

## Stock Indicators and Macroeconomic Aggregates in India: An empirical investigation

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**Abstract:** Examination of role of stock markets in economic growth is germane for emerging market economies and a country like India because there has been tremendous increase in stock market activities post financial liberalization. The movement of stock indices is highly sensitive to the changes in fundamentals of the economy and to the changes in expectations about the future prospects. Expectations are influenced by the micro and macro fundamentals which may be formed either rationally or adaptively on economic fundamentals, as well as by many subjective factors which are unpredictable and also non quantifiable. It is assumed that domestic economic fundamentals play determining role in the performance of stock market. This implies that securities market must have a significant relationship with real and financial sectors of the economy. After the economic reforms and liberalisation policy in 1991, there was a shift from rudimentary finance to organised financial system. This pro market transformation of the Indian economy led to free price determination of various financial products and services thereby highlighting the importance of macroeconomic policy variables - national growth rate, interest rates, inflation, savings rate and urbanization. There was a spurt in the savings rate. Post-independence and until liberalisation, the composition of Indian household savings was primarily concentrated in physical assets as compared to financial assets. However in the late nineties, the share of financial savings rose in various instruments – stock market, mutual funds, market linked insurance etc. This paper investigates the interrelationship of stock market indicators with chief economic indicators of the Indian economy. This study is limited to the Indian Stock Market represented by the various stock market performances – activity measured by the Stocks traded as a percentage of GDP, liquidity measured by Stocks traded turnover ratio, and benefits represented by the Bombay Stock Exchange Sensitivity Index (Sensex). The various economic variables will include: GDP deflator, deposit and lending interest rates, gross domestic savings rate, GDP growth rate and urbanization rate. The securities market has a significant relationship with real and financial sectors of the economy. This relationship is generally viewed in two ways: stock market as the leading indicator of the economic activity in the country, and the second focuses on the possible impact, which the stock market may have on aggregate demand, particularly through aggregate consumption and investment. An examination of the impact of key economic variables on stock market investments at national level is undertaken.

**Keywords:** GDP growth rate, Gross domestic savings rate, Inflation, Interest rates, Stocks traded total value, Stocks traded turnover ratio (%), Sensex Returns, Urbanization Rate

**JEL Codes:** C22, E44, G14

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### I. Introduction

Financial markets like securities markets and financial intermediaries like banks are a critical element in the functioning of the economy that facilitates the transfer of funds for economic growth. After the economic reforms and liberalisation policy in 1991, the role of various financial markets and private players in the banking sector and securities market increased in the Indian economy. Examination of the role of stock markets in economic growth is more relevant for emerging market economies and a country like India because there has been tremendous increase in stock market activities in the last two decades. The market capitalisation to GDP ratio is an important indicator which confirms this heightened stock market activity which stood at 75.34% for financial year 2013-14<sup>2</sup>. Stock market is a remarkably good forecaster of economy. Stock markets attract the attention of economists, finance experts and policy makers because of the perceived benefits it provides for the real economy. It is the vital point of capital market activities and is often cited as a “*barometer of business direction*” (Gupta 2010).

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<sup>2</sup> <http://www.livemint.com/Money/vsTILOZ2Y6Kymsmxi2BsiP/Indias-market-captogdp-ratio-hints-at-more-room-for-upsid.html> accessed on 6th November 2015

The stock market acts as mobilizers and transferors of savings of the surplus units (household sector) to deficit units (government and industries). The stock market is a critical element in the functioning of the economy that facilitates the transfer of funds for economic growth. For sustainable economic growth and development, funds must be effectively mobilized and allocated to enable business and economies to harness their human, material, and management resources for optimal output. Stock Markets enable governments and industries to raise long term capital for financing their new projects, and expanding and modernizing industrial concerns, (*Gurusamy, 2004*). It thus contributes to economic growth through specific services it performs either directly or indirectly. Notably among the functions of the stock market are mobilization of savings, creation of liquidity, risk diversification, improved dissemination and acquisition of information, and enhanced incentive for corporate control (*Agrawalla and Tuteja, 2007*).

## **II. Stock Indices and Macroeconomic Aggregates**

The general perception is that the stock market represents the state of the economy. This throws light on the information efficiency of the Indian markets. The information efficiency of a market refers to the ability of a market to process, analyse and reflect information fully and instantly in the market prices. This type of efficiency of the market is generally discussed under three forms depending on the information set, (*Fama, 1970*). The modern financial theory focuses upon systematic factors as sources of risk and contemplates that the long run return on an individual asset must reflect the changes in such systematic factors. This implies that securities market must have a significant relationship with real and financial sectors of the economy. There exists a rich literature investigating the interrelationship of various macroeconomic variables - GDP growth rate, inflation, interest rates, money supply etc. These variables were found to have a direct relationship with stock prices. *Chen, Roll & Ross (1986)* explains the reason how economic variables have an influence on dividends-through discount rates. These macroeconomic variables are exchange rate, inflation, money supply, real economic activity, long term government bond rate and the call money rate. This is identified as “*simple and intuitive financial theory*”. Following are some of the pertinent review of literature in d Indian context which investigates the relationship between economic indicators with stock indices.

## **III. Interrelationship between Macroeconomic Indicators and Stock Prices: International Studies**

*Darrat and Dickens (1999)* investigated the interrelationship among real, monetary and financial variables in the US market represented by industrial production, money supply and S&P 500 index respectively. Their research revealed strong evidences of pronounced co integration and causal interrelationships among the three variables. This interrelationship strengthened when two additional variables – inflation and interest rates were introduced. *Pilinkus (2009)* investigated the relationships between a group of macroeconomic variable and the stock market index in the Lithuanian economy. His research revealed that GDP deflator, net export and foreign direct investment led the stock market returns. Whereas, GDP, material investment and construction volume index were led by the Lithuanian Stock Index returns. Money supply, and payment balance and the stock market returns were of a coincident nature. *Picou (2009)* examined the relationship between two relevant macroeconomic variables -adjusted leading economic indicator comprising of eight factors and yield curve and two different stock indexes - S&P 500 and Nikkei. His study found negative effect of yield curve on Nikkei and positive effect of adjusted leading economic indicator on S&P 500 for the period between Jan 1990 to May 2008. *Christopher, Rufus & Ezekiel (2009)* examined the extent to which some market factors affected the stock price in the Nigerian markets for the study period between 2001 and 2007. The market factors taken by them were earnings per share, GDP, lending interest rate and foreign exchange rate. These variables showed a positive correlation to stock prices with the exception of lending interest rate and foreign exchange rate. *Mahmood & Dinniah (2009)* examined the dynamic relationship between stock prices and three economic variables: inflation rate, industrial production index and foreign exchange rates, in six Asia Pacific countries of Malaysia, Korea, Thailand, Hong Kong, Japan and Australia from January 1993 to December 2002. Their study provided evidence of long run relationship between these variables in all the countries, thus supporting the co integration hypothesis with exception for Malaysia. In the short run no co integration was observed among the variables except between foreign exchange rates with stock price in Hong Kong and between real output and stock price in Thailand. *Horobet & Dumitrescu (2009)* explored the dynamic links between stock prices and four macroeconomic variables- GDP, consumer price index, money supply, interest rates and real exchange rates in four countries of Central and Eastern Europe viz.: The Czech Republic, Hungary, Poland and Romania

for the period from January 1998 to September 2007. Their findings were consistent with economic reasoning: the consumer price index was found to be positively related to stock prices. While the real exchange rate exhibited an opposite behavior, except for the case of Romania. The shocks in GDP determined positive responses of stock prices in all the four countries. The positive correlation of real interest rates in The Czech Republic, Poland and Romania indicated lack of liquidity in their financial markets over the period of the study. In Hungary, Poland and Romania, the money supply was found to be negatively correlated with the stock prices, indicating positive inflationary and substitution effect. *Supanvanji (2009)* found that stock prices of S& P 500 can be determined by consumer price index in the long run and the yield curve of interest rate spread in the short run for the period between 1997 -2008. *Mukherjee and Naka (1995)* established a co- integration of Stock indices of Tokyo with other macroeconomic variables for the period between 1971 to 1990. They found negative relation between inflation (CPI) and stock prices (similar to the study of Chen, Roll and Ross, 1986). The relation found between stock index of Tokyo with Index of Industrial production and long term government bond rates was positive. Negative relationship was found between stock index and call money rates.

#### **IV. Interrelationship between Macroeconomic Indicators and Stock Prices: Indian Studies**

*Bhattacharya and Mukherjee (2003a)* probed the lead lag relationship between stock prices (BSE) and three macroeconomic aggregates – real effective exchange rate foreign exchange reserves and value of trade balance in India for the period 1990 -91 to 2000-01 using unit root tests, co integration and long run granger non causality test . Their study finds no causal linkage between the stock prices and the three macro economic variables, thereby concluding that Indian stock markets are approaching towards informational efficiency. In another study by *Bhattacharya and Mukherjee (2003b)* the nature of the causal relationship between stock price and macro economic variables like money supply, national income, index of industrial production, interest rate and inflation rate was investigated for the period 1992-93 to 2000-01. No causal linkage was found between stock prices and money supply, stock prices and national income, and stock prices and interest rate. It was found that index of industrial production led the stock price, and there existed a two –way causation between stock price and rate of inflation. *Ahmed (2008)* used various macroeconomic variables viz. the index of industrial production, exports, foreign direct investment, money supply, exchange rate and interest rate to explore the long run relationship of the mentioned macroeconomic variables with NSE Nifty and BSE Sensex in India. His study revealed that stock prices in India led economic activity except movement in interest rate. Interest rate seemed to lead the stock prices. *Deb and Mukherjee (2008)* tested the causal relationships between the real GDP growth rate and the Indian stock market represented by BSE for the study period between 1996: Q4 to 2007: Q1. They took three important indicators for stock market development variables viz.: real market capitalization ratio (as size proxy), real value traded ratio (activity ratio) and stock market volatility. Real GDP growth rate is used by them as a proxy for economic development. Their research found bidirectional causality between real GDP growth rate and real market capitalization ratio and a unidirectional causality from both stock market activity and volatility to real GDP growth in Indian economy. *Sen and Ghosh (2008)* examined the impact of five macroeconomic variables – index of industrial production, Consumer price index, exchange rate of rupee against dollar, gold prices M3 (money supply) on stock market liquidity of BSE and NSE for the period December 1994 – December 2005. Their study found positive significant relationship between the macro economic variables and Stock market liquidity measured by turnover ratio and amivest liquidity ratio. *Naka, Mukherjee & Tufte (1998)* analysed the relationships among four macroeconomic variables in India, viz. industrial production index, the consumer price index, M1, the money market rate and stock market indices represented by BSE post 1990. Their research findings proved that industrial production was the largest positive determinant and inflation was the largest negative determinant of Indian Stock prices. *Srivastava (2010)* found that in the Indian markets, industrial production, WPI, and interest rates are more significant and likely to influence the long term pricing mechanism of Indian stock market. His study affirmed that the Indian stock market seems to give little importance to foreign exchange rate and MSCI world index related information in pricing mechanism, thereby concluding that in long term the Indian stock market is more driven by domestic macroeconomic factors rather than global factors.

#### **Objectives**

At this backdrop of rich literature this study aims to extend the frontier of knowledge by introducing two new variables: urbanization rate and domestic savings and measure its impact on stock market indicators. The objective investigated in this paper is:

**To investigate the important macroeconomic aggregates which impact stock market investment indicators at the national level**

Under this objective the impact of various economic indicators – inflations, domestic savings, interest rates, urbanisation rate and GDP growth rate on the stock market indicators is investigated using time series data. Under this objective the combined impact of the economic factors is tested on three national level time series indicators of stock markets: activity, liquidity and benefits.

**V. Research Methodology**

**Secondary data** on time series of stock indicators, economic indicators and quality of life indicators have been collected from World Bank Reports and reports of Ministry of Statistics and Programme Implementation (MOSPI). Data was targeted to be analyzed from 1991, since that was the era of the start of Liberalization. However due to unavailability of economic indicators data for the years 1991 and 1992 ; and unavailability of stock market indicators data of volumes and liquidity for the years 2013 and 2014 , the data was analyzed from 1993- 2012.

The annual time series data has been collected and tested for stationarity according to the Augmented Dickey Fuller’s test. Where ever the individual time series was found to be non-stationary, log differences of one and two (as applicable) have been taken to eliminate unit roots. The list of variables taken in the study are listed in Table 1.

**Table 1: List of Study variables**

S.No.	Variable Notation	Variable full name	Remarks
1	GDP_GR	GDP growth rate	Found stationary at levels
2	LNGDS	Gross domestic Savings rate	Found stationary at first difference
3	LNLEN	Average lending rates of Banks for 3-5 years	Found stationary at first difference
4	LNINFL	GDP Deflator indicator of Inflation	Found stationary at first difference
5	D(LNDEP)	Average deposit rates of Banks for 3-5 years	Found stationary at second difference
6	D(LNURB)	Urbanisation rate of India	Found stationary at second difference
7	Sensex_Returns	Log normal returns of Sensex- Indicator of stock market investment benefits	Found Stationary at Level
8	LNSTURN	Stocks traded turnover ratio- indicator of stock market liquidity	Found stationary at first difference
9	D(LNSTR)	Stocks traded ratio- indicator of stock market volumes	Found stationary at second difference

Granger Causality and Vector Autoregression tests have been applied to establish the direction of the causation and to establish long run equilibrium relationship among the study variables.

The VAR model is frequently used in forecasting interrelated time series and for evaluating the dynamic impact of arbitrary disturbances on the variables. In essence, VAR model is a multiple time series generalization of the autoregressive model. The term autoregressive in VAR model is due to the presence of the lagged value of the dependent variable .The term vector is used as the analysis involves dealing with a vector of variables. Moreover, the VAR model is a system of simultaneous equations and all the variables are considered to be as endogenous variables.

Since the results of Granger Causality could not identify a clear causation relationship among the variables chosen, further analysis of the study variables using Vector Autoregression (VAR) was conducted to establish a long run lead lag relationship among the stock market indicators and macroeconomic aggregates.

**VI. Relationship between Economic Indicators and Stock Market Indicators:  
 Empirical analysis**

**Relationship between Deposit Interest rates and Stock Market Returns**

There exists a rich literature on the interrelationship of interest rates and stock returns. Studies of *Picou 2009* (Nikkei stock Market) and *Christopher, Rufus and Ezekiel 2009* (for Nigerian market) found negative

relationship between lending interest rates and stock market returns. *Horobet and Dumitrescu (2009)* found positive relationship between real interest rates and stock prices. Indian Studies by *Srivastava (2010)* have found that in the long run stock markets in India are driven more by domestic macroeconomic factors like interest rate rates, rather than global factors. *Ahmed (2008)* found interest rates a key factor in influencing stock market movements in India. It can be so explained that as long run deposit rates of banks improve, investors divert their investable corpus from equity which has a high risk factor to safer investments like bank deposits. An unidirectional relationship was observed between Stock Market returns and deposit rates of banks. Sensex Returns Granger causes / influences Deposit rates of Banks. The results are presented in table 2. However the results of the present paper is in direct contrast to Ahmed 2008 after data has been tested for more recent times.

**Table 2: Significant relationship results of Pairwise Granger Causality Test**

Pairwise Granger Causality Tests

Sample: 1993- 2012

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
D(LNDEP) does not Granger Cause SENSEX_RETURNS	16	0.04916	0.95224
<i>SENSEX_RETURNS does not Granger Cause D(LNDEP)</i>		<b>6.44212</b>	<b>0.01406</b>

Source: Author's Calculation

## VII. Relationship between GDP growth rates and Stock Market Returns

Past studies have shown a positive relationship of economic growth and stock prices (*Christopher, Rufus and Ezekiel (2009); Horobet and Dumitrescu (2009)*). It works on the intuitive financial theory that improvement in economy boosts industrial growth, which in turns spurts the individual company performances thereby raising their stock prices. In the Indian context, the study of *Agrawalla and Tuteja (2007)* has found long run equilibrium in stock market development and economic growth. The study of *Deb and Mukherjee (2008)* found a bidirectional relationship between GDP growth and Stock Market capitalization. Results of the present paper as tabulated in table 3 confirms that GDP growth rate impacts stock market indicators – returns positively( at 5% significance level). The findings are in confirmation with the findings of previous study of *Gupta-Bhattacharya et al. 2014*. As economy grows, the demands for consumption and investment purposes increase. This increases the inflow of more funds from domestic investors towards stock market, resulting in greater demand returns delivered by stock market. Further at 10% significance level the paper unleashes two more variables which influences stock market returns in the long run. Inflation negatively influences stock market returns and past performance of stock market returns also influences future returns.

**Table 3. Vector Autoregression Estimates of Stock Market Returns**

Sample (adjusted): 1995- 2012

Included observations: 18 after  
adjustments

Standard errors in ( ) & t-statistics in [ ]

	SENSEX_RETURNS
<i>SENSEX_RET</i>	
<i>URNS(-1)</i>	-0.306025 (0.09621) [-3.18066]
<i>SENSEX_RETU</i>	
<i>RNS(-2)</i>	-0.578519 (0.11664) [-4.95997]

C	-0.545550 (0.11723) [-4.65375]
<b>GDP_GR</b>	<b>0.104575</b> <b>(0.01535)</b> [ 6.81353]
LNGDS	2.005030 (0.29680) [ 6.75558]
<b>LNINFL</b>	<b>-0.259956</b> <b>(0.08190)</b> [-3.17425]
LNLEN	1.365457 (0.32843) [ 4.15749]
D(LNDEP)	-0.315208 (0.25832) [-1.22025]
D(LNURB)	6.114013 (7.75298) [ 0.78860]
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R-squared	0.947019
Adj. R-squared	0.899925
Sum sq. resids	0.111770
S.E. equation	0.111440
F-statistic	20.10900
Log likelihood	20.19430
Akaike AIC	-1.243811
Schwarz SC	-0.798625
Mean dependent	0.088822
S.D. dependent	0.352271

Source: Author's calculations

### VIII. Conclusion

This paper finds no causal linkage between the stock market volumes and liquidity and other macroeconomic aggregates- economic growth, gross domestic savings, lending and deposit rates of banks and the rate of urbanization of the economy. However Stock market returns influences deposit rates of banks and there exists a lead lag relationship between stock returns with GDP growth rate, inflation and past returns of stock market. The results of the study conclude that Indian stock markets are still far from approaching towards informational efficiency.

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