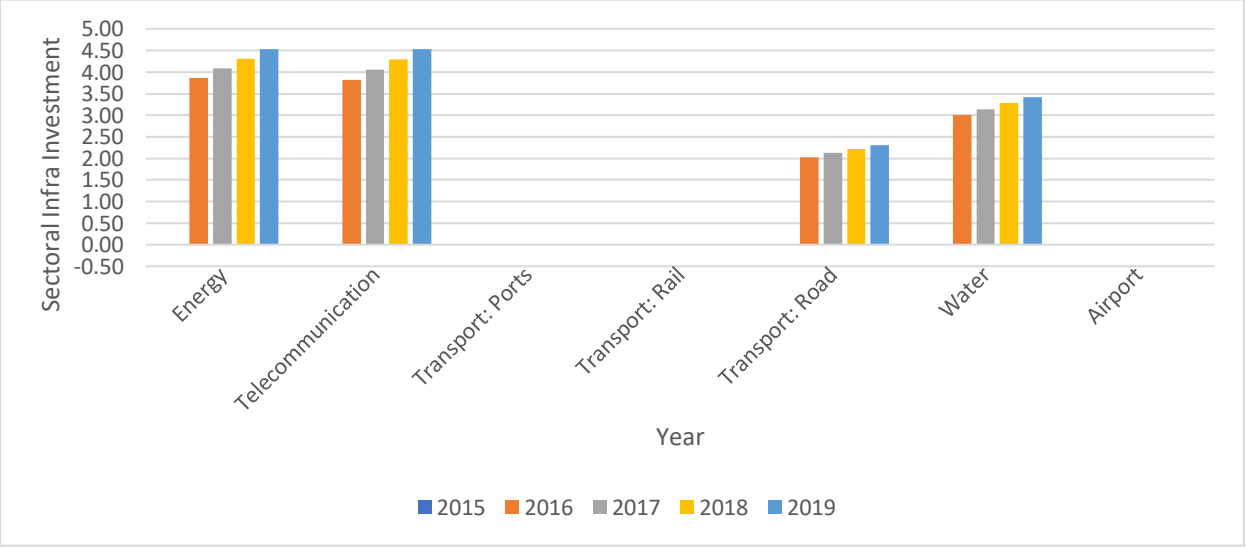

Figure 6: Sectoral Infra Investment Status in India (In Billion USD)
Source: Global Infrastructure Outlook

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China's towering infra financing deficit situation is shown in figure 7 which states that energy sector requires greater degree of awareness to eliminate the investment gap, while other sectors have a deficit of approximately five billion dollars which needs to be addressed as it's going to increase inadvertently with the growth of the economy.

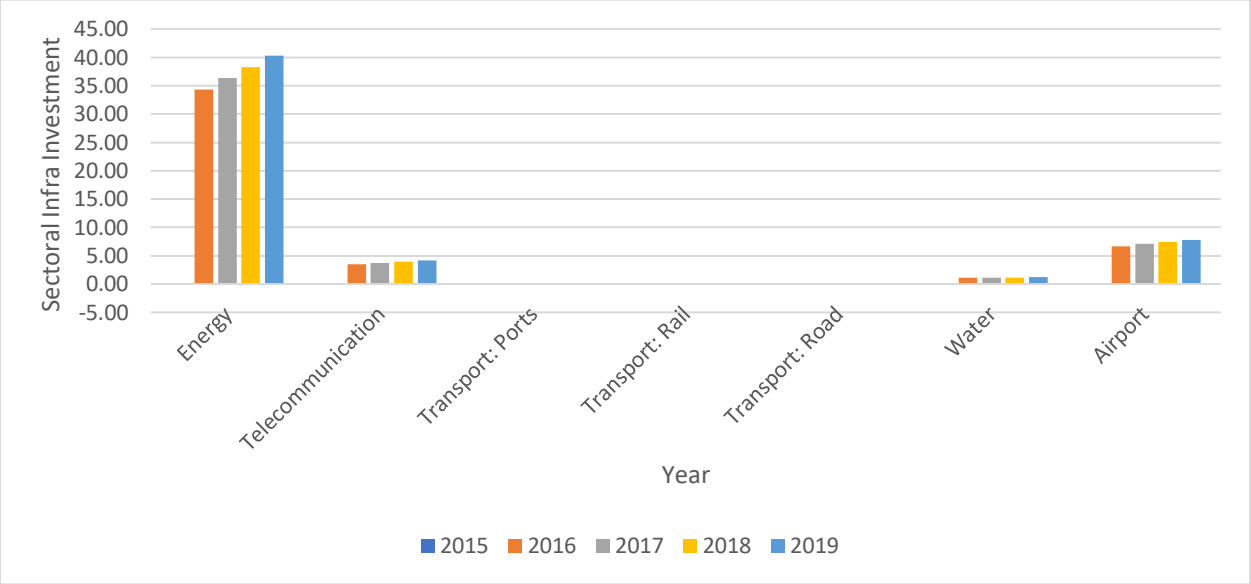

Figure 7: Sectoral Infra Investment Status in China (In Billion USD)
Source: Global Infrastructure Outlook

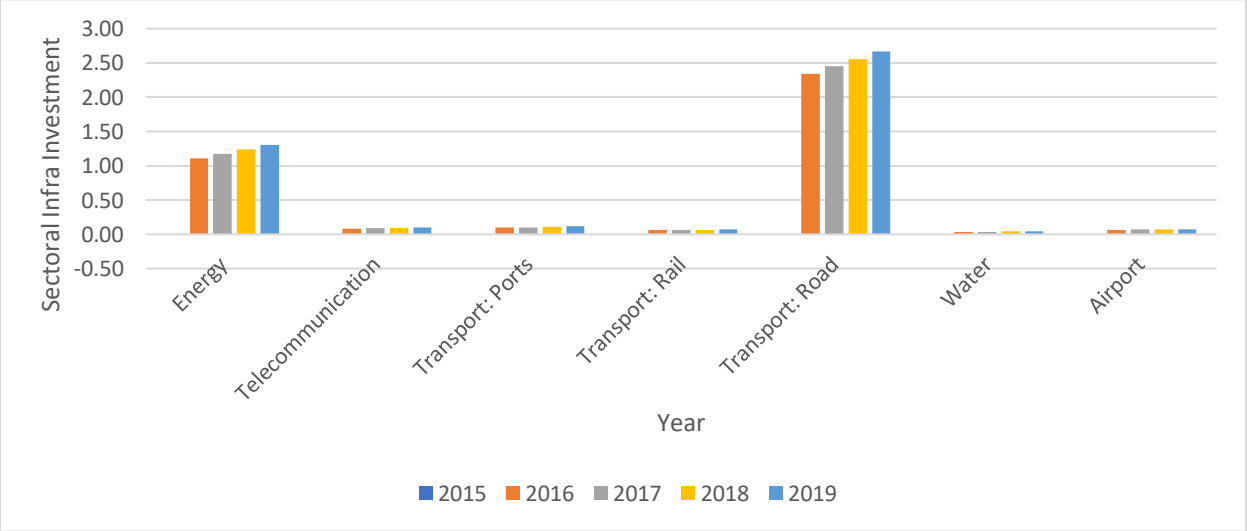

Figure 8: Sectoral Infra Investment Status in South Africa (In Billion USD)
Source: Global Infrastructure Outlook

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Figure 8 represents South Africa's sectoral infra investment deficit from which it is inferred that Transport: Road sector is the major contributor to South Africa's financing gap followed by the Energy sector.

From the analysis of data of the past five years of the BRICS nations, it can be said that major sectors that combat the shortage of infrastructure investment are Transport: Road, Energy and Telecommunication.

3.2 Economic Status of BRICS economies:

Particulars	**Brazil**	**Russia**	**India**	**China**	**South Africa**
GDP (Current USD)	1.87 Trillion	1.66 Trillion	2.72 Trillion	13.61 Trillion	0.37 Trillion
GDP Growth Rate	1.10%	2.30%	7.00%	6.60%	0.60%
Savings Rate (% of GDP)	16%	33.30%	29.30%	46.70%	18.40%
Infrastructure Finance Deficit (%of GDP),2018	1.84%	1.50%	0.55%	0.38%	1.28%
Infrastructure Development Bank	BNDES	NA	NIIF	CDB	DBSA
Yield Rate & Bond Maturity:					
1M	NA	7.15	NA	NA	NA
2M	NA	7.13	NA	NA	NA
3M	5.84	7.12	5.52	NA	6.57
6M	5.52	7.11	5.64	NA	NA
9M	5.45	NA	NA	NA	NA
1Y	5.41	6.77	5.93	2.55	NA
2Y	5.76	6.93	6.13	2.73	6.75
3Y	6.245	7.01	6.07	2.83	NA
4Y	NA	NA	6.16	NA	NA
5Y	6.86	7.14	6.29	2.92	7.42
6Y	NA	NA	6.52	NA	NA
7Y	NA	7.25	6.37	3.13	NA
8Y	7.12	NA	6.57	NA	NA
9Y	NA	NA	6.59	NA	NA
10Y	7.27	7.31	6.36	3.07	8.35
11Y	NA	NA	6.79	NA	NA
12Y	NA	NA	6.74	NA	9.24
13Y	NA	NA	6.85	NA	NA
14Y	NA	NA	6.72	NA	NA
15Y	NA	7.48	6.78	3.46	NA
19Y	NA	NA	6.83	NA	NA

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20Y	NA	7.79	NA	3.48	9.85
24Y	NA	NA	6.87	NA	NA
25Y	NA	NA	NA	NA	9.9
30Y	NA	NA	6.85	3.75	9.89

Source: World Bank Data, Investing.com

Note: Data as of 2018

Countries	USA	UK	JAPAN	GERMANY	CANADA
Yield of 10Y Bonds	1.64%	0.48%	-0.22%	-0.59%	1.20%

Source: Tradingeconomics.com/bonds

China is $13.61 trillion economy and has a growth rate of 6.6% and gross domestic savings rate is 46.7% which justifies the literature that there's no financing gap rather it's the shortage of bankable projects. Consequently, mounting infrastructure investment deficit. In China, 6 types of Bonds are being traded on the basis of maturity greater than or equal to 5 years and average yield is 3.3%. It is noteworthy that since infrastructure projects are long-term affair bonds above or equal to 5 years of maturity have been considered for analysis. India, the second fastest growing economy has Gross domestic savings rate of 29.3% which is approximately 796 billion dollars is being invested in low return yielding securities in the absence of better investing options available to investors as the average yield of bonds in India is 6.65% which is far better than most nations the only hindrance is inadequate credit enhancement of the bonds. Based on maturity there are 14 distinct varieties of bonds being traded having maturity above or equal to 5 years but still this prominent source of financing infrastructure projects is not optimally harnessed. Among BRICS highest average yield of bonds is of South Africa (9.11%) tailed by Russia (7.39%), Brazil (7.08%) and India (6.65%) whereas china has the lowest average yield (3.3%). It's interesting to note apart from Russia, all the BRICS countries have established infrastructure development banks with the objective to monitor infrastructural development and management of funds.

Key Indicators of Investment Bonds:

Country	**Bonds on the basis of maturity (greater than or equal to 5 Years)**	**Average Yield (%)**
Brazil	3 Types	7.08%
Russia	5 Types	7.39%
India	14 Types	6.65%
China	6 Types	3.30%
South Africa	6 Types	9.11%

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3.3 Bonds Traded in Capital Market (India):

There were 367 bonds being traded in capital market at NSE out of which 198 issues form the sample of the research as issues with incomplete information related to issue data, Maturity date credit ratings were removed. From the sample, 6 issues were of the nature of "Infrastructure", 80 issues constituted the "Tax-Free", "Plain Vanilla (Regular)" nature bonds had 104 issues whereas 8 issues were of "Taxable" nature which is represented in Figure 9. The Average Maturity of the bonds being traded in the capital market is 11.19 year which is suitable for infrastructure projects as it fits their long-term nature. The average coupon rate of the traded bonds is 7.53% which is comparatively better than other fixed income securities as well as trading eliminates the risk of liquidity which has been one of the concerns of past studies. Bonds traded are of high credit rating and investment-grade as all the bonds in the sample have above "A+" rating and of stable nature which makes them suitable for Insurance and Pension funds to be employed to suffice their long-term financial commitments but to utilize the bonds potential to fund infrastructure projects to the fullest extent mechanism has to be devised to increase the trading of Non-investment grade bonds (Due to lower credit rating) i.e. bond may be performing well but insurance and pension fund owners can't invest in them as they need to comply with regulatory norms of making only safe investments and most infrastructure projects are rated "BBB" or below. With the increasing exposure of banks' lending its necessary to employ bonds as another major source of financing infra projects because it will facilitate mobilizing the huge gross domestic savings to productive investments.

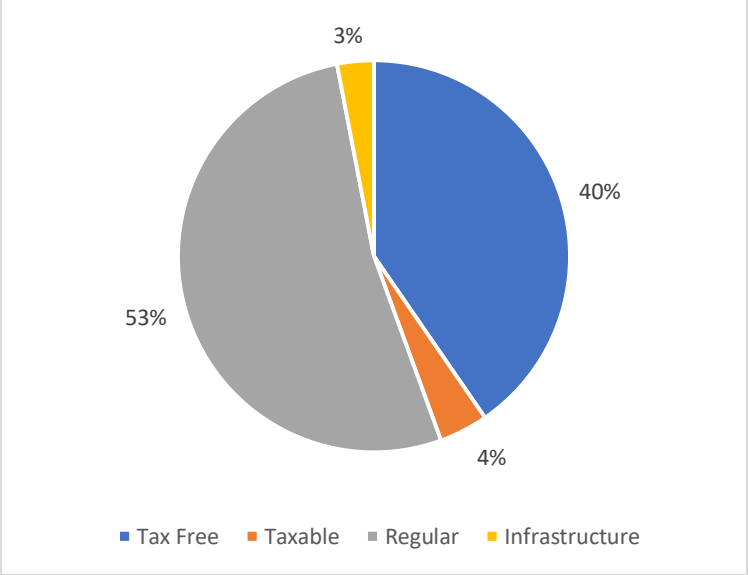

Figure 9: Nature of Bonds Traded at NSE
Source: NSE, India

4. DISCUSSION AND IMPLICATIONS:

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Bonds satisfy the prerequisites of Infrastructure financing and suffice the return expectations of long-term investors. By exercising certain measures such as Credit Enhancement, trading, adequate investigation of viability of projects, utility of bonds can be enhanced and would be significant for governments as well as long term investors and Infrastructure firms.

Long-term Investors: Long-term investors' objective is to maximize return with the minimum risk inherent which is possible by investing in bonds as the research highlights that the yield of BRICS nations is higher than the yield offered by other major economies. Hence, long term investors may target investing in Infrastructure Bonds to avail higher returns.

Infrastructure Firms: Infra firms can avail huge funding at low cost by giving attractive investing options (such as Derivatives embedded Bonds, Inflation-linked Bonds) to long-term investors to explore the unutilized savings potential as highlighted in comparison table of BRICS nations.

Government: It's almost impossible to broaden the horizon of Bond financing without the support of the government. The extension of credit enhancement by government will improve the ratings of bonds as in the case of Europe under Project finance Initiative which facilitated European infrastructure firms to avail funding at lower cost(Advantage of credit Enhancement) but this credit enhancement shall be priced to eliminate any contingent risk arising due to default which is rare in the case of bond financing and even if default occurs its repayment rate is much better than other infrastructure financing sources. The usage of bonds would reduce the undue pressure on the fiscal which majorly leads to deficit financing.

5. CONCLUSION:

This paper's originality can be attributed to the investigation of Infrastructure investment deficit in BRICS nations and examining the sectors resulting in financing deficit country wise. The investment deficit for funding infrastructure projects is rising and going to breach the capacity of sovereign governments to finance infra projects alone which necessitates the involvement of private players to overcome the deficit situation but even with wide popularity of PPPs it requires a herculean task to encounter the infrastructure needs thus sovereigns must look for alternative innovative solutions to fund infra projects of which Bonds are tried and trusted as most developed nations employ bonds majorly to fund their infrastructure development. BRICS nations must route their financing mechanism via bonds to harness the potential available within (in terms of Savings) rather than looking for financing opportunities. Evidence from the comparison table and figures indicating huge savings and increasing infra investment requirements of BRICS nations respectively, open up the possibility for long term investors as well as infrastructure firms to reap the benefits of Bond financing by targeting sectors (Transport: Road, Energy) with maximum infrastructure investment deficits. Financing through Bonds tends to remain in fashion for long-term when bank lending remains insubstantial and government budgetary support creates undue budgetary pressure.

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