Asymmetries in the Impact of Investor Sentiment on Equity Returns: An Analysis of the Indian Equity Market

** Saji George*
*** P. Srinivasa Suresh*

Abstract

This study, on the basis of arguments from behavioural finance literature, examined the nature of impact of investor sentiment on the returns of equity portfolios based on market capitalization. The research was carried out on the four major indices of the Bombay Stock Exchange such as : BSE Sensex, BSE 500, BSE Mid-cap, BSE Small-cap Indices over a period from April 2007 to January 2015. We found evidence of significant positive impact of past level of investor sentiment in determining the current market returns. The impact of sentiment was found to be asymmetric across stock returns of different portfolios and the magnitude of the impact of the sentiment index was found to be higher upon BSE Small-cap and BSE Mid-cap returns as compared to BSE Sensex and BSE 500. The impulse response analysis identified higher levels of positive responses in market returns up to four months into the future to a Cholesky one standard deviation shock in sentiment in the initial period, and the impact of this shock was found to be active at a decreasing rate even after 10 months in the future, confirming the delayed price adjustment processes and excess profit making opportunities in the Indian market. This primary level analysis and the findings leave certain research questions open for further in-depth investigation, specifically : the structural and policy level deficiencies which constrain faster market correction process; the implications of market sentiment upon the *momentum* formation in the market; the nature of investors and intermediaries ; and trading in medium and small cap securities in the Indian equity market.

Keywords: **market inefficiency, behavioural bias, investor sentiment, equity return formation, asymmetric sentiment effects**

JEL Classification: G00, G020, G10, G12, G14

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In recent times, every monetized and integrated economy is challenged by the task of taming wider fluctuations and financial asset losses emanating mainly from stock market crashes and run on banks as an outcome of the burst of financial bubbles and recession-related panics. At the same time, in the financial market research arena, these occurrences have raised reservations on the informational efficiency of markets, and investors' rationality based frames of market analysis. This has invigorated studies in line with the asymmetric distribution of information and the resultant micro as well as macro-level behavioral biases in the investment decision making. The literature on behavioural finance puts forward ample arguments and empirical evidences to support the role of behavioural biases in the price formation process in the markets.

Market sentiment is the aggregate outcome of heuristic behaviour based investment decision making rather than that of Bayesian rationality based investment decision of market participants. These biased investment decisions of individual investors evolve as a force that deviate stock prices away from their fundamental values. In their analysis of information diffusion among investors, Shiller and Pound (1989) found indications of contagion of investors' naive trading decisions in the market through word of mouth. The probability of making a

* *Ph.D Scholar,* Department of Economics, North Eastern Hill University, Shillong- 793 022, Meghalaya.
E-mail : sjtjohn2008@yahoo.co.in
** *Associate Professor,* Department of Economics, North Eastern Hill University, Shillong- 793 022, Meghalaya.
E-mail: sureshps03@yahoo.co.in

biased decision is inversely related to the income level of the investor (Kelly, 1997). Shiller (2000) in his book titled *Irrational Exuberance* highlighted the role of social, political, cultural, and psychological factors that lead to irrational decisions among all types of market participants, causing unsustainable price movements in the stock market. He asserted that these factors act through a mechanism of feedback loop or a ponzi process with an inbuilt force to carry forward the enthusiasm fostered by media in generating similar thinking in large diverse group of investors. The flood of investors with superficial opinions force them to land up on misleading interpretations, qualitative and moral anchors in decision making and keep away from the assessment of quantitative data. As a result, market would move to any extreme levels as investors would revise their consumption behaviour in the new situation until there comes a strong reason not to revise it.

Since overall market behaviour is the outcome of individual investors' behaviour revealed through their trading activity, the market will also have psychology, thoughts, beliefs, moods, and emotions. Therefore, the intuitive feeling of the investor community regarding the expected movement of a stock price or the market price can be termed as market sentiment. The experimental studies in market psychology and investors' behavioural biases (Kahneman & Tversky, 1979, 1983 ; Simon, 1959, 1978; Tversky & Kahneman, 1973, 1974) also have corroborated this line of market analysis. Zouaoui, Nouyrigat, and Beer (2011) empirically examined the influence of investor sentiment on the probability of occurrences of stock market crises over the period from 1995-2009 using panel data of 15 European countries and United States. They found that the sentiment of investors positively influenced the probability of occurrence of market crisis within the 1-year horizon ; stronger impact of sentiment on the stock market was found in those countries which were culturally more prone to herd like behaviour, and also in countries with low regulatory institutions.

There is a growing apprehension about whether the performance of the Indian stock market is really an indicator of market fundamentals, and it has raised concern in different quarters. Many research studies have also pointed out the statistically insignificant association between stock market movements and economic growth. These evidences indicate the inefficiency of the market in incorporating stock specific as well as market specific information into asset prices contrary to the arguments of the efficient market hypothesis. Most of the studies in behavioural finance that are carried out on the Indian market have identified Indian investors being influenced by various psychological factors. Similarly, there were also attempts to understand the influence of individual psychological traits in the performance of the Indian equity market. However, since the overall market performance is the outcome of all these factors, an analysis of their impact on market indicators with an aggregate measure of market sentiment is essential and that has been scarcely attempted in the Indian context.

This study specifically examines the impact of market sentiment on equity returns in the four major indices of Bombay Stock Exchange (BSE) separately such as BSE Sensex, BSE 500, BSE Mid-cap, and BSE Small-cap. Each of these indices, though from the same exchange, is distinguished by the unique feature of stocks considered in their construction. S&P BSE Sensex is the free-float market weighted index of well-established and financially sound 30 companies from various industrial sectors listed on the BSE. The S&P BSE 500 index represents nearly 93% of the total market capitalization on BSE, and it covers 20 major industries of the economy. BSE Mid-cap and BSE Small-cap cover medium capitalization and small capitalization companies respectively. This analysis on the nature of sentiment dynamics across these different types of portfolio returns adds to the behavioural finance literature with the evidences of asymmetric influences of market sentiment in emerging market economies. The findings of this study are also of importance for investor community in pricing of equities, index linked derivatives and funds, and for the construction of their portfolios.

Survey of Literature

(1) Market Sentiment and Returns - Empirical Evidences : Market sentiment is positively associated with contemporaneous excess market returns and is negatively related to the return volatility (Bandopadhyaya & Jones, 2005 ; Lee, Jiang, & Indro, 2002 ; Neal & Wheatley, 1998). At the same time, it is a contrary indicator of future market returns (Zhang, Deng, & Yang, 2010). Higher current period sentiment levels lead to relatively

lower future period returns (Lee et al., 2002) especially in stocks like : younger stocks, small stocks, unprofitable stocks, non-dividend paying stocks, high volatility stocks, extreme dividend paying stocks, and distressed stocks, which are attractive to optimists and speculators and are difficult to value (Baker & Wurgler, 2006 ; Kumar, 2009). Corroborating this, Li (2010), in his study on the Chinese market, also found that when sentiment at the beginning of a period was low, growth stocks yielded relatively lower returns than value stocks ; when sentiment at the beginning of a period was high, growth stocks tended to have higher returns than value stocks.

Investor sentiment influences cross sectional stock returns differently in bull and bear markets. The effect of sentiment is more influential in bear markets. Lutz (2013) found a positive relation between sentiment and future returns during sentiment expansion periods, but the relation was found to be reversing during sentiment contractions. Over the periods of negative sentiments, excess returns were found to be more sensitive to changes in sentiments than in periods of positive sentiments (Daszynska - Zygadlo, Szpulak, & Szyszka, 2014). Brown and Cliff (2004) reported that the investor sentiment is being affected by previous and contemporaneous market performance and psychological biases of investors, especially of individual investors, in their investment decision making. Lutz (2010) found inconsistencies and potential structural breaks in sentiment measures that may often lead to conflicting results on the effect of market sentiment on the stock market.

(2) Behavioural Bias in the Indian Stock Market : Thenmozhi and Chandra (2013) found a statistically significant negative relationship between stock market returns and the Indian Volatility Index (India VIX), an investor fear gauge index that represents investors' risk aversion. However, in the case of high upward movements in the market, both these variables were found to be moving independently. Similarly, when the market took a sharp downturn, the relationship was not significant for higher quintiles. The prevalence of overconfidence, disposition effect, and herd behaviour in the Indian stock market was reported by Prosad (2014). Herd behaviour was mostly found in bull phases in the overall market, and it reduced the return dispersions. The study noted past volatility to be one of the decisive factors behind pessimism in the market. On examination of relative effects of disposition effect and overconfidence within and across investor categories in the Indian market, De, Gondhi, and Sarkar (2011) observed lowest degree of both biases among financial institutions. Individual investors were found to be displaying the highest disposition effect, while non-financial corporations evinced the highest degree of overconfidence. Wealth loss due to these biases was higher for individual investors. It was also found that an average individual Indian investor appeared to have higher disposition coefficient as compared to those in other countries.

Sehgal, Sood, and Rajput (2009), through a questionnaire based survey, identified that factors such as real GDP, corporate profits, ratio of inflation, levels of interest rate, and liquidity in the economy, put-call ratio, advance decline ratio, earnings surprises, P/E ratio, price to book value, corporate governance, and investor grievance redressal mechanism affected market sentiment in the Indian market. The study also reported that the Indian investors' perception had a bidirectional relationship between stock returns and market sentiment. Similarly, Bennet, Selvam, Vivek, and Shalin (2012), based on a questionnaire based survey, found that factors such as herd behaviour, internet led access to information and trading, macro-economic factors, risk and cost factor, performance factor, confidence level of institutional investors, and game in town, and so forth significantly influenced investors' sentiment in the Indian market.

Chandra and Kumar (2012), based on a survey data of more than 350 individual investors, identified that prudence and precautionary attitude and information asymmetry played a significant role in determining individual investors' behavior apart from the conventional psychological biases such as conservatism and overconfidence in the Indian market. The study also noticed the existence of asymmetric pattern of distribution and usage of information among individual investors in the market. Labroo (2013) reported that the daily stock returns, market volatility, and investor sentiments were affected by global as well as local events such as the terror attack in Mumbai, Satyam IT scam, Middle East crisis, oil price fluctuations, and the global financial crisis.

Research Issues

Many research studies in the post reform period have pointed out statistically insignificant association between stock market movements and economic growth in India. This draws our attention to questions such as : Is Indian market sentiment driven? or is it such an establishment, which neither reflects economic fundamentals nor indicates information-based expectations of investors - that moves up and down based on the liquidity based bargaining power of the participants. If the market is sentiment driven, what is the nature of sentiment impact on the equity market returns, how the market reacts to the ups and downs of the sentiment ? and how it is related to the cross sectional variation in stock returns ? The literature in behavioural finance attributes this discrepancy of the market to psychological bias of investors and aggregate market sentiment. From the review of literature, it can be deduced that inefficiency in the price discovery process occurs mainly because of the naïve trading behaviour of investors. The factors such as income level of the investors ; changes or shocks in social, political, cultural, and psychological realms ; and technological advancements have a bearing on the investment decisions of investors and can collectively attribute the market with psychology, thought, beliefs, moods, emotions, and so forth.

The Indian economy, with all the features of an emerging economy, has been experiencing high level of transformation in all its realms, especially in the capital market from the beginning of the 21st century. Moreover, the sentiment persistent factors such as arbitrage limits, synchronization problem of arbitrageurs, heterogeneous investor base, disproportionate information accessibility and distribution, and higher role of intermediaries are prevalent in the market. Bennet et al. (2012), Labroo (2013), and many other studies have pointed out that the investor sentiment in the Indian market was affected by technological advancements and domestic & international socio-political and economic development. Therefore, an examination of the role of sentiment in driving market indicators is of high relevance. Moreover, the literature on the dynamics of market sentiment is mostly based on the findings from developed markets. Therefore, with all uniqueness of the Indian market among the emerging-market economies, a study on the role of market sentiment in Indian market will be valuable.

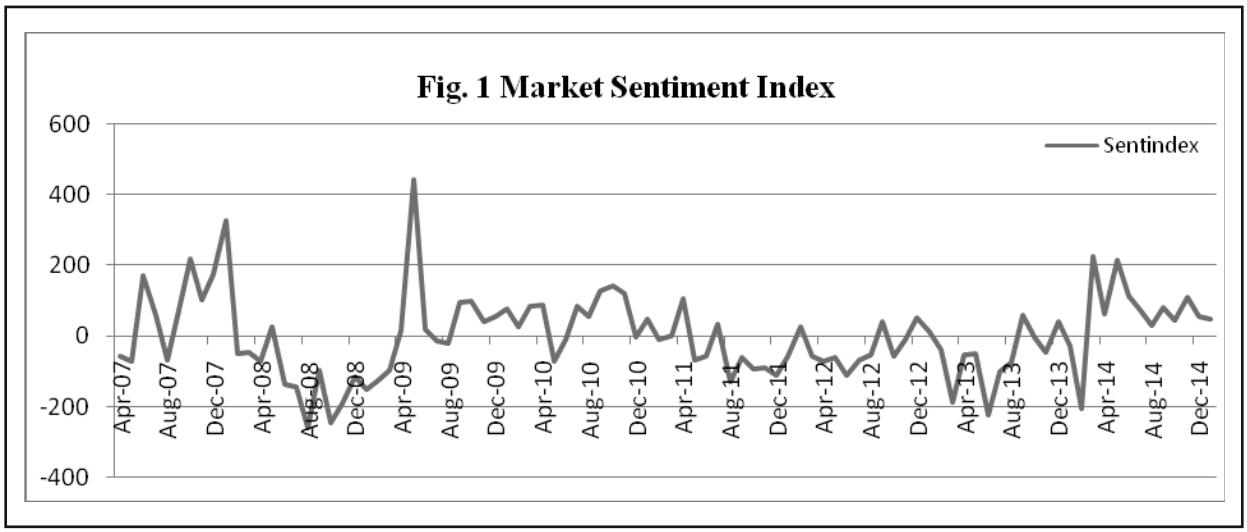
Most of the studies in behavioral finance that are carried out on the Indian market have identified Indian investors being influenced by various psychological factors. Similarly, as mentioned in the literature review section, attempts have been made by researchers to understand the influence of individual psychological traits in the performance of the market. However, since the overall market performance is the outcome of all these factors, an analysis of their impact on market indicators with an aggregate measure of market sentiment is essential, and that has been scarcely attempted in the Indian context. This study, by constructing a composite index of market sentiment, examines the impact of market sentiment upon current equity market returns. The research is carried out on all the four major indices of BSE such as BSE Sensex, BSE 500, BSE Mid-cap, BSE Small-cap indices, as each of them are unique in their features and reflect different characteristics of the equity market.

Data and Methodology

The study is carried out on monthly data for the period from April 2007 to January 2015. In order to analyze the impact of market sentiment on the return formation process, there is a need for a measure of market sentiment, which is unobservable. We constructed a sentiment index, following a similar approach of Baker and Wurgler (2007) and Dash and Mahakud (2012), and have made use of data on the sentiment proxy measures such as net of buy-sell of each investor category, advance decline ratio, market trade volume, IPO index, new equity issues, price-earnings ratio, price - book ratio, and so forth to construct a composite sentiment index. All the required data were retrieved from databases of the Bombay Stock Exchange (BSE) and Reserve Bank of India (RBI).

Empirical Analysis and Results

(1) A Brief Note on the Sentiment Index Used : The sentiment proxy measures such as net of buy-sell in different



investor accounts such as client *(Cln)*, non - resident Indians *(NRI)*, foreign institutional investors *(FIIs/FPI)*, domestic institutional investors *(DIIs)*, and proprietary accounts *(Pro)*; advance decline ratio *(Ad)*, market trade volume *(TV)*, IPO index *(IPO)*, new equity issues *(New Issues)*, price-earnings ratio *(PE)*, and price - book *(PB)* ratio were used to construct the composite sentiment index. The data, after *Z* standardization, was directly used for the principal component analysis without eliminating the influence of real economic fundamentals. There were five components whose eigen-values were above one. The first two principal components explain 27.9% and 23% of the variability in the data, respectively. Since the influence of economic fundamentals were not eliminated in the first stage, we examined the correlation coefficient of first five principal components with the standardized fundamental economic variables such as average call money rate *(Callmoneyrate)*, industrial production index *(IIP)*, foreign trade balance *(Trade balance)*, fiscal deficit *(Fiscal deficit)*, and wholesale price index *(WPI)*.

Since each principal component is linearly uncorrelated, we assumed that the component that has the lowest correlation with economic fundamental variables and higher level of correlation with sentiment proxies should hold the irrational factor component. We observe that among the components, the second principal component *(PC2)* has the lowest and insignificant correlation coefficients with fundamental economic factors, but it also evinces higher correlation with the sentiment proxy variables compared to that of other principal components. Therefore, based on this statistical evidence, we consider the second principal component as our measure of market sentiment *(Sentindex)*. The factor loadings of each proxy variable in the second principal component are taken as their weights in the *Sentindex* equation.

$$Sentindex_t = -0.409Clnstd_t - 0.287NRIstd_t - 0.357*Prostd_t - 0.159*FIIsstd_t - 0.176*DIIsstd_t + 0.14*IPOstd_t + 0.280*ADstd_t + 0.361*TVstd_t + 0.328*NewIssuestd_t + 0.307*Pestd_t - 0.185*Pbstd_t \quad .....(1)$$

The Figure 1 portrays the movement of *Sentindex* from April 2007 to January 2015. The index records periods of positive upward momentum in the market sentiment in the periods : April 2007 - January 2008 ; April 2009 - May 2011 ; and February 2014 - January 2015. The other periods were stained with pessimism in the market. The year 2008 witnessed contagion effects of the global financial crisis, Mumbai terror attack, last term of 1st UPA rule, and reversal of FII inflows. The market experienced loss of retail investor confidence in the years that followed. The ratio of retail investment turnover to total turnover touched its decadal lowest points in 2013. It is only by 2014 that retail investments showed signs of return to the market. The sentiment index well captures quite a long period of pessimism that the market went through from Q2 of 2011 to February 2014.

Table 1. Correlation Co-efficients of *Sentindex* and Market Index Returns

	***Sentindex* and its various lags**					
	0	**(-1)**	**(-2)**	**(-3)**	**(-4)**	**(-5)**
BSE30rt	0.2157	0.246207	0.463169	0.363879	0.018939	0.076347
BSE500rt	0.219957	0.25461	0.488446	0.399959	0.033111	0.076082
BSEMIDCAPrt	0.203233	0.239664	0.508248	0.449212	0.0789	0.089887
BSESMLLCAPrt	0.226284	0.252045	0.542238	0.470774	0.072923	0.098499

Data Source: Bombay Stock Exchange

Table 2. Granger Causality Test: Sentiment and Market Returns

Sample: 2007M04 2015M01, Pairwise Granger Causality Tests		
Lags: 3, Observation.91		
Null Hypothesis:	***F*- Statistic**	**Prob.**
BSE30rt does not Granger Cause SENTIMENTPC2	2.37713	0.0988
Sentindex does not Granger Cause BSE30RT	12.761	1.00E-05
BSE500rt does not Granger Cause SENTIMENTPC2	2.89842	0.0604
Sentindex does not Granger Cause BSE500RT	13.9542	6.00E-06
BSEMIDCAPrt does not Granger Cause SENTIMENTPC2	3.7368	0.0277
Sentindex does not Granger Cause BSEMIDCAPRT	14.3939	4.00E-06
BSESMLLCAPrt does not Granger Cause SENTIMENTPC2	4.50665	0.0137
Sentindex does not Granger Cause BSESMLLCAPRT	17.0626	6.00E-07

Data Source: Bombay Stock Exchange

(2) Market Sentiment and Market Returns : In this section, we examine the relationship between the market sentiment and return of the broad market indices of BSE such as BSE Sensex *(BSE30rt)*, BSE 500 index *(BSE500rt)*, BSE Mid-Cap index *(BSEMIDCAPrt)*, and BSE Small-Cap index *(BSESMLLCAPrt)*. The returns are calculated based on the following formula :

$$r_t = In\left(\frac{P_t}{P_{t-1}}\right)$$

where,
r_t is the rate of return,
P_t and P_{t-1} are the current and one period lagged (one month) index points.

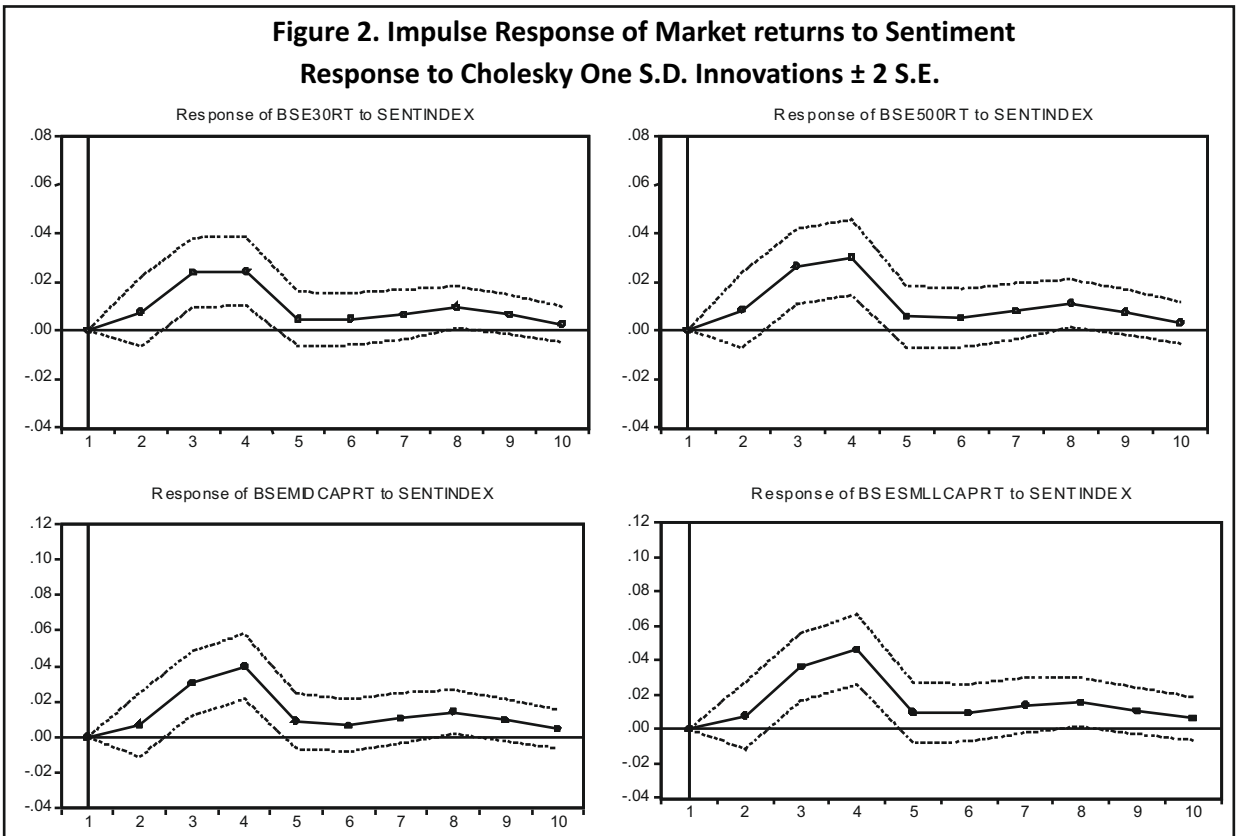
As the first step, we have considered the correlation across five lag periods of sentiment index to current index returns to get a gist of the nature of relationship between the concerned variables over periods. The Table 1 presents the results of this analysis. It is observed that the contemporaneous correlation between sentiment index and the index returns are comparatively lower. As the sentiment lag increases, they evince an increasing trend, especially in the first three lags of sentiment index, which further declines to lower levels at higher lags. Therefore, it is an indication of the possibility of time lagged influence of market sentiment on the market returns.

From among the four different broad market portfolio returns considered, the BSE small-cap portfolio returns show the highest degree of positive correlation with market sentiment followed by BSE mid-cap returns; BSE 500 returns and BSE Sensex returns are in descending order of degree of correlation. In light of these observed evidences of comovement between these variables, we further venture to examine the nature of causality between market sentiment and returns movements using paired Granger causality test (Granger, 1969). The Granger causality was tested for 3 lags as per Akaike Information Criterion (AIC). The Table 2 reports the results with *F*-

statistic and *p*-values of the respective null hypotheses tested.

The test fails to reject the null hypothesis of no Granger causality from returns to market sentiment at 1% level of significance in all cases ; whereas, when we consider 5% level of significance, BSE mid-cap and BSE small-cap returns show a significant granger causality running from returns to market sentiment. At the same time, no causality hypotheses are rejected at both levels of significance in case of Granger causality from *Sentindex* to

Figure 2. Impulse Response of Market returns to Sentiment



Data Source: Authors Calculations

Table 3. BSE Sensex Index Returns and Market Sentiment

$BSE30rt_t = \theta_1 BSE30rt_{t-1} + \theta_2 BSE30rt_{t-2} + \theta_3 BSE30rt_{t-3} + \theta_4 Sentindex_{t-1} + \theta_5 Sentindex_{t-2} + \theta_6 Sentindex_{t-3} + \theta_7 + \varepsilon_t$

	θ_1	θ_2	θ_3	θ_4	θ_5	θ_6	θ_7
Coeffi.	-0.1031	-0.1850	-0.034	0.0038	0.02450	0.017557	0.01163
Std. Error	0.1059	0.095659	0.0979	0.0066	0.00680	0.007227	0.006911
t-Statistic	-0.9738	-1.9348	-0.350	0.5764	3.5988	2.4294	1.6829
Prob.	0.3329	0.0564	0.7271	0.5658	0.0005	0.0173	0.0961

R-squared. 0.289305, Adjusted *R*-squared. 0.238541 — Wald Test: Null hypothesis: $\theta_4 = \theta_5 = \theta_6 = 0$

Breusch-Godfrey Serial Correlation LM Test:

Null Hypothesis. No serial correlation in the residual terms				***Test Statistic***	***Value***	***df***	***Prob.***
F-statistic	0.967	Prob. *F* (3,81)	0.412	*F*-statistic	10.244	3, 84	0.00
Obs**R*-sq	3.147	Prob. Chi-Sq(3)	0.369	Chi-sq	30.732	3	0.00

Data Source: Bombay Stock Exchange

Table 4. BSE 500 Index Returns and Market Sentiment

$BSE500rt_t = \theta_1 BSE500rt_{t-1} + \theta_2 BSE500rt_{t-2} + \theta_3 BSE500rt_{t-3} + \theta_4 Sentindex_{t-1} + \theta_5 Sentindex_{t-2} + \theta_6 Sentindex_{t-3} + \theta_7 + \varepsilon_t$

	θ_1	θ_2	θ_3	θ_4	θ_5	θ_6	θ_7
Coeffi.	-0.0842	-0.1827	-0.0655	0.00398	0.02813	0.021632	0.011874
Std. Error	0.1049	0.0935	0.0965	0.00721	0.00732	0.00788	0.00741
t - Statistic	-0.8024	-1.9534	-0.6791	0.55296	3.84011	2.74378	1.60192
Prob.	0.4246	0.0541	0.4989	0.5818	0.0002	0.0074	0.1129

R- squared.0.3246, Adjusted R-squared. 0.2763 — Wald Test: Null hypothesis: $\theta_4 = \theta_5 = \theta_6 = 0$

Breusch-Godfrey Serial Correlation LM Test:

Null Hypothesis. No serial correlation in the residual terms				**Test Statistic**	**Value**	***df***	**Prob.**
F - statistic	0.874	Prob. *F*(3,81)	0.457	*F*-statistic	12.027	(3, 84)	0.00
Obs*R-sq	2.856	Prob. Chi-sq(3)	0.414	Chi-sq	36.082	3	0.00

Data Source: Bombay Stock Exchange

Table 5. BSE Mid-Cap Index Returns and Market Sentiment

$BSEMidrt_t = \theta_1 BSEMidrt_{t-1} + \theta_2 BSEMidrt_{t-2} + \theta_3 BSEMidrt_{t-3} + \theta_4 Sentindex_{t-1} + \theta_5 Sentindex_{t-2} + \theta_6 Sentindex_{t-3} + \theta_7 + \varepsilon_t$

	θ_1	θ_2	θ_3	θ_4	θ_5	θ_6	θ_7
Coeffi.	0.0100	-0.1673	-0.0376	0.00067	0.03371	0.026028	0.008922
Std. Error	0.1046	0.0931	0.0961	0.00845	0.00851	0.009227	0.008531
t -Statistic	0.0959	-1.7964	-0.3911	0.0799	3.96165	2.820924	1.045893
Prob.	0.9238	0.076	0.6966	0.9365	0.0002	0.006	0.2986

R-squared.0.3534, Adjusted *R*-squared. 0.3072 — Wald Test: Null hypothesis: $\theta_4 = \theta_5 = \theta_6 = 0$

Breusch-Godfrey Serial Correlation LM Test:

Null Hypothesis. No serial correlation in the residual terms				**Test Statistic**	**Value**	***df***	**Prob.**
F-statistic	0.7172	Prob. *F*(3,81)	0.5446	*F*-statistic	12.413	(3, 84)	0.00
Obs**R*-sq	2.3547	Prob. Chi-Sq(3)	0.5021	Chi-sq	37.239	3	0.00

Data Source: Bombay Stock Exchange

Table 6. BSE Small-Cap Index Returns and Market Sentiment

$BSESmlrt_t = \theta_1 BSESmlrt_{t-1} + \theta_2 BSESmlrt_{t-2} + \theta_3 BSESmlrt_{t-3} + \theta_4 Sentindex_{t-1} + \theta_5 Sentindex_{t-2} + \theta_6 Sentindex_{t-3} + \theta_7 + \varepsilon_t$

	θ_1	θ_2	θ_3	θ_4	θ_5	θ_6	θ_7
Coeffi.	-0.0496	-0.1538	-0.0234	0.0001	0.0407	0.0325	0.0083
Std. Error	0.1037	0.0901	0.0936	0.0092	0.0092	0.0102	0.0092
t-Statistic	-0.4783	-1.7075	-0.2506	0.02036	4.4055	3.1719	0.9044
Prob.	0.6336	0.0914	0.8027	0.9838	0.0000	0.0021	0.3683

R-squared.0.3900, Adjusted *R*-squared. 0.3464 — Wald Test: Null hypothesis: $\theta_4 = \theta_5 = \theta_6 = 0$

Breusch-Godfrey Serial Correlation LM Test:

Null Hypothesis. No serial correlation in the residual terms				**Test Statistic**	**Value**	***df***	**Prob.**
F-statistic	1.0249	Prob. *F* (3,81)	0.3861	*F*-statistic	15.020	(3, 84)	0.00
Obs**R*-sq	3.3280	Prob. Chi-Sq(3)	0.3438	Chi-sq	45.060	3	0.00

Data Source: Bombay Stock Exchange

market returns. This test confirms that market sentiment has a significant impact on the return formation in the Indian equity market, and also, the relationship is bi-directional in case of BSE Mid-cap and Small-cap broad market portfolios.

(3) Impulse Response of Market Returns to Shocks in Market Sentiment : We further examined the impulse response relationship between market returns and sentiment index by tracing out the effect of an exogenous shock or innovation in market sentiment upon market returns in order to substantiate our previous findings. Cholesky decomposition is adopted to transform the variable to introduce shock in the sentiment variable, and it was examined for the impulse response over the 10-month horizon. The Figure 2 depicts the response of different index returns to Cholesky one standard deviation innovation introduced into market sentiment.

It is observed that the responses of market returns are positive in all the 10 periods and reach their peak mostly in time period 3 and 4, which declines to lower levels thenceforth. But the effect does not die completely from the system even after 10 periods. It is an indication of the persistence of behavioural bias in the return generating process in all the markets considered.

(4) Impact of Market Sentiment on Market Returns - Vector Autoregressive Analysis (VAR) : We further look into the return explanatory power of market sentiment on the basis of the evidences observed in the previous analysis. Since the log-returns of market indices and the *Sentindex* are stationary at level form based on ADF test and ,therefore, being not co-integrated, we adopted unrestricted vector autoregressive analysis (VAR) which provides a systematic way to capture dynamics in the variables. In vector auto-regressions, all the variables are treated symmetrically in the form of system equations. In the case here, two variables; returns and *Sentindex*, are considered. Each variable is expressed as a linear function of its own past values, and past values of the other variables in two equations and are estimated by the ordinary least squares (OLS) method. The error terms represent the surprise movements in the variables after taking the past values into account. The lags are selected based on Akaike Information Criterion (AIC).

The model with minimum AIC value is considered for analysis. Since the objective of this analysis is to examine the impact of sentiment on market equity returns, we report here only the results of the regression equations of returns on market sentiment from among those system equations. Each of these linear equations expresses the change in the respective market returns with respect to its own time lagged values, and time lagged values of market sentiment. The coefficients of each term in the equation represent the marginal effect of a unit change in the respective independent variables upon the market returns. The analysis is carried out for all the four market indices as they individually represent different features of the equity market. Tables 3, 4, 5, and 6 report the regression results for BSE Sensex, BSE 500, BSE Mid-cap, and BSE Small-cap indices in sequence, together with the Breusch-Godfrey Serial Correlation LM Test and Wald test results.

Tables 3 to 6 show the results of regression equations of different index returns on market sentiment drawn from the VAR system equations selected based on AIC criterion. We find statistically significant impact of sentiment index at two and three lags upon current return of BSE indices at the 5% level of significance. The effect of immediate past one-month sentiment is found to be insignificant in all the cases considered. The results exhibit comparatively higher magnitude of impact of market sentiment upon the Small-cap index returns. The Wald test results also confirm significant departure of coefficients of market sentiment from zero, which substantiates the findings of the analysis. In all the four cases, the residual terms are free from the autocorrelation problem as the BG test fails to reject the null hypothesis of no serial correlation in them. These models are also found to be dynamically stable over time as their respective CUSUM (cumulative sum) statistics (not reported), which are based on the residuals from the recursive estimates, are found to be drawn from the CUSUM distribution.

Research Implications, Limitations of the Study, and Scope for Further Research

This study has examined the impact of market sentiment upon the returns of four selected portfolios of stocks over a period of 9 years. It is found that there is a significant positive impact of past level of market sentiment in determining the current market returns. At the same time, the impact of previous one-month period sentiment level upon current market return is found to be insignificant in all the cases considered for the analysis. These evidences can be an indication of the presence of conservatism bias in the Indian equity market. Conservatism bias is the psychological trait of individuals that is related to the belief revision of the decision maker in the presence of new information. This behavioural trait causes people to update their beliefs slower than according to the Bayes's rule that serves as a standard of rationality in financial economics (Edwards, (1968), as cited in Chan, Frankel, & Kothari, 2004). This bias renders the investors an opportunity to predict the returns and earn excess profits. This empirical finding is in line with the findings of Chandra and Kumar (2012) from their survey based study of investor behaviour in the Indian market. It has also been observed from the Granger causality test that in case of BSE Mid-cap and BSE Small-cap indices, the portfolios are constructed based on market capitalization, having significant bidirectional causality between their respective return movements and market sentiment index, and this finding corroborates the arguments of Brown and Cliff (2004).

The impact of sentiment is found to be asymmetric across stock returns of different portfolios. The magnitude of impact of sentiment index is found to be higher upon BSE Small-cap and BSE Mid-cap returns compared to that of BSE 500 index, representing the stocks of varying characteristics from the economy and often biased by the movement of stocks of larger market capitalization, and that of BSE Sensex, representing the most sensitive stocks of well-established and large companies. This supports the arguments of Baker and Wurgler (2007) that younger stocks, small stocks, unprofitable stocks, non-dividend paying stocks, high volatility stocks, extreme dividend paying stocks, and distressed stocks are highly affected by market sentiment.

The impulse response analysis identified higher levels of positive responses in the market returns up to four periods into future to a Cholesky one standard deviation shock in sentiment in the initial period. The impact of this shock remains active at a decreasing rate even after 10 periods in the future. This result is the reaction of the market returns to an initial shock in market sentiment, but, in the real-world scenario, shocks to the investor sentiment are more frequent. Considering the features of the Indian market, with quite diverse investor groups, wherein market frictions are rampant, this finding questions the level of divergence of the price discovery process from the true value and applicability of pricing models based on rational expectations. They also back up the divergence between the economic fundamentals and stock market performance in the Indian market reported in the literature in the post reform period, ruling out the status of market indices as the barometer of economic growth.

Overall, these observations broadly confirm the role of behavioural biases in the Indian equity market, and the resultant delayed market correction processes and excess profit making opportunities in the intermediate horizon from the Indian market. At this juncture, recognizing the present diverse market participation base as well as the market's fragility to fictitious efforts, which affect the sentiments by the vested interest groups in the market should be of great concern.

This primary level analysis and the findings leave certain research questions open for further in-depth investigation, specifically; the structural and policy level deficiencies which constrain faster market correction process; the implications of market sentiment upon the momentum formation in the market; the nature of investors and intermediaries, and trading in medium and small cap securities in the Indian equity market.

The study was carried out based on the aggregate market sentiment index constructed by using various sentiment proxy measures suggested by the literature. However, no proxy measures or any level of aggregation can capture the complete nature of this behavioural factor. The composite index construction method and the selection of sentiment component, although widely used, are not flawless methods. Therefore, the findings of this analysis should be read taking into consideration these limitations.

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