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Investor Sentiment and Stock Market Returns: Evidence from the Indian Market

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Abstract

Investor sentiment refers to investors' confidence in the market based on their subjective beliefs. Investor sentiment has become a topic of substantial interest among academicians as investor sentiment induces uninformed demand shocks, which can potentially drive away stock prices from their fundamental value. This study expands the literature on the effect of investor sentiment on stock market returns by constructing an Investor sentiment index for the Indian market. We use Nifty-Fifty returns and the sample period ranges from April 2012 to March 2022. The Principal Component Technique is employed to construct an investor sentiment index using seven market and firm implicit proxies: advances to decline ratio, buy-sell imbalance ratio, equity issues to total issues, volatility premium, share turnover, price-earnings ratio, and turnover volatility ratio. The regression analysis shows that the investor sentiment index has the predictive power to forecast Nifty-Fifty returns.

Keywords: Investor sentiment, Stock returns, Stock market returns, Principal Component Analysis, Index

Introduction

Standard finance assumes that investors are rational in their decision-making and markets are informationally efficient (Fama, 1970) as investors can negate the effect of irrational trading and react similarly to the new information. It also states that the fundamental value of the securities is reinstated by the arbitrageurs even if irrational traders try to time the market. This normative assumption of standard finance has been challenged by the strands of behavioral finance literature, which believes that investors make irrational decisions based upon their beliefs and are guided by heuristics (Barberis & Thaler, 2003). Behavioural finance stands the ground that investors are informationally inefficient and make investment decisions as per their varied opinions and sentiments about the market. The concept of investor sentiment challenges the notion of the efficient market hypothesis and is defined as the tendency of investors to speculate the stock returns (Baker & Wurgler, 2006). It is considered the noise in the market (Black, 1986), which leads to overestimation or underestimation of stock returns, not always guided by the fundamental value (DeLong et al., 1990).

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The sentiment of the investors emerges out of their cognitive, affective, and behavioural responses rather than the informed decisions they make as per the changes in the market (Xu & Green, 2013). Thorp (2004) defines investor sentiment as the sum of people's opinions, feelings, emotions & perspectives and aggregates. Brown and Cliff (2004) studied the effect of investor sentiment on near-term stock valuations using the combination of direct and indirect measures of investor sentiment, highlighting the role of historical stock returns in directing investors' sentiment. Baker and

Wurgler (2006) emphasized that stocks whose valuations are highly subjective and difficult to arbitrage are more prone to sentiment effect. The investors' sentiment is influenced by unanticipated market changes, which affects the stock returns (Schmeling, 2009).

Investors' irrationality has attracted the attention of academicians and practitioners across the globe. As a result, researchers have increasingly focused on investor sentiment and its relationship with stock returns (Aggarwal & Mohanty, 2018; Al-Nasseri et al., 2021; Baker & Wurgler, 2006; Brown & Cliff, 2004, 2005; Canbas & Candir, 2009; Chakraborty & Subramaniam, 2020; Dash & Mahakud, 2012; Rashid et al., 2019; Sayim & Rahman, 2015). However, the studies focusing on the sentiment-return relationship in the Indian context are limited (Aggarwal and Mohanty, 2018; Chakraborty and Subramaniam, 2020; Dash and Mahakud, 2012, 2013; Dash and Maitra, 2018; Pandey and Sehgal, 2019). We extend the literature documenting the effect of investor sentiment on stock returns by constructing the investor sentiment index using seven market and firm-related implicit proxies, namely: advances to decline ratio, buy-sell imbalance ratio, equity issues to total issues, volatility premium, share turnover, price-earnings ratio, and turnover volatility ratio.

The rest of the section of this paper is structured as follows. Section 2 reviews the relevant literature, and Section 3 proposes the research methodology and data. Section 4 discusses the results of the study. Section 5 includes the discussion, Section 6 consists of the study's conclusion, and Section 7 entails the implications, limitations and the Scope for future research.

Literature Review

Investor sentiment is defined as the propensity of investors to speculate on stock returns (Baker & Wurgler, 2006, 2007). Investor sentiment influences current and future stock returns because it arises from cognitive and behavioural biases (Barberis & Thaler, 2003). The investors' sentiment possibly guides the abnormal market trends with investors' over-optimistic or pessimistic behavior (Cui et al., 2022; Dash & Mahakud, 2012).

The scholars in the domain of investor sentiment and stock returns have initially studied the effect of investor sentiment on stock returns, mainly catering to the developed markets (Daniel et al., 1998; DeLong et al., 1990), but over a period of time the researchers' interest have increased significantly in the developing market owing to the tremendous pace at which these markets have evolved (Aggarwal, 2017; Daszyńska-Żygadło et al., 2014; Raza et al., 2019; Zia Ur Rehman et al., 2017). Also, measuring investor sentiment has been a challenge among scholars worldwide, as there are no universal proxies to measure investor sentiment (Baker & Wurgler, 2006; He et al., 2017; Molchanov & Stangl, 2018; Pandey & Sehgal, 2019). Broadly, there are two approaches for measuring investor sentiment; direct and indirect. Direct measures are based on investor surveys, and indirect measures are based on economic or market indicators. Direct measures look into the opinions of the investors by the use of surveys such as Investor's Intelligence, The American Association of Individual Investors survey (AAII), and the Conference Board Consumer Confidence Index (CCI) (Baker & Stein, 2004; Brown & Cliff, 2004; Clarke & Statman, 1998; Fisher & Statman, 2000; Ho & Hung, 2009; Lee et al., 2002; Sayim et al., 2013). Many studies have used indirect or market-based indicators to measure investor sentiment using different proxies. Brown and Cliff (2004) have employed investor's intelligence survey and indirect measures in the form of advances to decline ratio (ADR), closed-end fund discount (CEFD), short interest, and change in margin borrowing (CMB) as the proxies to measure investor sentiment and examine the relationship between investor sentiment and stock returns. Baker and Wurgler

(2006) have used CEFD, Turnover (TURN), the number and average first-day returns on Initial Public Offering (RIPO), Number of IPOs (NIPO), the equity shares in new issues (S), and the dividend premium (DP) to construct a composite investor sentiment index for measuring the relationship between investor sentiment and stock returns. They propound that when investors' sentiment is high(low), the market is bullish(bearish). They also opine that stocks whose valuations are highly subjective and difficult to arbitrage are most likely to be affected by the investors' sentiment.

Canbas and Kandir (2009) have used Equity share issues in total issues, odd lot sales to purchase, mutual fund flows, and repo holdings of mutual funds to construct an investor sentiment index. Baker et al. (2012) developed investor sentiment indices using four proxies: volatility premium, the total number of IPO, first-day IPO returns, and market turnover for six significant global stock markets. Dash and Mahakud (2012) constructed an aggregate investor sentiment index using 12 market-related implicit sentiment proxies (MRISPs) in the context of the Indian stock market. They emphasized that investor sentiment impacts the stock returns in the long and short run and has a unidirectional relationship between investor sentiment and stock returns.

Methodology and Data

Measurement of Sentiment

Researchers over the years have used various direct and indirect proxies to measure sentiment, but there are no universal proxies to measure investor sentiment (Aggarwal and Mohanty, 2018; Chen et al., 2020). Therefore, the first task is to measure the investor sentiment of the Indian investors by constructing an investor sentiment index. We have used indirect measures to construct an investor sentiment index because the indirect measures comprise firm-related or market-related proxies to measure the Investor sentiment index. This method is much more reliable and can be generalized due to the broader availability of financial data. Therefore, we have tried to quantify the sentiment-return relationship by employing seven indirect proxies for constructing the sentiment index that depicts the length of the Indian stock market. The indirect proxies used for the construction of the sentiment index are listed below:

- *Price-to-Earnings Ratio (P/E ratio)* is a valuation ratio that measures the investors' willingness to pay for the earnings of a particular firm (Baker and Wurgler, 2007). It shows the market expectations regarding the growth of a firm. P/E ratio is positively correlated with investor investment, i.e., a high P/E ratio signifies overvaluation in the stock prices representing a high degree of investor sentiment. Price-to-Earnings Ratio is measured by computing the ratio between the firm's market price and earnings per share of the firm.

- *Advance to Decline Ratio (ADR)* is the ratio of advances and declines in stock prices. In other words, it is the ratio between the stocks whose closing price is higher than the closing price of the previous day to the stocks whose closing price is lower than the closing price on the previous day. ADR measures the market breadth and positively relates to the investors' sentiment. When this ratio exceeds 1, it signifies bullish market sentiment and vice-versa.

- *Share Turnover* is the ratio that measures the market liquidity. Share turnover is calculated as the ratio between the total number of shares traded daily to the number of outstanding shares. It has a positive relationship with investor sentiment. When turnover increases (decreases), it shows investors' optimistic (pessimistic) behaviour.

- *Volatility Premium* measures the value of highly volatile stocks. Volatility influences the investors' sentiments as high volatile stocks signify a higher degree of return dispersion. Volatility is measured as the standard deviation in the stock returns. Volatility premium is calculated as the ratio of price-to-book value of high volatile stocks to low volatile stocks.

- *Buy-Sell Imbalance Ratio (BSIR)* is the ratio of the total volume of buy minus total volume of sell to the total volume of buy plus sell. It captures the trading behaviour of investors in totality. If BSIR is greater (less) than zero, it indicates investors' optimistic (pessimistic) sentiments.

- *Equity issuance in total issuance (EITI)* is the share of equity issues to total issues (equity issues + debt issues). It has a positive (negative) relationship with investor sentiment as the higher (lower) value of EITI denotes bullish (bearish) sentiment.

- *Turnover Volatility Ratio (TV***R)** is the ratio of market turnover (Trading volume/ Market capitalization) to the standard deviation of stock market returns. A high (low) TVR ratio signifies overvaluation (undervaluation) in the market leading to positive (negative) investor sentiment.

Methodology for Constructing Sentiment Index

In order to develop an investor sentiment index, we use seven indirect sentiment proxies based on the availability of data in the Indian stock market. To achieve this, we use the top-down technique proposed by Baker and Wurgler (2006, 2007). We use the monthly returns and other firm-specific indicators of the Nifty-Fifty companies listed on the National stock exchange between April 1, 2012, and March 31, 2022. In all, there are 120 monthly observations included in the data set. Before constructing the investor sentiment index, we first apply Z-scores to each sentiment proxy to normalize them and bring them to the same scale to compute the proxies.

In addition, the factors of sentiment that were studied for this research might be influenced by the macroeconomic variables. Therefore, to adjust and remove the redundant business cycle fluctuations, we orthogonalize our sentiment proxies to the set of macro-economic fundamentals to remove the non-sentiment components. The selected macro-economic variables are Bank rate (BR), Index of Industrial Production (IIP), Foreign institutional investment (FII), Consumer price index (CPI), and Exchange rate ((EX). These variables are used to remove the business cycle fluctuations that are redundant. We first regress each sentiment proxy to the macroeconomic factors and use the resultant residuals as orthogonalized versions of the sentiment proxies.

We apply a two-stage process for the construction of a sentiment index. First, we develop the raw sentiment index, and subsequently, we obtain the final sentiment index. In order to generate the raw sentiment index, we first apply the principal component approach to the orthogonalized proxies. We then use the first principal components to analyze the results, considering each proxy's lead and lagged values. Next, we compute the correlation between each sentiment proxy's lead or lagged values and the raw sentiment index. Finally, the value of the proxy, either the lead value or the lagged value, whichever has the highest correlation with the raw sentiment index, is used to construct the final stage sentiment index by means of the first principal component.

Data

We selected 120 monthly observations of NIFTY 50 non-financial firms from April 1, 2012, to March 31, 2022. The exclusion of financial firms is that

financial firms have very high leverage, which may impact the overall results for calculating proxies (Baker and Wurgler, 2006). The number of firms varies each year based on the availability of data and the consistency of the firms being listed on the exchange. The information for the indirect firm-related proxies has been obtained from the PROWESSIQ database maintained by the Centre for Monitoring Indian Economies (CMIE), the website of the National stock exchange, and SEBI (Securities Exchange Board of India). The data for the five macroeconomic indicators have been sourced from the Reserve Bank of India (RBI).

Results

Descriptive Statistics of the Proxies and Economic-Variables

The proxies used in the study to measure investor sentiment are Advances to Decline ratio, Buy-Sell imbalance ratio, Equity issues to total issues, Volatility Premium, Share Turnover, Price-Earnings ratio, and Turnover volatility ratio. The descriptive statistics of these sentiment proxies are presented in Table 4.1.

Table 4.1: Descriptive statistics of the sentiment proxies

Descriptive Statistics	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
ADR	120	-1.8116	4.7319	0.0000	1.0000	1.061	0.202	3.205	0.401
BSIR	120	-3.0196	5.5298	0.0000	1.0000	1.863	0.202	8.684	0.401
EITI	120	-2.8867	0.8515	0.0000	1.0000	-1.541	0.202	2.022	0.401
TVR	120	-1.2126	7.0688	0.0000	1.0000	2.969	0.202	16.739	0.401
TURN	120	-1.2283	4.0027	0.0000	1.0000	1.656	0.202	2.868	0.401
PE	120	-1.0210	6.1316	0.0000	1.0000	4.251	0.202	22.706	0.401
VOLPREM	120	-0.5749	6.7195	0.0000	1.0000	5.237	0.202	30.192	0.401

Source: The Authors.

Note: ADR: Advances to Decline ratio, BSIR: Buy-Sell imbalance ratio, EITI: Equity issues to total issues, VOLPREM: Volatility Premium, TURN: Share Turnover, Price-Earnings ratio (PE), and TVR: Turnover volatility ratio, N=Number of Observations, Min: Minimum value, Max: Maximum value.

The sentiment variables considered for the study may be affected by macro-economic variables. Hence, to adjust our sentiment proxies to the set of macro-economic fundamentals to remove the redundant business cycle fluctuations, we use five macro-economic variables: bank rate, Index of Industrial Production, Foreign institutional investors, and Consumer price index and Exchange rate. The Descriptive statistics of the Macro-Economic Variables are presented in Table 4.2.

Table 4.2: Descriptive statistics of the Macro-Economic Variables

Descriptive Statistics	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
BR	120	-1.5322	2.1822	0.0000	1.00000	0.1820	.194	-0.907	.386
EX	120	-1.7268	1.5062	0.0000	1.00000	-0.5570	.194	-1.039	.386
IIP	120	-4.2267	2.3687	0.0000	1.00000	-0.1540	.194	0.7150	.386
FII	120	-4.4200	5.2750	0.0000	1.00000	0.8570	.194	8.0870	.386
CPI	120	-2.1139	2.1349	0.0000	1.00000	0.0920	.194	-0.8140	.386

Source: The Authors.

Note: BR: Bank rate, IIP: Index of Industrial production, FII: Foreign institutional investors, CPI: Consumer price index and EX: Exchange rate, N=Number of Observations, Min: Minimum value, Max: Maximum value.

4.2 Raw Sentiment Index

We run regression between macro-economic variables and each sentiment proxy and the computed residuals are treated as orthogonalized sentiment proxies to compute the sentiment index. To construct the investor sentiment index, the technique of Principal Component Analysis (PCA) is used in the study. PCA is a technique that reduces the dimensionality of the dataset by transforming a larger dataset into a smaller one while increasing its interpretability without causing much information loss.

We apply the principal component analysis to the residuals derived from the seven proxies and the lagged values of these proxies. The real movement in sentiment is reflected by using a lag of one month in our data. PCA technique is applied to the proxies and their one-month lag (Baker and Wurgler, 2006; Dash and Mahakud, 2012; Pandey and Sehgal, 2019; Schmeling, 2009; Stambaugh et al., 2012).

Before we apply Principal Component Analysis, we compute the KMO measure of sampling adequacy and Barlett's test of sphericity to ascertain that the sample is appropriate for the use of principal component analysis. As can be seen in Table 4.3, the value of KMO is 0.631, which is higher than 0.6. Furthermore, Barlett's test of sphericity has a significant level of 0.000, which suggests that the sample size is adequate.

Table 4.3: KMO and Bartlett's Test of Sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.631
Bartlett's Test of Sphericity	Approx. Chi-Square	579.494
	df	91
	Sig.	0.000

Table 4.4 Variance Explained by the Principal Component Analysis

ComponentInitial	EigenvaluesExtraction			Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.863	20.448	20.448	2.863	20.448	20.448
2	2.17	15.498	35.946	2.17	15.498	35.946
3	1.746	12.47	48.416	1.746	12.47	48.416
4	1.51	10.788	59.205	1.51	10.788	59.205
5	1.105	7.892	67.096	1.105	7.892	67.096
6	0.846	6.046	73.143			
7	0.824	5.888	79.031			
8	0.683	4.88	83.911			
9	0.574	4.102	88.013			
10	0.534	3.812	91.825			
11	0.421	3.008	94.833			
12	0.3	2.142	96.975			
13	0.236	1.683	98.658			
14	0.188	1.342	100			

Extraction Method: Principal Component Analysis.

The total variance explained by the PCA accounts to 67.096% as shown in Table 4.4. It shows the factors with their eigen values and the percentage of variance explained. We have extracted five principal components as their eigen values are greater than 1. Following Baker and Wurgler (2006,2007), Principal Component analysis is executed on the seven proxies and their first lag and Principal Component 1 is chosen to construct provisional sentiment index. The component matrix is shown in Table 4.5. The first principal component represents the coefficients of the proxies and their lags which together forms the raw sentiment index.

Table 4.5: Component Matrix

	Component				
	1	2	3	4	5
ADR_t	0.150	0.019	0.365	0.478	0.107
$BSIR_t$	0.054	0.060	0.529	0.435	0.369
$EITI_t$	0.420	0.302	-0.356	-0.166	0.363
TVR_t	0.731	0.120	0.084	0.217	0.154
$TURN_t$	0.511	-0.351	-0.046	0.322	0.153
PE_t	0.748	0.898	0.123	0.083	-0.018
$VOLPREM_t$	0.277	-0.089	0.633	-0.588	-0.018
ADR_{t-1}	0.356	0.303	0.088	0.141	-0.329
$BSIR_{t-1}$	0.228	0.226	0.078	0.140	-0.774
$EITI_{t-1}$	0.289	0.292	-0.384	-0.544	0.169
TVR_{t-1}	0.727	0.219	-0.137	-0.056	-0.043
$TURN_{t-1}$	0.816	-0.236	-0.183	-0.008	-0.153
PE_{t-1}	0.296	0.889	0.067	0.066	0.129
$VOLPREM_{t-1}$	0.253	-0.021	0.750	-0.468	0.018

Source: The Authors

The provisional sentiment index is represented as rawSENT.

rawSENT=$0.150ADR_t + 054.BSIR_t + 0.420EITI_t + 0.277VOLPREM_t + 0.511TURN_t + 0.748PE_t + 0.731TVR_t + 0.356ADR_{t-1} + 0.228BSIR_{t-1} + 0.289EITI_{t-1} + 0.253VOLPREM_{t-1} + 0.816TURN_{t-1} + 0.296PE_{t-1} + 0.727TVR_{t-1}$

Final Sentiment Index

A provisional sentiment index is generated by utilizing the first principal component. For developing the final sentiment index, whichever of the proxies' lead or lag values has a greater correlation with the raw sentiment index is used.

Table 4.6 Correlation of sentiment proxies and their lagged values with the raw sentiment index.

	ADRt	BSIRt	EITIt	VOL PREMt	TURNt	PEt	TVRt	ADRt-1	BSIRt-1	EITIt-1	VOLPREMt-1	TURNt-1	PEt-1	TVRt-1	rawSENTt
ADRt	1.000														
BSIRt	0.074	1.000													
EITIt	0.090	0.011	1.000												
VOLPREMt	0.097	0.063	0.083	1.000											
TURNt	0.264	0.176	0.216	0.105	1.000										
PEt	0.037	0.074	0.181	0.200	0.005	1.000									
TVRt	0.176	0.224	0.189	0.183	0.398	0.072	1.000								
ADRt-1	0.146	0.003	0.024	0.033	0.283	0.039	0.317	1.000							
BSIRt-1	0.065	0.072	0.019	0.075	0.017	0.181	0.128	0.153	1.000						
EITIt-1	0.005	0.097	0.297	0.192	0.057	0.155	0.047	0.045	0.036	1.000					
VOLPREMt-1	0.066	0.015	0.005	0.403	0.025	0.122	0.241	0.062	0.101	0.047	1.000				
TURNt-1	0.028	0.008	0.163	0.279	0.368	0.102	0.444	0.334	0.237	0.176	0.040	1.000			
PEt-1	0.021	0.046	0.191	0.114	0.011	0.666	0.034	0.032	0.009	0.160	0.151	0.055	1.000		
TVRt-1	0.084	0.026	0.208	0.019	0.255	0.184	0.354	0.194	0.268	0.175	0.012	0.388	0.116	1.000	
rawSENTt	0.252	0.084	0.470	0.216	0.585	0.325	0.707	0.531	0.304	0.351	0.146	0.688	0.265	0.639	1.000

The lead or the lag values of the respective proxies, which have a higher correlation with the provisional sentiment index, are selected. Based on the correlation values with rawSENT, the proxies chosen for constructing the final sentiment index are $EITI_t$, $VOLPREM_t$, PE_t, TVR_t, ADR_{t-1}, $BSIR_{t-1}$, $TURN_{t-1}$. Again, Principal Component Analysis is run on the above-mentioned proxies to obtain the final sentiment index.

In order to ensure that the sample is fit for the application of principal component analysis, we first compute the KMO measure of sampling adequacy and Barlett's test of sphericity. The value of KMO is 0.630, as shown in Table 4.7 (which is greater than 0.6), and Barlett's test of sphericity has a significance level of 0.000, implying that the sample is adequate.

Table 4.7: KMO & Barlett Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.630	
Bartlett's Test of Sphericity	Approx. Chi-Square	101.965
	Df	21
	Sig.	.000

Table 4.8: Component matrix

Component Matrixa				
	Component			
	1	2	3	4
EITIt	0.273	0.707	0.024	0.420
VOLPREMt	0.772	0.072	0.084	0.048
PEt	0.402	0.614	0.046	0.210
TVRt	0.043	0.194	0.807	0.511
ADRt-1	0.751	0.209	0.203	0.121
BSIRt-1	0.411	0.182	0.418	0.616
TURNt-1	0.061	0.591	0.379	0.355
Extraction Method: Principal Component				
a. 4 components extracted.				

Table 4.9: Variance explained by Principal Component Analysis

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.569	22.418	22.418	1.997	28.531	28.531
2	1.345	19.220	41.638	1.316	18.806	47.337
3	1.021	14.586	56.224	1.061	15.163	62.501
4	1.004	14.343	70.567	1.004	14.343	70.567
5	.858	12.264	82.830			
6	.651	9.303	92.133			
7	.551	7.867	100.000			
Extraction Method: Principal Component Analysis.						

The total variance explained by the PCA accounts for 70.567%, represented in Table 4.9. It shows the factors with their eigenvalues and the percentage of variance explained. We extract four principal components as their eigenvalues are greater than 1. Following Baker and Wurgler (2006,2007), Principal Component analysis is executed on the selected proxies, and Principal Component 1 is chosen to construct the final sentiment index. The component matrix is shown in Table 4.8.

The final sentiment index is represented as SENT.

$$\mathbf{SENT} = 0.273EITI_t + 0.772VOLPREM_t + 0.402PE_t + 0.043TVR_t + 0.751ADR_{t-1} + 0.411BSIR_{t-1} + 0.061TURN_{t-1}$$

Unit Root Tests

In order to check the stationarity in the time series data, two-unit root tests were run, namely, the Augmented Dickey-Fuller Test (ADF) and Philips Perron (PP), to check the stationarity of the time series data for doing the statistical analysis and draw inference from it. The Results of Unit Root Tests are shown in Table 4.10.

Table 4.10: Results of Unit Root Tests

Level	ADF Test		Phillips-Perron Test	
	Constant	Constant & Trend	Constant	Constant & Trend
Nifty 50 Market Returns	-5.13***	-4.26***	4.82***	-4.24***
SENT	-4.87***	-4.58***	5.30***	-6.27***
First Difference				
Nifty 50 Market Returns	-7.82***	-8.20***	4.68***	-5.82***
SENT	-12.43***	-10.18***	9.56***	-8.82***

The results of both PP and ADF tests include that at constant and at constant with time trend at both levels, and the first difference rejects the null hypotheses indicating the series to be stationary.

4.5 Regression Analysis

The regression analysis assesses the relationship between market return and SENT (sentiment index). The following models of regression analysis of return on investor sentiment are followed:

$$RMt = \alpha + \beta SENTt + €t \quad (1)$$

RMt = Market returns at the current time-period
$SENT_t$ = Orthogonalized investor sentiment index at the current time-period
β = Sensitivity coefficient
€t = Error term
α = Intercept term

H_0: Investor sentiment does not affect stock market returns

We examine the effect of investor sentiment on stock market returns. In order to verify the validity of the hypothesis **H_0**, ordinary least square regression was performed, with stock market returns serving as the dependant variable and investor sentiment serving as the predictor variable. There is a positive relationship between the investor sentiment index and the returns on the stock market, as measured by a coefficient of 1.263 and a probability value of 0.000. The regression results reveal that the alternative hypothesis H1, which claims that investor sentiment affects stock market returns, is accepted. This is because the p-value is lower than 0.05, which indicates that the null hypothesis should be disregarded. In addition, the value of adjusted R2 was 0.547, which suggests that the regression model explains 54.7% of the variation in the returns on the stock market. Table 4.11 shows the regression analysis results between investor sentiment and stock market returns.

Table 4.11: Regression results of investor sentiment and stock market returns

Hypothesis	H01: Investor sentiment does not affect stock market returns
Regression Weights	SENT ⟶ RETURNS
Beta Coefficient	1.263
R2	0.543
Adjusted R2	0.547
Std. Error of the Estimate	0.88499669
F statistic	792.685
t-value	28.155
p-value	0.000
Durbin-Watson	2.147
Hypothesis status	Rejected
Hypothesis supported	H1: Investor sentiment affects stock market returns

Discussion

This study documents that investor sentiment strongly affects stock market returns, which is in line with the findings of previous research in the Indian context (Aggarwal and Mohanty, 2018; Chakraborty and Subramaniam, 2020; Dash and Mahakud, 2012, 2013; Dash and Maitra, 2018; Pandey and Sehgal, 2019). The regression analysis shows that the value of adjusted R-square is relatively high, which supports the fact that investor sentiment has an effect on the returns of stock markets and can explain the variance in the Indian stock markets returns.

This study indicates the existence of a positive relationship between investor sentiment and stock market returns which is consistent with the findings

of Aggarwal and Mohanty (2018), Ryu et al. (2017), Xu and Zhou (2018), Yang et al. (2017) and Verma and Verma (2007) but contradicts the findings of (Baker and Wurgler, 2006; 2007; Frazzini and Lamont, 2008; McGurk et al., 2020; Rashid et al., 2019; Schmeling, 2009; Yu and Yuan, 2011; Yu et al., 2014) as they document the existence of a negative relationship between investor sentiment and stock market returns. The positive relationship between investor sentiment and stock market returns may be attributable to institutional investors' dominance in the Indian market or Indian investors' trading behaviour.

Conclusion

This study explores the relationship between investor sentiment and stock returns for the Indian stock market (Nifty-Fifty) returns for the period ranging from April 2012 to March 2022. In order to establish the relationship between investor sentiment and stock returns in the Indian stock market, we have constructed the investor sentiment index using seven market and firm-related implicit proxies, namely advances to decline ratio, buy-sell imbalance ratio, equity issues to total issues, volatility premium, share turnover, price-earnings ratio, and turnover volatility ratio. In addition, a two-stage Principal Component Technique has been used to construct the sentiment index. The study's result suggests a positive relationship exists between investor sentiment and stock market returns, and the constructed investor sentiment has the predictive power to forecast Nifty-Fifty returns in the Indian stock market.

Implications, Limitations, and Scope for Future Research

This study offers several benefits. First, it highlights the effect of idiosyncratic sentiment on stock market returns. Secondly, the study will benefit academicians as they can use the investor sentiment index to gauge the sentiment-return relationship in the Indian market. Further, the study also incentivizes the market participants to understand retail investors' tendency to trade on their subjective beliefs.

This study suffers from a few limitations. Firstly, the sample period only covers the period of 10 years which future studies can further extend. Secondly, the Nifty-Fifty returns have been considered in the study. Future studies can incorporate other index returns to gauge investor sentiment effect on the Indian markets. Moreover, since there are no universal proxies to measure investor sentiment, the choice of proxy depends upon the availability of the data and the requirement of the study. Future researchers can incorporate other firm and market-related proxies to measure sentiment.

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