# An Econometric Assessment of Performance of Indian Capital Market

## Leonard T Das

Eritrea Institute of Technology, Abardae, Eritrea

**Abstract**

During last two and half decades there has been a paradigm shift in Indian capital market. The applications of technology in the payment and settlement systems have made the Indian capital market comparable with the international capital markets. Now, the market features a developed regulatory mechanism and a modern market infrastructure with growing market capitalization, market liquidity, and mobilisation of resources. However, the market has witnessed its worst time with the recent global financial crisis that originated from the US sub-prime mortgage market and spread over to the entire world as a contagion. The capital market of India registered a sluggish performance. In this context, it is imperative to conduct empirical analysis to study the performance of Indian capital market. It is with this backdrop, this paper attempts to analyse the key market parameters such as market size, market liquidity, market turnover ratio, market volatility, and market efficiency of Indian capital market over a period from 2002 to 2009 so as to assess its performance. The application of time series econometric model provides the evidence of greater volatility and weak form inefficiency of the market. However, the market shows strong potential for greater market size, more liquidity and reasonable market turnover ratio.

**Keywords:** capital market, market size, market liquidity, market volatility, market efficiency
**JEL Codes:** G24, G30

## I. Introduction

Indian Capital market has witnessed a paradigm shift at par with the advanced markets of the world in the last 10 years or so. Business process, functionality, monitoring / regulating mechanisms, hardware, software etc., are all revamped to compete with the global leaders. The current stand of Indian capital market has a long history in its back. The history of the capital market in India dates back to the eighteenth century when East India Company securities were traded in the country. In 1850s, the trading was limited to a dozen brokers and their trading place was under a banyan tree in front of the Town Hall in Bombay. The location of trading changed many times, as the number of brokers constantly increased. The group eventually moved to Dalal Street in 1874 and in 1875 became an official organization known as 'The Native Share & Stock Brokers Association'. In 1895, this association acquired a premise in the Dalal Street and it was inaugurated in 1899. Thus, the Stock exchange at Bombay was consolidated. And, the orderly growth of the capital market in India began. The Bombay stock exchange got recognition in May 1927 under the Bombay Securities Contracts Control Act, 1925. The constitution of India came into being on 26th January, 1950. The constitution put the stock exchanges and the forward markets under the exclusive authority of the Government of India. In 1956, the BSE became the first stock exchange to be recognized by the Indian Government under the Securities Contracts (Regulation) Act. The 1980s witnessed an explosive growth of the securities market in India, with millions of investors suddenly discovering lucrative opportunities. Many investors jumped into the stock markets for the first time. The government's liberalization process initiated during the mid-1980s, spurred this growth. The Bombay Stock Exchange developed the BSE Sensex in 1986, giving the BSE a means to measure overall performance of the exchange.

In this context, now it is imperative to conduct an empirical analysis to appraise the performance of Indian capital market. The paper is organised as follows: section two reviews related literature, section three discusses the methodology of the study, section four analyses the Indian capital market and fifth section makes the data analysis and final section concludes.

## II. Relevant Literatures

There has been a wide range of studies concerning the Indian capital market. Several studies such as Sahni (1985), Kothari (1986), Mookerjee (1988), Lal (1990), Ramesh and Gupta (1991,1992), Raghunathan (1991), Gupta (1992) and Sinha (1993) comment upon the Indian capital market in general and trading systems in the stock exchanges in particular. Raju and Ghosh (2004) empirically observe that emerging capital markets exhibit higher intra-day volatility compared to developed markets. It is a sign of an emerging market owing to economic and socio-political variations; the volatility in the emerging markets is generally on the high side. Chakrabarti and Mohanty (2005) discuss how capital market in India is evolved in the reform period. Bajpai (2006) concludes that the capital market in India has gone through various stages of liberalisation, bringing about fundamental and structural changes in the market design and operation, resulting in broader investment choices, drastic reduction in transaction costs, and efficiency, transparency and safety as also increased integration with the global markets. The opening up of the economy for investment and trade, the dismantling of administered interest and exchange rates regimes and setting up of sound regulatory institutions have enabled time. This literature review brings into forefront the fact that the capital market literature lacks the empirical study of the performance of the Indian capital market, especially in the aftermath of global financial crisis. Therefore, in this paper an attempt has been made to study empirically the performance of Indian capital market and enrich the literature.

## III. Methodology

Indian capital market is truly an emerging market as it is significant in terms of the degree of development, volumes of trading and in terms of its tremendous growth potential. Thus, this study uses the parameters like market size, market liquidity, market turnover, market volatility, and market efficiency to gauge the performance of Indian capital market. This paper assumes the two leading stock markets of India, namely, Stock Exchange, Mumbai and NSE India as the proxies for Indian capital market. All the pertinent data have been gathered from the publications of RBI, NSE India, and SEBI and from the websites of BSE India, NSE India, RBI, and SEBI. The sample period of the study spans from 2002 to 2009.

## IV. Indian Capital Market

The 1990s is the most important decade in the history of the capital market of India. The Capital Issues (Control) Act, 1947 was repealed in May 1992. The decade was characterized by a new industrial policy, emergence of SEBI as a regulator of capital market, advent of foreign institutional investors, euro-issues, free pricing, new trading practices, new stock exchanges, entry of new players such as private sector mutual funds and private sector banks, and primary market boom and bust. The 1991-92 securities scam revealed the

inadequacies of and inefficiencies in the financial system. It was the scam, which prompted a reform of the equity market. The Indian stock market witnessed a sea change in terms of technology and market prices. Technology brought radical changes in the trading mechanism. The Bombay Stock Exchange (BSE) was subject to nationwide competition by two new stock exchanges – the National Stock Exchange (NSE), set up in 1994, and Over the Counter Exchange of India (OTCEI), set up in 1992. The National Securities Clearing Corporation (NSCC) and National Securities Depository Limited (NSDL) were set up in April 1995 and November 1996 respectively form improved clearing and settlement and dematerialized trading. The Securities Contracts (Regulation) Act, 1956 was amended in 1995-96 for introduction of options trading. Moreover, rolling settlement was introduced in January 1998 for the dematerialized segment of all companies. With automation and geographical spread, stock market participation increased. In 1996, the National Stock Exchange of India launched S&P CNX Nifty and CNX Junior Indices that make up 100 most liquid stocks in India. CNX Nifty is a diversified index of 50 stocks from 25 different economy sectors. The Indices are owned and managed by India Index Services and Products Ltd (IISL) that has a consulting and licensing agreement with Standard & Poor's. In 1998, the National Stock Exchange of India launched its web-site and was the first exchange in India that started trading stock on the Internet in 2000. The NSE has also proved its leadership in the Indian financial market by gaining many awards such as 'Best IT Usage Award' by Computer Society in India (in 1996 and 1997) and CHIP Web Award by CHIP magazine (1999).

In 2000 the BSE used the sensitive index, i.e., Sensex to open its derivatives market, trading Sensex futures contracts. The development of Sensex options along with equity derivatives followed in 2001 and 2002, expanding the BSE's trading platform. The introduction of rolling settlement system in all scrips and electronic fund transfer in 2003 reduced the settlement cycle to T+2. Indian capital market in 2007-08, thus, features a developed regulatory environment, a modern market infrastructure, a steadily increasing market capitalization and liquidity, better allocation and mobilization of resources, a rapidly developing derivatives market, a robust mutual fund industry, and increased issuer transparency. However, in the last quarter of 2008 and up to the first quarter of 2009, the capital market went through a phase of downsizing due to the direct impact of global financial crisis that originated from the USA sub-prime mortgage market. Indian capital market has seen its worst time with the global financial crisis. The most popular stock index, i.e., Sensex declined to its levels attained in December 2005. Similar decline has also been noticed for S & P CNX Nifty index. Despite the scale down of popular capital market indices up to the first quarter of 2009, Indian stock markets now provide the evidence of strong resistance to global financial contagion. This infers the strong investor confidence and well risks diversification in Indian capital markets. The Figure-1 below illustrates the trend of these index movements from January 2007 to July 2009.

**Figure-1 Movements in BSE Sensex and NSE Nifty**



BSE Sensex [Jan 2007 to July 2009]    NSE Nifty [Jan 2007 to July 2009]
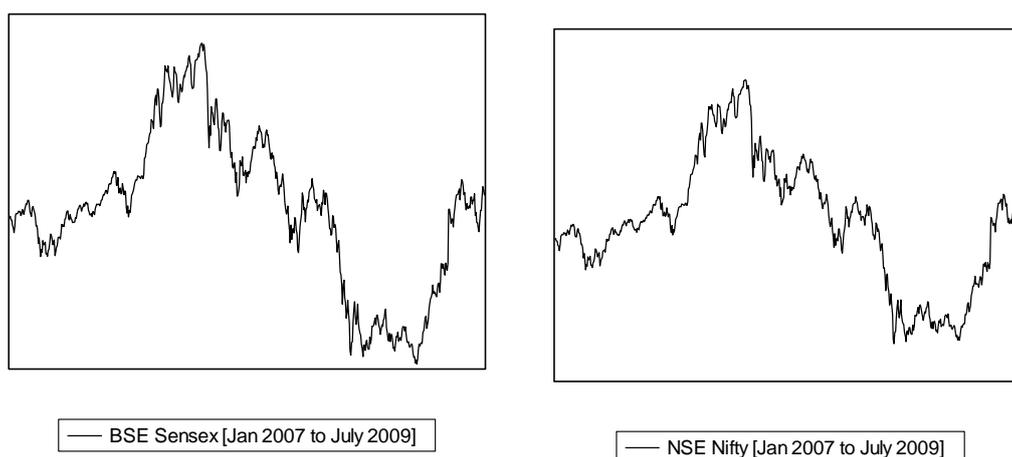
### V. Data Analysis
This section makes an empirical assessment of the performance of Indian capital market taking into account the analysis of the parameters like market size, market liquidity, market turnover, market volatility, and market efficiency over the sample period of 2002-09 by examining the annual, and the daily data.

### V.I. Market Size

The size of a capital market as measured by stock market capitalization is positively correlated with the ability to mobilise capital and diversify risk on an economy-wide basis. The size of the Indian capital market can be assessed by employing the stock market capitalisation to GDP ratio Levine and Zervos (1998). Table-1 illustrates the size ratio of Indian capital market.

**Table-1 Market Size (BSE and NSE)**

| Year | Size Ratio (BSE)% | Size Ratio (NSE)% |
|------|-------------------|-------------------|
| 2002-03 | 23.31 | 21.88 |
| 2003-04 | 43.60 | 40.69 |
| 2004-05 | 53.92 | 50.34 |
| 2005-06 | 84.41 | 78.57 |
| 2006-07 | 85.50 | 81.22 |
| 2007-08 | 109.00 | 103.07 |
| 2008-09 | 86.95 | 81.47 |

It is observed from the above table that the market size of Indian capital market is increasing over the years except in 2008-09. The last year's decline in market size is the effect of global financial crisis on Indian capital market. Thus, the overall indication is that in India the size of capital market is expanding which is the signal for strong potential of the market to mobilise capital for the economic development of the country.

### V.II. Market liquidity

Market Liquidity refers to the ability to buy and sell securities easily. Liquid capital market allows companies on the one hand, to have a permanent access to capital through equity issues and on the other hand, to allow investors to switch out of equity if they need to access funds or if they want to change the composition of their portfolios. The market liquidity is measured by the ratio of total value of shares traded to GDP. The liquidity ratio in Indian capital market is depicted in Table-2.

**Table-2 Market Liquidity (BSE and NSE)**

| Year | Liquidity Ratio (BSE)% | Liquidity Ratio (NSE)% |
|------|------------------------|------------------------|
| 2002-03 | 14.16 | 27.87 |
| 2003-04 | 20.91 | 45.76 |
| 2004-05 | 19.93 | 43.82 |
| 2005-06 | 28.71 | 55.22 |
| 2006-07 | 30.67 | 62.40 |
| 2007-08 | 33.42 | 72.72 |
| 2008-09 | 20.27 | 50.29 |

Table-2 reveals that the market liquidity of Indian capital market is increasing over years except for the year 2008-09 due to global financial contagion. But the overall performance of the ratio indicates that the Indian capital market is liquid and in particular the liquidity of NSE India is quite higher than that of Stock Exchange, Mumbai. The ratio performance of 2008-09 is also appreciable for the National stock Exchange.

### V.III. Market turnover

The market turnover gives the total value of shares traded in relation to the size of the market. It is the most important indicator of market activity. It is calculated as the ratio of total value of shares traded to the market capitalisation. The turnover ratio is also the indication of market liquidity. This ratio for Indian capital market is represented in Table-3.

**Table-3 Market Turnover (BSE and NSE)**

| Year | Turnover Ratio (BSE)% | Turnover Ratio (NSE)% |
|------|-----------------------|-----------------------|
| 2002-03 | 54.88 | 115.05 |
| 2003-04 | 41.84 | 98.08 |
| 2004-05 | 30.54 | 71.90 |
| 2005-06 | 27.00 | 55.79 |
| 2006-07 | 26.97 | 57.76 |
| 2007-08 | 30.72 | 73.09 |
| 2008-09 | 2.33 | 6.17 |

It is very clear from the Table-3 that the turnover ratio in Indian capital market is oscillatory and in 2008-09 the performance is quite disappointing. And, it is due to the US sub-prime mortgage problem that spread over to India in the third quarter of 2008-09. The low levels of turnover ratio in BSE can be interpreted as characterised by low levels of trading activities in comparison to NSE. High turnover ratio of NSE may be due to its transparency, technological sophistication, and after all may be due to the efficient payment and settlement framework.

### V.IV. Market Volatility

Market volatility is the degree to which asset prices tend to fluctuate. Volatility is the variability or randomness of asset prices. Volatility is often described as the rate and magnitude of changes in prices and in finance often referred to as risk. This research focuses particularly on time series volatility behaviour in Indian capital market. The objective is, thus, to investigate the volatility characteristics of the Indian capital market measured by fat tail, volatility clustering, and leverage effects. The volatility modelling uses daily stock returns data based on closing Sensex for BSE and Nifty for NSE over the sample period from Jan 2005 to July 2009. Daily stock returns ($R_t$) are calculated by the log difference change in the price index: $R_t = \log\left(\dfrac{I_t}{I_{t-1}}\right)$ where $R_t$ is the daily stock return at time 't' and $I_t$ and $I_{t-1}$ are the closing value of the Indices at time 't' and 't-1' respectively. The descriptive statistics pertinent to the return series so defined for Indian capital market are summarized in Table-4.

**Table-4 Descriptive Statistics**

| Statistics | BSE | NSE |
|---|---|---|
| Mean | 0.000721 | 0.000663 |
| Standard Deviation | 0.020147 | 0.020015 |
| Skewness | 0.0854 >0 | -0.02909 <0 |
| Kurtosis | 8.5935 >3 | 9.5146 >3 |
| Jarque-Bera statistic | 1465.39 with probability zero | 1996.63 with probability zero |

The measure of kurtosis suggests that the daily stock return series in Indian capital market have fatter tails than the normal distribution over the sample period. That is, the probability of extreme returns that has been observed empirically is higher than the probability of extreme returns under the normal distribution. This is termed as Lepto-kurtosis, or simply 'fat tails'. The daily stock returns series are, thus, not normally distributed – a conclusion which is confirmed by the Jarque-Bera (JB) test. The existence of fat tails indicates the time varying volatility of the Indian capital market.

Now to test the volatility clustering in Indian capital market, the daily stock return series based on closing values of Sensex and CNX Nifty over the sample period have been plotted as shown in Figure-2.

**Figure -2: MOVEMENTS IN BSE SENSEX AND NSE NIFTY**



Daily Stock Return on Sensex

Daily Stock Return on CNX Nifty
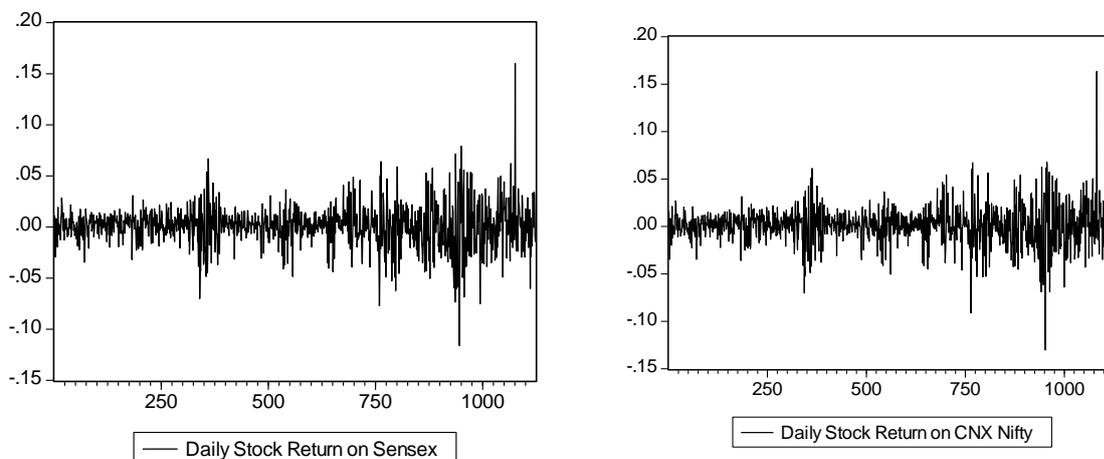
It is apparent from Figure -2 that the amplitude of daily stock returns is changing in Indian capital market. The magnitude of this change is sometimes large and sometimes small. This sort of effect is called volatility clustering. And, this volatility is higher when stock prices are falling than when prices are rising. It means that the negative returns are more likely to be associated with greater volatility than positive returns. This is called asymmetric volatility effect. But to concretely draw any inference about the event whether good news or bad news that increases volatility in Indian capital market, the regression based on Threshold GRACH(1,1) model may be estimated for the said sample period. The specification for conditional variance (volatility) in Threshold GRACH(1,1) model is:

$$\sigma_t^2 = \omega + (\alpha + \gamma I_{t-1})\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2$$

Here, the dummy variable $I_{t-1}$ is an indicator for negative innovations and is defined by: $I_{t-1} = 1$, if $\varepsilon_{t-1} < 0$ and $I_{t-1} = 0$ if $\varepsilon_{t-1} \geq 0$. In this model, good news, $\varepsilon_{t-1} > 0$, and bad news, $\varepsilon_{t-1} < 0$, have differential effects on the conditional variance; good news has an impact of $\alpha$, while bad news has an impact of $\alpha + \gamma$. If $\gamma > 0$, then bad news increases volatility, and we say that there is a leverage effect. If $\gamma \neq 0$, the news impact is asymmetric.

**Table-5 TGARCH (1, 1) Estimates of Daily Return [BSE]**

|  | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| | Variance Equation | | | |
| C | 6.02E-06 | 1.17E-06 | 5.144980 | 0.0000 |
| ARCH(1) | 0.072257 | 0.013300 | 5.432694 | 0.0000 |
| ARCH(1)*(RESID<0) | 0.099559 | 0.022720 | 4.382043 | 0.0000 |
| GARCH(1) | 0.866410 | 0.013780 | 62.87358 | 0.0000 |

The estimated form of TGARCH model for BSE is:

$$\sigma_t^2 = 0.00000602 + 0.072257\varepsilon_{t-1}^2 + 0.866410\sigma_{t-1}^2 + 0.099559\varepsilon_{t-1}^2 I_{t-1}$$

It shows that the good news has an impact of 0.072257 magnitudes and the bad news has an impact of 0.072257+0.099559 = 0.171816 magnitudes in the BSE.

**Table-6 TGARCH (1, 1) Estimates of Daily Return [NSE]**

|  | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| | Variance Equation | | | |
| C | 6.86E-06 | 1.21E-06 | 5.654239 | 0.0000 |
| ARCH(1) | 0.072563 | 0.014435 | 5.026752 | 0.0000 |
| ARCH(1)*(RESID<0) | 0.114747 | 0.023590 | 4.864339 | 0.0000 |
| GARCH(1) | 0.857896 | 0.013900 | 61.71783 | 0.0000 |

The estimated form of TGARCH model for NSE is:

$$\sigma_t^2 = 0.00000686 + 0.072563\varepsilon_{t-1}^2 + 0.857896\sigma_{t-1}^2 + 0.114747\varepsilon_{t-1}^2 I_{t-1}$$

It shows that the good news has an impact of 0.072563 magnitudes and the bad news has an impact of 0.072563 +0.114747 = 0.18731 magnitudes in the NSE. Thus, it is inferred that in the Indian capital markets, the bad news increases the volatility substantially. Also, this time varying stock return volatility is asymmetric. The change in

the pattern of volatility and the recent irregular behaviour of the stock market came as a result of the global economic events, particularly the recent sub-prime crisis and news of probable recession. Analysis depicts that this has created an unprecedented high level of volatility and could explain to some degree the recent sluggish performance of the market.

## V.V. Market Efficiency

The term 'market efficiency' is used to explain the relationship between information and share prices in the capital market literature (Mishra, 2009) and Mishra et al, 2009). An efficient capital market is commonly thought of as market in which security prices fully reflect all relevant information that is available about the fundamental value of the securities. Fama (1970) defines an efficient market as a market in which prices always reflect the recent available information and states that three different levels of efficiency exist based on what is meant as 'available information' – the weak, semi-strong, and strong forms. *Weak form efficiency* exists when security prices reflect all the information contained in the history of past prices and returns. If capital markets are weak-form efficient, then investors can not earn super-normal profits (excess profits) from trading strategies based on past prices or returns. Therefore, stock returns are not predictable, and hence follow a random walk. Under *semi-strong form efficiency*, security prices reflect all publicly available information. Investors, who base all their decisions on the information that becomes public, cannot gain above-average returns. Under *strong form efficiency*, all information - even apparent company secrets – is incorporated in security prices and thus, no investor can earn excess profit by trading on public or non-public information. The objective of this part of the study is testing the weak form efficiency in Indian capital market. And, we used the most popular unit root test to cater the need. In the class of unit root test, the Augmented Dickey-Fuller Test is considered strong enough to examine whether Indian capital market is efficient in its weak-form. The test consists of estimating the following regression:

$$\Delta R_t = \beta_1 + \beta_2 t + \rho R_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta R_{t-i} + \varepsilon_t \; ;$$

Where: $\Delta R_t$ is the first difference of the $R_t$, $\beta_1$ is the intercept, $\beta_2, \rho$ are the coefficients, $t$ is the time or trend variable, $m$ is the number of lagged terms chosen to ensure that $\varepsilon_t$ is white noise, i.e. $\varepsilon_t$ contains no autocorrelation, $\varepsilon_t$ is the pure white noise error term, and $\sum_{i=1}^{m} \alpha_i \Delta R_{t-i}$ is the sum of the lagged values of the dependent variable $\Delta R_t$. Using the stated regression, the null hypothesis ($H_0$) of a unit root i.e. $\rho = 0$ is tested against the alternative hypothesis ($H_1$) that $\rho < 0$. The acceptance of null hypothesis implies the existence of a unit root, which means the time series under consideration, is non- stationary thereby indicating that the market shows characteristics of random walk and as such is efficient in the weak form. The rejection of null hypothesis (test statistic is more negative than critical value at a given level of significance) implies the non-existence of a unit root and weak form of inefficiency of the capital market. The results of this test for a sample period from Jan 2005 to July 2009 as applicable to BSE and NSE are summarized in the Table-7.

**Table-7 ADF Unit Root Test (BSE and NSE)**

| Indian capital market | ADF Unit Root Test Result (with Trend and Intercept terms) |
|---|---|
| BSE | -30.95(0) < -3.96 at 1% level |
| NSE | -31.56(0) < -3.96 at 1% level |

Clearly, the null hypothesis of unit root in the series of index based daily returns is rejected in the capital market of India at 1% level of significance. Thus, Indian capital market is not efficient in its weak form. This market inefficiency is an indicative of sub-optimal allocation of portfolios into capital market of India. From the perspective of investors, the weak form of inefficiency can provide an opportunity for predicting the future prices thereby earning supernormal profits.

## VI. Conclusions

A modest attempt is done here to assess empirically the performance of the Indian capital market in the aftermath of the global financial crisis in terms of the key market parameters like size ratio, liquidity ratio, turnover ratio, market volatility, and market efficiency. This study provides the evidence of growing market size, market liquidity, greater volatility and weak form inefficiency of the market. The time varying volatility

study depicts that the recent sluggish performance of the market is basically due to spread of global contagion that originated from the US sub-prime crisis. However, the nature of size ratio and liquidity ratio indicates the repeat of the previous steady growth of the market. Therefore, the growth of Indian capital market has the potential to contribute to the sustainable development of Indian economy.

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