
Infrastructure Stocks: A Low - Volatility Investment Alternative?

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The continuing volatility in equity markets following the global financial crisis has led the focus of the global investment community towards low volatility stocks. This pursuit of low risk investments has drawn attention of the investor community towards new, alternative investments avenues like infrastructure companies and funds. This paper is an attempt at identifying low volatility investment sectors in Indian market. Using data from the S&P CNX Nifty Index and the CNX Infrastructure Index, it provides an analysis of the risk return performance of the infrastructure portfolio and the broader market portfolio in India to assess whether it constitutes a low volatility investment in the volatile equity markets in India.

Analysis reveals that investment in infrastructure stocks yields returns comparable to the broader market portfolio with significantly lower risk or volatility. This finding has important implications for investors. Infrastructure stocks can serve as a long term, low risk investment in portfolio construction without loss in returns. The study also contributes to the increasing body of evidence in academic literature that “share returns and risk are not always inextricably linked”.

Key Words: Investment, low risk, infrastructure portfolio, market portfolio, returns.

JEL classification code: G11, G31.

INTRODUCTION

The continuing volatility in equity markets following the global financial crisis has led the focus of the global investment community towards low volatility stocks. Investment in low volatility portfolios is being preferred not only by risk averse investors but also by risk takers who use it as a defensive component of their portfolio to counterbalance their allocation to risky assets and reduce the overall volatility of their combined portfolio. This pursuit of low risk investments has drawn attention of the investor community towards new, alternative investments avenues like infrastructure companies and funds. Consequently investors, particularly institutional investors, have been increasing their allocations to infrastructure companies and funds. The commitment to infrastructure funds grew from US\$ 4 billion in 2004 to US\$ 37 billion in 2008 and after the adverse impact of the financial crisis, from US\$ 9 billion in 2009 to US\$ 32 billion in 2010 (Source: Preqin Global Infrastructure Report, 2012). But, Asian pension funds constitute only 7 percent of the pension funds investing in infrastructure as compared to 56 percent in North America and 37 percent in Europe (Source: Preqin Infrastructure Spotlight, August 2011).

This paper is an attempt at identifying low volatility investment sectors in Indian market for constructing a low volatility portfolio. Using data from the S&P CNX Nifty Index and the CNX Infrastructure Index, it provides an analysis of the risk return

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performance of the infrastructure portfolio and the broader market portfolio in India to assess whether the former constitutes a low volatility investment in the volatile equity markets in India.

The remainder of the paper is organised as follows: the first section provides brief background on low volatility and defensive investment strategies and the characteristics of infrastructure sector that make it suitable for a low volatility and defensive investment portfolio. The next section reviews the relevant literature on the subject. The third section analyses and compares the risk return performance of infrastructure portfolio with the broader market. The final section provides the conclusion.

Low - volatility investments and Defensive Investment Strategies:

Low Volatility Strategies means using new classes of assets in the portfolio to address portfolio volatility concerns. Defensive Investment Strategy is a method of portfolio allocation and management aimed at minimising the risk of losing principal by purchasing securities that have lower volatility while returning atleast at par with the market. Traditionally, a defensive investment strategy was designed to even sacrifice returns on the investment to minimise the risk. The unprecedented uncertainty and consequent volatility in global equity markets in the past few years have rendered traditional asset allocation strategies useless to reduce overall portfolio volatility. As a consequence, new strategies were designed and new asset classes were identified to help find the right mix of investments to reduce portfolio risk. This led to introduction of defensive investment strategies and low volatility products, either to complement other equity allocations or as core allocations themselves, to increase portfolio stability in highly volatile equity markets. Hence, defensive and low volatility products are very relevant in the present day high volatility, low return environment.

Infrastructure stocks exhibit many attractive financial characteristics which make them suitable for inclusion in a low volatility portfolio. First, infrastructure is not a homogeneous sector like banks, IT, etc. It includes companies from diversified businesses that construct and operate permanent structures and facilities that a country needs for the orderly operation of its economy for example, transportation infrastructure (roads, airports, bridges, etc.); communication infrastructure (telecom services, towers, etc.); energy infrastructure (power generation and distribution, etc.); utility services (water supply, wastewater management, etc.); social infrastructure (education, health management, etc.). Secondly, infrastructure companies have assets with long, economically useful lives and enjoy natural monopolies or have significant barriers to entry, due to huge fund requirement and long gestation period of infrastructure projects. Also, the elasticity of demand for their services is low since they are providers of essential services. Their revenues are secured through long term, contractual agreements and hence, they enjoy stable cash yields. That's why this sector is less sensitive to economic cycles as compared to others. Due to these characteristics, it can be an excellent choice for a low volatility portfolio.

LITERATURE REVIEW

Clarke, De Silva and Thorley (2006), in their study, "Minimum Variance Portfolio in the US Equity Market", found that low volatility portfolios have only three fourths of the market risk and this risk reduction is not achieved at the expense of lower realized returns.

A Bloomberg CFSGAM 2009 Report has shown that earnings before interest, tax and depreciation for infrastructure companies have been more stable (grew by 10 percent through the recession) during and after global financial crisis as compared to the MSCI World Equity Index companies (which

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showed a 28 percent fall in earnings) and this sector has been consistently defensive in the current economic downturn.

Petryk A. and Manley L. August (2012) in their study, "Lower Volatility Strategies: the Upside of Downside", concluded that low volatility products like infrastructure stocks can improve asset allocation while controlling risk, and thus allow investors to reduce volatility for the same level of return.

Rodel M. and Rothballer C. (2012), in their study, "Infrastructure as Hedge against Inflation Fact or Fantasy", compared inflation hedging characteristics of infrastructure stocks and other equities for one and five year investment horizon, using the infrastructure indices and other broad equity indices across 46 countries. They inferred that though infrastructure provides better inflation coefficients than equities, the difference is not statistically significant. Also, results for inflation hedging for five year investment horizon were better than one year investment horizon.

UBS Global Asset Management in its 2011 report, "Infrastructure: a defensive component in portfolios can enhance long term overall returns", inferred that there is a sound case for investing in infrastructure as it reduces downside risk of the portfolio and increases long term returns over the economic cycle.

OBJECTIVES OF THE STUDY

The purpose of this study is to assess whether or not investment in infrastructure stocks constitutes a defensive investment strategy in the present - day volatile Indian equity markets. This can be ascertained by analysing the returns and risk performance of the infrastructure portfolio vs. the broader market portfolio. Using the CNX Infrastructure Index and the S&P CNX Nifty Index in India, the paper examines (i) whether the returns of the CNX Infrastructure Index is different from the

market benchmark Nifty and, whether the difference is significant statistically and (ii) whether there is significant difference in the volatility (risk) of the two indices under study.

Hypothesis:

The paper tests the following two hypotheses:

1. H_{01} : There is no significant difference in the returns of the broader market benchmark CNX Nifty and the CNX Infrastructure index.

H_{a1} : There is significant difference in the returns of the broader market benchmark CNX Nifty and the CNX Infrastructure index.

2. H_{02} : There is no significant difference in the risk i.e. volatility of the returns (as measured by their variances) of the CNX Nifty and the CNX Infrastructure index.

H_{a2} : The variance of returns of CNX Nifty is greater than those of the CNX Infrastructure index.

Data:

The dataset comprises of daily index data of the two stock indices viz., the CNX Infrastructure & CNX Nifty 50. The data was collected for the entire study period that ranges from January 01, 2004 (the base date of the CNX Infrastructure) to December 31, 2012, ignoring non trading days and holidays. To avoid any potential sample bias, observations have been included only if available for both indices under study. The daily index data was available for all trading days except for 7 days over the study period, when the data for the CNX Infrastructure index was not available. Corresponding data for Nifty was also removed from the dataset for the study, thus amounting to a dataset of 2244 trading days. Data of closing value of the indices has been used for the purpose of this study, which was obtained from the official website of the stock exchange. It has been assumed that all trading is done at closing value.

RESEARCH METHODOLOGY

The study is empirical in nature. The CNX Infrastructure Index has been used as a proxy for infrastructure portfolio and the CNX Nifty 50 as the proxy for the broader market. According to NSE website, CNX Infrastructure Index includes companies belonging to telecom, power, port, air, roads, railways, shipping and other utility service providers. The Index comprises of 25 companies listed on National Stock Exchange of India and represents about 75.17% of the free float market capitalisation of the companies forming part of the infrastructure sector universe as on September 28, 2012. S&P CNX Nifty is a diversified 50 stock index representing about 22 sectors of the economy and about 67.27% of the total free float market capitalisation of stocks traded on NSE (as on September 28, 2012). (Source: NSE website www.nseindia.com).

The paper provides a comparison of the risk return performance of India's sole Infrastructure Index the CNX Infrastructure Index against the benchmark CNX Nifty 50 Index. It first examines the historical price performance of the two indices over the nine year period, beginning from 1st January 2004 (the date of inception of the CNX Infrastructure Index) to 31st December 2012.

The study then compares the returns of the two indices. The stock returns have been computed using daily closing values of the CNX Nifty and the CNX Infrastructure. Symbolically, $R_t = [(P_t / P_{t-1}) - 1]$ where R_t is daily index return on day t , P_t and P_{t-1} are the closing values on day t & day $t-1$ respectively. Logarithm of daily returns has been taken to remove the base effect.

Stock return data may be characterised with unit root, which could influence the statistical estimates from such data. For performing univariate statistical procedures on the return series, randomness has been ascertained by computing autocorrelations and

stationarity testing has been done using the KPSS (Kwiatkowski Phillips Schmidt Shin) test, (which tests the null hypothesis of stationarity against the alternative of a unit root), and the ADF test.

To assess the deviation of portfolio returns from the benchmark, tracking error (standard deviation of the mismatch in index / portfolio return and benchmark return) has been computed. The significance of the difference in returns of the two indices has been determined by computing the t - statistic for the equality of means.

To assess the risk of the CNX Infrastructure index as against the market, volatility is studied. There are many ways of measuring volatility but the most common measure used is standard deviation. Hence, volatility has been calculated as the standard deviation of rolling 12- monthly log returns. F- test for the homogeneity of variances has been used to determine the significance of the difference in the variances.

ANALYSIS AND DISCUSSION

The rolling 12- monthly correlation of performance of CNX Infrastructure index with the benchmark CNX Nifty for the nine year period i.e. 1st January 2004 to 31st December 2012 is depicted in Figure 1 below. As illustrated in figure 1, the CNX Infrastructure index exhibits very high positive correlations with the market benchmark Nifty, suggesting that they move together in different market regimes, their returns are synchronised and do not provide a source of diversification for investors. Since they do not offer diversification benefits, they can be viewed as alternative investment opportunities.

Figure 2 shows the historical price performance comparison of the two indices under study for the nine year period. Right from its inception in January 2004, the Infrastructure index has recorded almost consistent outperformance as compared to Nifty.

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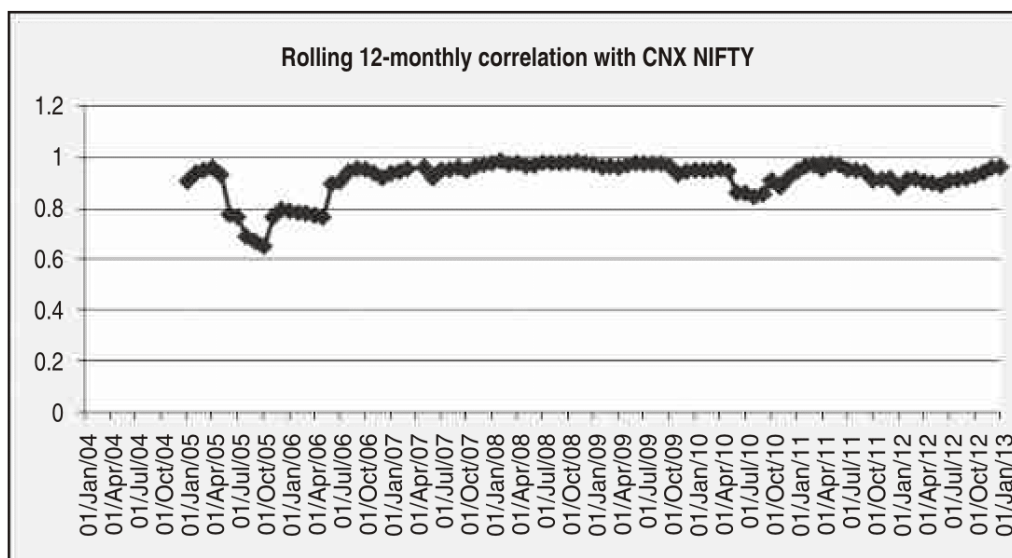


Figure 1: Rolling 12-monthly correlation with CNX NIFTY

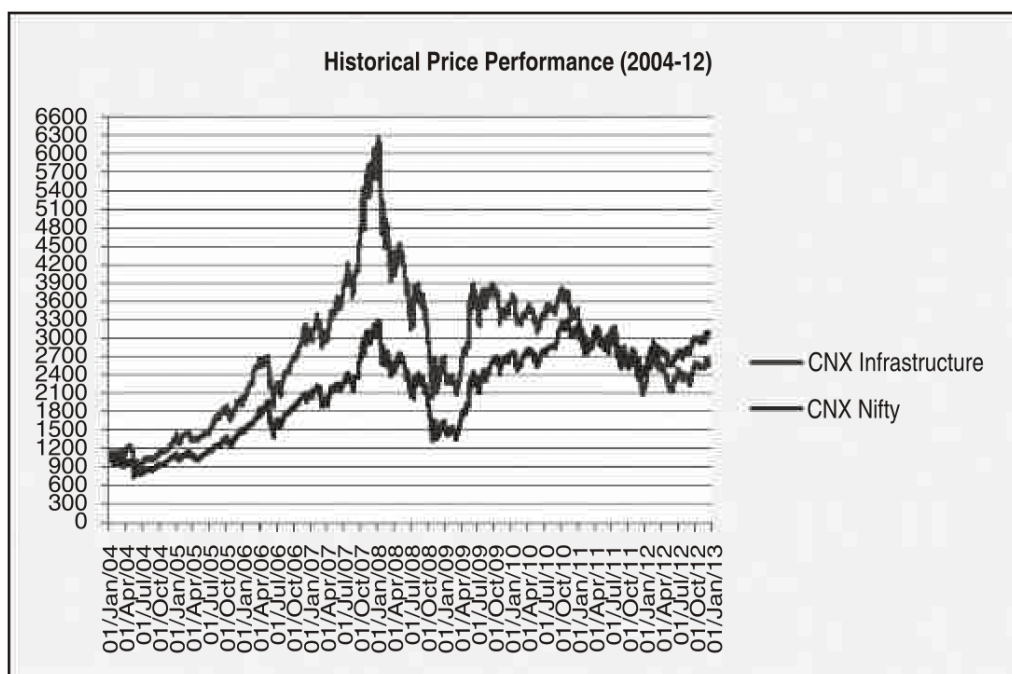


Figure 2: Historical Price Performance (2004-12) of CNX Nifty & CNX Infrastructure

The CNX Infrastructure Index has a base date of January 1, 2004 and a base value of 1000. For comparison purposes, the value of CNX Nifty on January 1st, 2004 has been normalised to a value of 1000 and all the subsequent values of the index have been computed taking the base index value as 1000.

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Table 1 & Table 2 show the output of the Augmented Dickey- Fuller test for CNX Nifty and CNX Infrastructure return series respectively.

Table 1: Output of Augmented Dickey- Fuller test for CNX Nifty series
Augmented Dickey-Fuller test for CNX Nifty including one lag of (1-L) CNX Nifty Series (max was 1)
Sample size 2241
Unit-root null hypothesis: $\alpha = 1$
1st-order autocorrelation coeff. for ϵ : 0.000
Estimated value of $(\alpha - 1)$: -0.993344
Test statistic: $\tau_{ct}(1) = -34.3034$
Asymptotic p-value 4.229e-130

Table 2: Output of Augmented Dickey- Fuller test for CNX Infrastructure return series
Augmented Dickey-Fuller test for CNX Infrastructure including one lag of (1-L) CNX Infrastructure Series (max was 1)
Sample size 2241
Unit-root null hypothesis: $\alpha = 1$
1st-order autocorrelation coeff. for ϵ : 0.001
Estimated value of $(\alpha - 1)$: -0.974188
Test statistic: $\tau_{ct}(1) = -34.1638$
Asymptotic p-value 9.557e-130

Auto correlations should be near zero for randomness. Autocorrelations in the data series are zero for both series, indicating randomness and the ADF test statistic is highly negative as compared to the critical value for both the series, indicating a rejection of the null hypothesis of a unit root and acceptance of the alternative hypothesis of stationarity.

Table 3 gives the result of the stationarity test for the return series of the two indices using the KPSS test. The same evidence has been inferred from the more powerful KPSS test as the test statistics are less than critical values.

Table 3: KPSS stationarity test result			
Stock Return Series	KPSS Test Statistic	Test Critical Values	
CNX Nifty	0.0504925	1%	0.119
		5%	0.148
		10%	0.218
CNX Infra-structure	0.0479347	1%	0.119
		5%	0.148
		10%	0.218

Thus, the two series are stationary. Hence, statistical procedures can be applied on the above return series data.

Figure 3 shows the comparison of monthly returns (in percentages) of the two indices under study. As evident from the figure, there is no meaningful difference in the returns of the two indices under study.

This is further confirmed by the tracking error computations. Since the investment time horizons can range from short term to medium term or long term; the monthly as well as the annual tracking errors of the infrastructure portfolio with respect to the market have been computed. Figure 4 shows the monthly tracking error if a portfolio is constructed comprising of all the stocks of the Infrastructure index. The tracking error is very low i.e. less than 1.5% in all the cases.

Table 4 gives the annual tracking error computations of the portfolio of infrastructure stocks.

The tracking error for all the years is less than 1% and the Average annualised tracking error is 0.730077%, which shows a slight outperformance of 0.73% by Infrastructure portfolio as compared to the market. To ascertain if this outperformance is statistically significant, the t- statistic is computed for the difference in daily returns. Table 5 shows the t-test results for the returns of the two indices.

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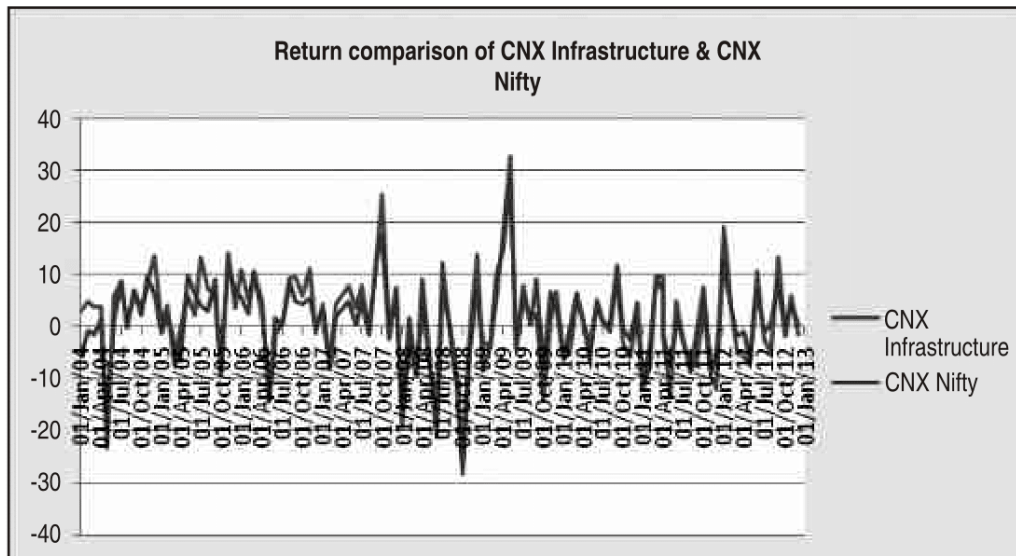


Figure 3: Return comparison of CNX Infrastructure & CNX Nifty

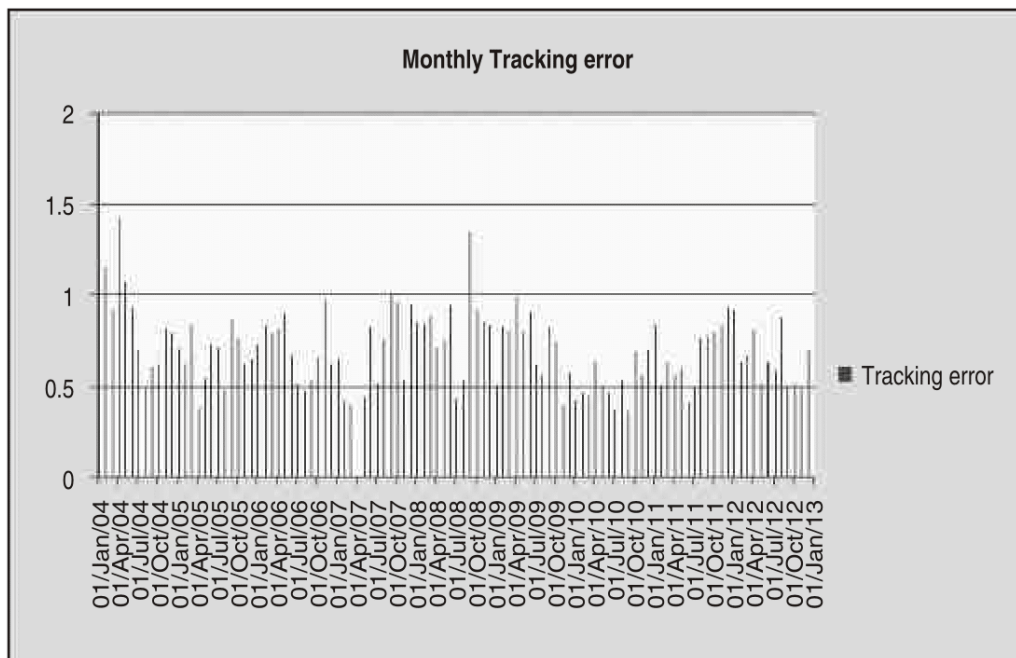


Figure 4: Monthly Tracking errors

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Table 4: Annual Tracking Error computations

Annual Tracking Error	
	in %
2004	0.976261
2005	0.698378
2006	0.723574
2007	0.658965
2008	0.863575
2009	0.762287
2010	0.510116
2011	0.678183
2012	0.699357
Average annualised tracking error	0.730077

**Table 5: T-test:
Two-Sample assuming Unequal Variances ($\alpha = 0.5$)**

	CNX Nifty	CNX Infrastructure
Mean	-0.03263	-0.01092
Variance	1.66579	1.48294
Observations	2243	2243
Hypothesized Mean Difference	0	
df	4469	
t Stat	-0.57972	
P(T<=t) one-tail	0.28106	
t Critical one-tail	1.64519	
P(T<=t) two-tail	0.56213	
t Critical two-tail	1.96049	

The computed value of t is less than t- critical for a two tailed test, which suggests that the null hypothesis cannot be rejected. Hence, the null hypothesis is accepted and it is inferred that there is no significant difference in the returns of the CNX Infrastructure and CNX Nifty at 95% level.

To ascertain if there is a difference in volatility of the two indices, the F- statistic for the homogeneity of variances is computed. Table 6 shows the F-test results for the variances of returns of the two indices.

Table 6: F-Test Two-Sample for Variances ($\alpha=0.5$)

	CNX Nifty	CNX Infrastructure
Mean	-0.032639	-0.010919
Variance	1.665794	1.482946
Observations	2243	2243
df	2242	2242
F	1.1233	
P(F<=f) one-tail	0.002964	
F Critical one-tail	1.071962	

The F- statistic computed value is 1.1233 which is greater than F- critical at $\alpha = 0.05$ level of significance. Since F computed is greater than F- critical for a upper one- tailed test, the null hypothesis that the two variances are equal is rejected. We accept the alternative hypothesis that the variance of returns of CNX Nifty Index is greater than that of CNX Infrastructure Index.

CONCLUSION

The study has important implications for investors. The study shows that investment in infrastructure stocks yields similar returns as the broader market portfolio with significantly lower risk or volatility. Hence, they allow investors to minimize volatility for a given level of return through lower risk. Thus, regardless of the market volatility level, they can be used for constructing a low volatility or defensive portfolio or as a defensive component of a risky portfolio to balance portfolio risk.

LIMITATIONS OF THE STUDY

The study has been performed using data available for the nine - year period i.e. from January-04 to December-12 only since the base date for launch of CNX Infrastructure index was January 01, 2004. This is a short period for studying index performance. Study done with data of a longer period may provide better information about performance.

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