

Impact of Investor Sentiment on Portfolio Return - Do Economic and Market Conditions Matter?

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Abstract: *Purpose: In a first of its kind, this paper tries to explore the relationship between investors sentiment and BSE Sensex return over the period January 2010 to December 2021 and under different market and economic conditions. Design/Methodology/Approach: The paper uses 32 market and macroeconomic variables as proxy to the investor sentiment. Principal component analysis has been used and the first 11 principal components with eigenvalue more than 1, have been selected to create investor sentiment sub-indices. Weighted/generalized least squares (GLS) method has been used to achieve the objectives of the study. Findings: We find that the impact of sentiment was significantly positive on portfolio return over the period of study. Further, the slope of five sentiment sub-indices increased in the boom period and the slope of two sub-indices increased significantly in the bull period. Research Implications: Findings of the study are helpful for retail investors, policy makers and other decision makers in the Indian stock market. Results are helpful for retail investors as guidelines for decision making and; also, they learn about the association between sentiment and portfolio return under different economic and market conditions. Originality/Value: The study contributes to the existing literature by exploring the relationship of sentiment and portfolio return in the Indian stock market over different economic and market conditions.*

Keywords: Bear, Boom, Bull, Dummy Variable, GLS, Investor Sentiment, Portfolio Return; Principal Component Analysis, Recession.

I. INTRODUCTION

Investor sentiment is a concept which is difficult to define but its gaining importance among the academicians. [19] first showed the importance of investor sentiment in the “future profit of an asset.” He believed that sentiment plays a very important role in economic activities and emphasized that investors have animal spirits which form the basis of their investment decisions. Classical finance theory proposed that the market is full of rational investors and the competition among them leads to the equilibrium pricing which is nothing but the fundamental value based on discounted cash flows. Irrational investors (also called noise traders) generally suffer losses and get kicked out of the market [10].

However, stocks which are difficult to arbitrage possess a high subjective price. According to [5] the effect of speculation on such stocks is very high. [15] proposed a model specifying that sentiment plays an important role in the financial markets. Understanding sentiment, identifying a tool to measure it and to assess its impact on stock prices has been a difficult task for a long time. To estimate the prospects of investment, [19] suggested that it is very important to understand the concerns and emotions of investors. It is natural to believe that high (low) sentiment drives the asset prices above (below) and results in higher (lower) returns. [33] showed that high/low sentiment affects the asset prices. In order to test the relationship between sentiment and asset prices there is one major issue which is the measurement of sentiment. As discussed earlier, sentiment is difficult to define, but it is difficult to measure too. Further, it is not directly observable though, [31] suggested that a survey method can be used to get insights of it. We must use some proxies to measure the sentiment which can replicate the true level of it [3]. [4] suggested some proxies which can be used to measure the sentiment. In the literature there is no cap on the number of proxies which can be used. Different studies used, different proxies and different numbers to establish the linkage between sentiment and market return. Several studies documented the link between sentiment and market return. However, the degree of relationship varies according to the number of proxies and tools used. We attempt to measure the sentiment using a number of proxies as suggested in the literature to provide for a comprehensive coverage. All the proxies are further reduced to sentiment sub-indices by applying the principal component analysis. Further, we attempt to analyze the relationship between sentiment and portfolio return not only under normal circumstances but under different economic and market conditions as well. Our results suggest that there is a statistically significant relationship between sentiment (sub-indices) and portfolio return. In line with the literature, we also show that the relationship is positive. Further results show that some selected sentiment sub-indices affect the portfolio return differently under different economic and market conditions. So, these sentiment indices explain the portfolio return under these different economic and market conditions. This paper contributes to the literature in numerous ways. First, we have identified as many proxies to the sentiment as possible and obtained sub-indices. Second, we have analyzed the sentiment-portfolio return relationship. Third, 12-year (\cong) data captures two recessionary and two boom periods.

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This helps to analyze the sentiment–return relationship under different states of economy. Fourth, the data captures 4 bear periods and 5 bull periods and helps in analyzing the sentiment–return relationship under different market conditions. The key objectives of this paper are—

1. To examine the impact of investor sentiment on portfolio return.
2. To investigate the impact of investor sentiment on portfolio return over different market conditions.
3. To analyze the impact of investor sentiment on portfolio return over different economic conditions.

The remainder of this paper is organized as follows. Section II focuses on the review of literature. Section III describes the data and methodology.

Section IV gives the empirical evidence along with an analysis of sentiment-portfolio return relationship under normal circumstances and over different economic and market conditions. Section V concludes the paper with a discussion on policy implications and limitations.

II. REVIEW OF LITERATURE

Sentiment is a belief of the investors which is not based on evidence and certainty. It is something which can be described as an erroneous belief or judgement [5]. [19] described the sentiment as the animal spirits of human beings. [42] defined sentiment as something which belongs to the perceptive comparisons of the investment made by the investors. The above view was supported by [21] and it was claimed that incorporation of sentiment with economic fundamentals is not sufficient to predict the market return. One of the dimensions of the sentiment is that investors have a tendency to gamble in the financial market [5]. The above dimension of the sentiment was maintained by [35] and [6] with a claim that investors gamble in the market due to the existence of sentiment. [32] defined the sentiment as an understanding of investor behavior that affects the stock market activities. The emotions and confidence shown by the investors while investing in the stock market is the sentiment [8], [9]. Most of the studies have enshrined the sentiment-return relationship. Different studies have used different proxies for the measurement of sentiment to understand this relationship. Studies also used direct methods for the measurement of sentiment. [37], [34] and [16] used VIXTM as a proxy to the sentiment and reported that sentiment affects the market return positively. [21] used intelligence sentiment survey and [30] used consumer confidence as a proxy to the sentiment and reported the significant sentiment-return relationship. However, [11] used different proxies and reported that the survey method for the measurement is related to indirect methods for the measurement. Results implicated that statistically significant sentiment-return relationship exists but sentiment has insignificant predictive power for future returns. In their seminal work [5] and [6] created a composite sentiment index using principal components of six proxies and provided an opportunity to use more than one proxy. They also tried to eliminate the survey method to a great extent. Study reported statistically significant sentiment-return relationship. [31] analyzed the sentiment-return relationship at international level using data from over 18 countries and

[7] analyzed the sentiment-return relationship at international level using data from six countries. It was reported that this relationship holds good at international level also. [12] constructed a sentiment index in the context of US and EU stock markets and reported that sentiment affects the market return. Further, in the US stock market sentiment index has strong power to predict market return as compared to EU stock market where the predictive power was found to be very weak. In India, [32] pioneered in this field and they identified different sentiment proxies to the sentiment using survey method. [33] then constructed a sentiment index and using the VAR model they showed that sentiment is positively related to market return. The study of sentiment and return relationship was further carried forward by different authors (described further). [22] used trading volume as a proxy to extreme sentiment and concluded that such sentiment plays a very important role in explaining the changes in market return. [39] examined the relationship between sentiment and future stock return in the context of Brazil. The study established the statistically significant negative relationship between sentiment and future stock returns. [2] created a sentiment index in the context of Karachi Stock Exchange and concluded that there is a positive relationship between sentiment and market returns. The results confirmed the irrationality of investors. [24] reported that sentiment affects the employment policy of the US. Further, in the period of crisis sentiment is responsible for the instability of employment. [25] constructed a sentiment index and examined its relationship with the market return and volatility. Study reported the statistically significant positive relationship between sentiment and market excess return. Further, it was reported that sentiment affects the conditional volatility negatively. [1] used VIXTM as a proxy to the sentiment and concluded that market return moves in the opposite direction of VIX. [38] identified proxies to the sentiment and constructed a sentiment index following the BW¹ methodology in the context of the Chinese stock market. The study identified the circulation effect between sentiment and market return. [41] defined sentiment as a deviation from the fundamental value of an asset and reported that there is statistically significant relationship between sentiment and return of some selected stocks. Further, the study identified the future related to sentiment which shall be resolved in future. [26] constructed alternative sentiment indices and found that a composite index can better explain the market return as compared to the indices created in previous studies. [17] used VIXTM as a proxy to the sentiment and reported that it is an important factor which affects the decision of companies regarding IPO timing. It was also reported that chances of launching more IPOs at the time of positive (high) sentiment are very high. Most of the studies have focused on sentiment-return relationships in the western world. But in India, the work in this field is in its nascent stage and most of the studies have analyzed the relationship of sentiment with market return and volatility only.

¹Baker and Wurgler



Most of the studies have used a selected number of proxies to the sentiment [26]. Unlike other studies we wish to use as many proxies as possible for the measurement of sentiment and to examine its impact on portfolio return. We also want to analyze the impact over different economic and market conditions. To the best of our knowledge no efforts have been made to identify those proxies which can better explain the portfolio return over different economic conditions and market conditions.

III. DATA AND METHODOLOGY

A. Data and Sources

The study used a total of 141 monthly observations on 32 proxies from April 2010 to December 2021. The data was collected from various sources such as the BSE website, NSE website, RBI website, SEBI website, indexmundi.com, IMF website, CSO website and Department for Promotion of Industry and Internal Trade website. The data was subject to refinement and standardization. Data was tested for stationarity using unit root test (ADF and PP) and first order difference of all the data series was taken to make the series stationary. Data on 32 proxies² was then put in EViews 212 and principal component analysis was applied. First 11 principal components explaining 78.251% of the total variance, were extracted using varimax rotation and Kaiser criterion [18] and these were termed as sentiment sub-indices. Cronbach's alpha came out to be 0.857 showing good internal consistency. The Kaiser-Meyer Olkin (KMO) came out to be 0.835 showing that principal component analysis of the variables is a good idea. These sentiment sub-indices were given meaningful names for a better understanding. The 11 final sentiment sub-indices and their eigenvalues are given in Table I. The individual proxies which contributed to the particular principal component were selected on the basis of maximum factor loading of each proxy³.

Table I: Final Sentiment Proxies, Eigen Values and Variance Explained

Principal component	Name of the principal component	Eigenvalue	Proportion variance	Cumulative
PC1	Market and Economic Variables	3.757	16.336%	16.336%
PC2	Market Ratios	2.826	12.287%	28.623%
PC3	Advance-Dcline Ratio and High-Low Index	1.757	8.263%	36.887%
PC4	Price to Book Value Ratio and Liquidity in Economy	1.901	6.755%	43.641%
PC5	Oil Price	1.554	6.234%	49.876%

²Detail of the proxies used is given in Appendix-A.

³ Due to brevity of space Augmented Dickey Fuller Test results, Phillips Perron Test results, Maximum Factor Loadings are not given here but can be provided on request.

	and Industrial Production Index			
PC6	Put-Call Ratio	1.434	5.837%	55.713%
PC7	Ratio of Equity in Total Issues and Total Number of Issues	1.343	5.126%	60.839%
PC8	Buy-Sell Imbalance and Foreign Direct Investment	1.179	4.820%	65.659%
PC9	Trading-Volume Ratio	1.109	4.652%	70.311%
PC10	Extra Return on Market Portfolio	1.070	4.225%	74.535%
PC11	Term-Spread	.972	3.717%	78.252%

(Source: Author's own calculations in EViews 12)

Theoretically, a portfolio is a combination of various investments and when it comes to make a portfolio for analysis purposes then we have chosen the BSE Sensex as it comprises 30 stocks of the financially sound companies in India which are listed on the Bombay Stock Exchange and data has been taken from BSE website. We have used the data on recession and boom periods as reported by the OECD (Federal Reserve Bank of St. Louis) (Table II). Further, we have followed the methodology of using the dual moving average crossover rule with 50 days and 200 days moving averages to identify the market condition as suggested by [27]. [40] also suggested using the dual moving average crossover rule with 50 days and 200 days moving averages (Table III). The economic and market conditions have been used as dummy variables.

Table II: Recession and Boom Periods

Recession Periods	Boom Periods
December 2010 to September 2013	May 2009 to November 2010
March 2018 to December 2019	October 2013 to February 2018
March 2020 to February 2021	January 2019 to February 2020
	March 2021 to December 2021

(Source: OECD (Federal Reserve Bank of St. Louis) website)

Table III: Bear and Bull periods

Bear periods	Bull periods
February 2011 to December 2011	April 2010 to January 2011
June 2015 to May 2016	March 2012 to April 2015
November 2018 to February 2019	June 2016 to September 2018
February 2020 to May 2020	April 2019 to January 2020
	June 2020 to December 2021

(Source: Author's own calculations)

B. Hypothesis of the Study

To achieve the objectives of the study, following hypotheses have been tested—



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- **H_{0P1}**: There is no significant relationship between sentiment sub-indices and portfolio return.
- **H_{0P2}**: The effect of sentiment sub-indices is the same on portfolio return under different economic conditions.
- **H_{0P3}**: The effect of sentiment sub-indices is the same on portfolio return under different market conditions.

We have also made secondary hypotheses to above primary hypotheses which are given in the Appendix-B.

C. Investor Sentiment and Portfolio Return over Various Market and Economic Conditions

To analyze the impact of investor sentiment on portfolio return we have set the hypothesis that there is no significant impact of different sentiment sub-indices on portfolio return. To test this hypothesis, sentiment sub-indices were used as independent variables and portfolio return as a dependent variable. BSE Sensex percentage return has been used as a proxy to the portfolio return. We have established the following regression equation (generalized/weighted least squares) in the EViews 12—

$$\begin{aligned} & \text{BSE Sensex Percentage Return} \\ & = \alpha + \beta \text{SENT} \dots \dots (1) \end{aligned}$$

Where,

BSE Sensex Percentage Return = Portfolio Return (Independent variable)

SENT = Sentiment sub-indices *i.e.* PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10 and PC11 (Table I)

α = Constant or Intercept

β_i = Regression coefficient of i^{th} principal component

To analyze the relationship of investor sentiment and portfolio return over various economic conditions we have estimated the following regression equation—

$$\begin{aligned} & \text{BSE SENSEX RETURN} \\ & = \beta_0 + \beta_1 \cdot \text{ECONCOND} + \beta_2 \cdot \text{PC1} \\ & + \beta_3 \cdot \text{PC1} \cdot \text{ECONCOND} + \beta_4 \cdot \text{PC2} \\ & + \beta_5 \cdot \text{PC2} \cdot \text{ECONCOND} + \beta_6 \cdot \text{PC3} \\ & + \beta_7 \cdot \text{PC3} \cdot \text{ECONCOND} + \beta_8 \cdot \text{PC4} \\ & + \beta_9 \cdot \text{PC4} \cdot \text{ECONCOND} + \beta_{10} \cdot \text{PC5} \\ & + \beta_{11} \cdot \text{PC5} \cdot \text{ECONCOND} + \beta_{12} \cdot \text{PC6} \\ & + \beta_{13} \cdot \text{PC6} \cdot \text{ECONCOND} + \beta_{14} \cdot \text{PC7} \\ & + \beta_{15} \cdot \text{PC7} \cdot \text{ECONCOND} + \beta_{16} \cdot \text{PC8} \\ & + \beta_{17} \cdot \text{PC8} \cdot \text{ECONCOND} + \beta_{18} \cdot \text{PC9} \\ & + \beta_{19} \cdot \text{PC9} \cdot \text{ECONCOND} + \beta_{20} \cdot \text{PC10} \\ & + \beta_{21} \cdot \text{PC10} \cdot \text{ECONCOND} + \beta_{22} \cdot \text{PC11} \\ & + \beta_{23} \cdot \text{PC11} \cdot \text{ECONCOND} \dots \dots (2) \end{aligned}$$

Where,

β_0 = Intercept of recession

$\beta_0 + \beta_1$ = Intercept of boom

ECONCOND = Economic conditions *i.e.* Dummy variable (Boom=1, Recession=0)

β_2 = Slope of PC1 for the recession period

$\beta_2 + \beta_3$ = Slope of PC1 for the boom period

β_4 = Slope of PC2 for the recession period

$\beta_4 + \beta_5$ = Slope of PC2 for the boom period

β_6 = Slope of PC3 for the recession period

$\beta_6 + \beta_7$ = Slope of PC3 for the boom period

β_8 = Slope of PC4 for the recession period

$\beta_8 + \beta_9$ = Slope of PC4 for the boom period

β_{10} = Slope of PC5 for the recession period

$\beta_{10} + \beta_{11}$ = Slope of PC5 for the boom period

β_{12} = Slope of PC6 for the recession period

$\beta_{12} + \beta_{13}$ = Slope of PC6 for the boom period

β_{14} = Slope of PC7 for the recession period

$\beta_{14} + \beta_{15}$ = Slope of PC7 for the boom period

β_{16} = Slope of PC8 for the recession period

$\beta_{16} + \beta_{17}$ = Slope of PC8 for the boom period

β_{18} = Slope of PC9 for the recession period

$\beta_{18} + \beta_{19}$ = Slope of PC9 for the boom period

β_{20} = Slope of PC10 for the recession period

$\beta_{20} + \beta_{21}$ = Slope of PC10 for the boom period

β_{22} = Slope of PC11 for the recession period

$\beta_{22} + \beta_{23}$ = Slope of PC11 for the boom period

Similarly, to analyze the relationship of investor sentiment and portfolio return over various market conditions we have estimated following regression equation—

$$\begin{aligned} & \text{BSE SENSEX RETURN} \\ & = \beta_0 + \beta_1 \cdot \text{MARKCOND} + \beta_2 \cdot \text{PC1} \\ & + \beta_3 \cdot \text{PC1} \cdot \text{MARKCOND} + \beta_4 \cdot \text{PC2} \\ & + \beta_5 \cdot \text{PC2} \cdot \text{MARKCOND} + \beta_6 \cdot \text{PC3} \\ & + \beta_7 \cdot \text{PC3} \cdot \text{MARKCOND} + \beta_8 \cdot \text{PC4} \\ & + \beta_9 \cdot \text{PC4} \cdot \text{MARKCOND} + \beta_{10} \cdot \text{PC5} \\ & + \beta_{11} \cdot \text{PC5} \cdot \text{MARKCOND} + \beta_{12} \cdot \text{PC6} \\ & + \beta_{13} \cdot \text{PC6} \cdot \text{MARKCOND} + \beta_{14} \cdot \text{PC7} \\ & + \beta_{15} \cdot \text{PC7} \cdot \text{MARKCOND} + \beta_{16} \cdot \text{PC8} \\ & + \beta_{17} \cdot \text{PC8} \cdot \text{MARKCOND} + \beta_{18} \cdot \text{PC9} \\ & + \beta_{19} \cdot \text{PC9} \cdot \text{MARKCOND} + \beta_{20} \cdot \text{PC10} \\ & + \beta_{21} \cdot \text{PC10} \cdot \text{MARKCOND} + \beta_{22} \cdot \text{PC11} \\ & + \beta_{23} \cdot \text{PC11} \cdot \text{MARKCOND} \dots \dots (3) \end{aligned}$$

Where,

β_0 = Intercept of bear

$\beta_0 + \beta_1$ = Intercept of bull

MARKCOND = Market conditions *i.e.* Dummy variable (Bull=1, Bear=0)

β_2 = Slope of PC1 for the bear period

$\beta_2 + \beta_3$ = Slope of PC1 for the bull period

β_4 = Slope of PC2 for the bear period

$\beta_4 + \beta_5$ = Slope of PC2 for the bull period

β_6 = Slope of PC3 for the bear period

$\beta_6 + \beta_7$ = Slope of PC3 for the bull period

β_8 = Slope of PC4 for the bear period

$\beta_8 + \beta_9$ = Slope of PC4 for the bull period

β_{10} = Slope of PC5 for the bear period

$\beta_{10} + \beta_{11}$ = Slope of PC5 for the bull period

β_{12} = Slope of PC6 for the bear period

$\beta_{12} + \beta_{13}$ = Slope of PC6 for the bull period

β_{14} = Slope of PC7 for the bear period

$\beta_{14} + \beta_{15}$ = Slope of PC7 for the bull period

β_{16} = Slope of PC8 for the bear period

$\beta_{16} + \beta_{17}$ = Slope of PC8 for the bull period

β_{18} = Slope of PC9 for the bear period

$\beta_{18} + \beta_{19}$ = Slope of PC9 for the bull period

β_{20} = Slope of PC10 for the bear period

$\beta_{20} + \beta_{21}$ = Slope of PC10 for the bull period

β_{22} = Slope of PC11 for the bear period

$\beta_{22} + \beta_{23}$ = Slope of PC11 for the bull period



IV. RESULTS AND DISCUSSION

A. Investor Sentiment and Portfolio Return

The results are given in Table IV and V. Results suggest that there is a relation of only 5 sentiment sub-indices viz. PC1, PC3, PC5, PC4 and PC11, with the portfolio return. The values of r and r^2 are 0.828 and 0.685 respectively. The value of r^2 is more than 0.6 which means that model is worthy of attention.

The p values of the coefficients of PC1, PC3, PC5, PC4, and PC11 are less than 0.05 which means we can safely reject the null hypothesis that coefficients are zero.

Further, the variance inflation factor (VIF), which is the reciprocal of the tolerance value, is less than 10 for PC1, PC3, PC5, PC4 and PC11, which means that PCs are not correlated to each other, hence, no multicollinearity is there [29]. Also, after looking at the value of F statistic and p value of the model, which is less than 0.05, so the null hypothesis of equality of regression coefficients can be rejected and it is concluded that the coefficients are not equal and independent of each other.

Table IV: Regression Model Results of Equation 1

Dependent Variable: SENSEXRETURN							
Method: Least Squares							
Sample: 2010M04 2021M12							
Included observations: 141							
					Collinearity Statistics		
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Tolerance	VIF	
PC1	-0.038268	0.002377	-16.09930	0.0000	1.000	1.000	
PC3	0.008250	0.002377	3.470585	0.0007	1.000	1.000	
PC4	-0.009431	0.002377	-3.967481	0.0001	1.000	1.000	
PC5	0.005046	0.002377	2.122839	0.0356	1.000	1.000	
PC11	-0.003661	0.002377	-1.540276	0.0038	1.000	1.000	
C	0.009778	0.002369	4.128177	0.0001			
R-squared	0.685206	Mean dependent var					0.009778
Adjusted R-squared	0.673547	S.D. dependent var					0.049225
S.E. of regression	0.028125	Akaike info criterion					-4.262686
Sum squared resid	0.106788	Schwarz criterion					-4.137206
Log likelihood	306.5193	Hannan-Quinn criter.					-4.211695
F-statistic	58.77042	Durbin-Watson stat					1.757077
Prob(F-statistic)	0.000000						

(Source: Author’s own calculation in EViews 12)

As per the model, there are 5 sentiment sub-indices, the p value of which is less than 0.05 viz. PC1, PC3, PC4, PC5 and PC11. So, we reject the secondary hypotheses i.e. H_{0P1S1} , H_{0P1S3} , H_{0P1S4} , H_{0P1S5} and H_{0P1S11} and conclude that there is a significant impact of a particular sentiment sub-index on portfolio return. Further, the p -value of PC3, PC6, PC7, PC8, PC9 and PC10 is more than 0.05, so there is no reason to reject the H_{0P1S3} , H_{0P1S6} , H_{0P1S7} , H_{0P1S8} , H_{0P1S9} and H_{0P1S10} . It implies that there is no significant impact of PC3, PC6, PC7, PC8, PC9 and PC10 on portfolio return. Hence these PCs are irrelevant in explaining the portfolio return. One of the sentiment sub-indices is “Market and Economic Variables (PC1), which consists of 6 proxies to the investor sentiment viz. number of companies traded, VIX, foreign portfolio investment, economic risk-premium, banks deposit to market capitalization and investment in equity by mutual fund companies. It is a known fact that the market and economy perform better when the sentiment is strong and vice versa. But results show that the PC1 is negatively related to the market return. The possible reason for this may be that the PC1 consists of proxies viz. volatility and bank deposits to market capitalization which are generally negatively related to the market return and their combined effect is much stronger than other variables. One of the sentiment sub-indices is “Advance-Divide Ratio and High-Low Index (PC3)” which is positively linked to the portfolio

return. When sentiment is high, the number of stocks advancing are also high. The same is true with high-low index. The positive coefficient of PC3 is positively related to the portfolio return which is in line with [11], [36], [13], [14], [20] and [25]. One of the sentiment sub-indices is “Price to Book Ratio and Liquidity in the Economy (PC4)”. This variable has a negative relationship with the market return. When the price to book value ratio is low, it means the market is undervalued and vice-versa. Further, when liquidity in the economy goes down, the money with people is pumped into the market and vice-versa. Thus, both the proxies are negatively related with the portfolio return. The results are in line with [23] and [26] who reported negative relation of liquidity in the economy and price to book value ratio with portfolio return. Further, the level of industrial production is positively related to the return as reported by [25]. The “Oil Price and Industrial Production Index (PC5)” is positively related to the portfolio return and it can be concluded that the impact of industrial production is more than the impact of oil prices. This interpretation is in line with [28]. We have checked our model for robustness in the EViews 12 using actual, fitted and residual graph; serial correlation test; heteroskedasticity test and CUSUM test. Figure 1 reveals that the fitted values of BSE Sensex are close to their actual values.

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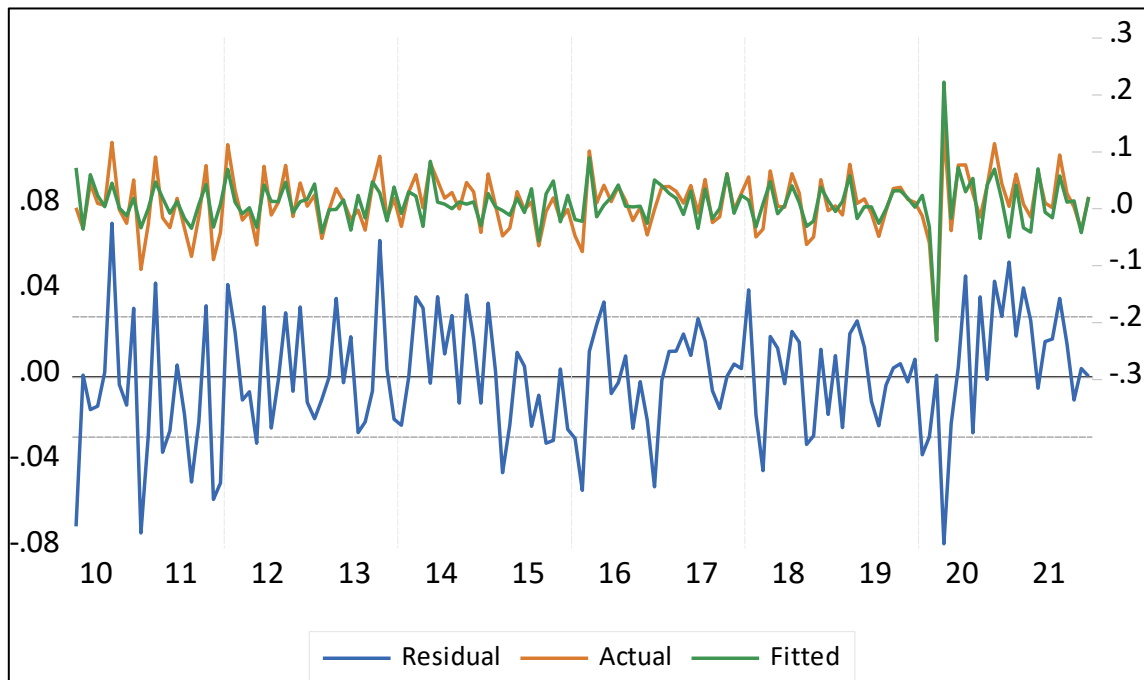


Figure 1 (Residual, Fitted and Actual Values)

Results of serial correlation and heteroskedasticity are in correlation and heteroskedasticity. Presence of serial correlation and heteroskedasticity makes a model invalid. Table V which show that our model is free from serial correlation and heteroskedasticity makes a model invalid.

Table V: Results for Serial Correlation and Heteroskedasticity Test

Breusch-Godfrey Serial Correlation LM Test			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	1.044038	Prob. F(2,127)	0.3550
Obs*R-squared	2.280759	Prob. Chi-Square(2)	0.3197
Heteroskedasticity Test: ARCH			
F-statistic	0.638650	Prob. F(1,138)	0.4256
Obs*R-squared	0.644921	Prob. Chi-Square(1)	0.4219

(Source: Author’s own calculation in EViews 12)

Results of the CUSUM test are in figure 2 which indicate that model is within the upper 5% significance level bounds and hence is stable. It also implies that coefficients are reliable.

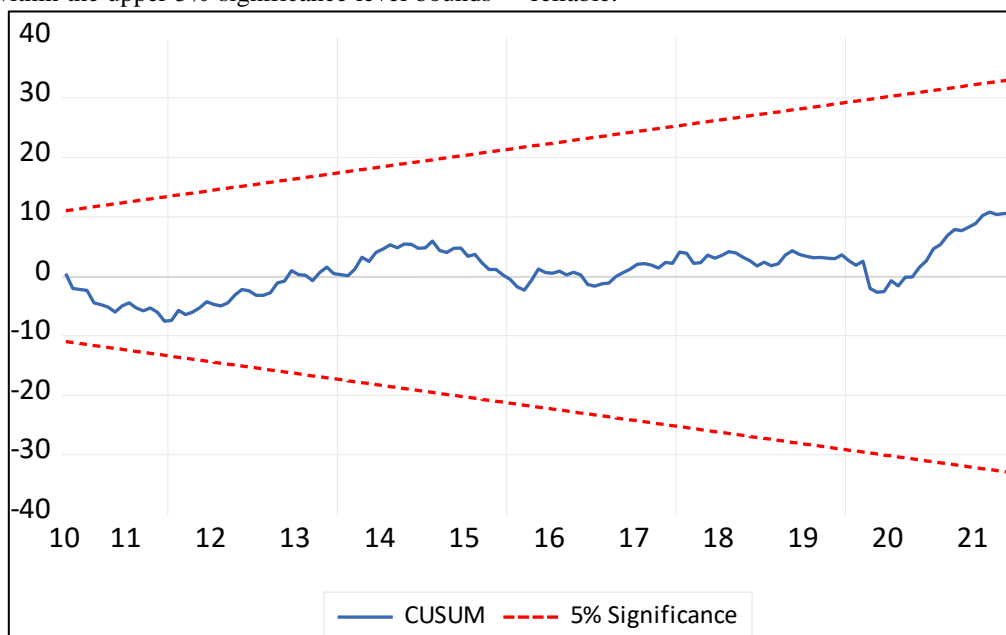


Figure 2(CUSUM Test Results in EViews 12)

It can be concluded that following 5 sentiment sub-indices have the explanatory power with respect to the portfolio return (Table VI)—

Table VI: Final Sentiment Proxies to Predict Market Return

Positively related	Negatively related
1. Advance-Decline Ratio and High-Low Index (PC3)&2. Oil Price and Industrial Production Index (PC5)	3. Market and Economic Variables (PC1), 4. Price to Book Value Ratio and Liquidity in Economy (PC4)&5. Term-Spread (PC11)

(Source: Author’s own calculation)

B. Investor Sentiment and Portfolio Return over Various Economic Conditions

Table VII: Regression Results of Equation 2

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.011	.002	5.257	.000	.011
ECONCOND	-.042	.003	-14.700	.000	-.042
PC1	.001	.005	.191	.849	.001
PC1.ECONCOND	.040	.009	4.750	.000	.040
PC2	-.043	.009	-4.875	.000	-.043
PC2.ECONCOND	.004	.003	1.201	.232	.004
PC3	.004	.004	.998	.320	.004
PC3.ECONCOND	-.025	.006	-4.055	.000	-.025
PC4	.020	.007	3.064	.003	.020
PC4.ECONCOND	.000	.003	-.075	.941	.000
PC5	.004	.005	.730	.467	.004
PC5.ECONCOND	-.002	.003	-.825	.411	-.002
PC6	.003	.005	.603	.548	.003
PC6.ECONCOND	.001	.003	.335	.738	.001
PC7	-.004	.004	-.924	.357	-.004
PC7.ECONCOND	.001	.003	.216	.829	.001
PC8	.003	.004	.623	.534	.003
PC8.ECONCOND	.007	.003	2.404	.018	.007
PC9	-.002	.006	-.307	.759	-.002
PC9.ECONCOND	-.006	.004	-1.701	.092	-.006
PC10	.012	.005	2.462	.015	.012
PC10.ECONCOND	-.003	.002	-1.282	.202	-.003
PC11	.011	.014	.800	.425	.011
PC11.ECONCOND	-.042	.003	-14.700	.000	-.042

(Source: Author’s own calculation)

Table VIII: Impact of Boom and Recession on Portfolio Return

Sentiment sub-indices	Slope for the boom period	Differential slope	Slope for the recession period
PC1 (Market and Economic Variables)	0.001	0.040*	0.041
PC2 (Market Ratios)	-0.043*	0.004	-0.039*
PC3 (Advance-Decline Ratio and High-Low Index)	0.004	-0.025*	-0.021
PC4 (Price to Book Value Ratio and Liquidity in Economy)	0.020*	0.000	0.020*
PC5 (Oil Price and Industrial Production Index)	0.004	-0.002	0.002
PC6 (Put-Call Ratio)	0.003	0.001	0.004
PC7 (Ratio of Equity in Total Issues and Total Number of Issues)	-0.004	0.001	-0.003
PC8 (Buy-Sell Imbalance and Foreign Direct Investment)	0.003	0.007*	0.01
PC9 (Trading-Volume Ratio)	-0.002	-0.006***	-0.008
PC10 (Extra Return on Market Portfolio)	0.012**	-0.003	0.009**
PC11 (Term-Spread)	0.011	-0.042*	-0.031

*Significant at 1%, **Significant at 5%, ***Significant at 10%

(Source: Author’s own calculation)

The results are given in Table VIII. Results demonstrate that independent variable “Market Ratios (PC2)” has a significant negative impact on portfolio return in different business economic conditions *i.e.* recession and boom. Further, with the help of dummy regression, we found that the difference in the coefficient of slope of PC2 during both recession as well as boom is not statistically significant. This means that PC2 does not affect the portfolio return in different economic conditions differently. Thus, the second secondary hypothesis is rejected (H_{0P2S2}). Here it is worth mentioning that PC2 does explain the portfolio return under boom but not under normal circumstances.

The independent variable “Price to Book Value Ratio and Liquidity in Economy (PC4)” has a positive impact on portfolio return under recession and boom period at 1%. The dummy regression suggested that the difference in the coefficient of slope of PC4 during recession and boom is statistically insignificant. This implies that the effect of PC4 is the same on portfolio return under recession and boom period. Thus, the fourth secondary hypothesis is rejected (H_{0P2S4}).

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The independent variable “Extra Return on Market Portfolio (PC10)” affects the portfolio return positively at 5% level of significance. However, the dummy regression suggested that the difference in the coefficient of slope is not statistically significant. This implies that the effect of PC10 on portfolio return is the same under different economic conditions. Thus, we reject the tenth secondary hypothesis (H_{OP2S10}). Here it is worth mentioning that PC10 does explain the portfolio return under boom but not under normal circumstances. Thus, from the above findings and discussion, it can be concluded that the impact of PC2, PC4

and PC10 on portfolio return is the same under recession and boom. The above findings suggested that the differential slope of the sub-indices “Market Ratios (PC2)”, Price to Book Value Ratio and Liquidity in the Economy (PC4) and Extra Return on Market Portfolio (PC10) is statistically insignificant. In the light of the above findings, the secondary hypotheses *viz.* H_{OP22} , H_{OP24} and H_{OP210} were accepted and it is concluded that the impact of above selected proxies on portfolio return is same under different economic conditions.

C. Investor Sentiment and Portfolio Return over Various Market Conditions

Table IX: Regression Results of Equation 3

Model	Unstandardized Coefficients		Standardized Coefficients*	t	Sig.
	B	Std. Error	Beta		
(Constant)	.012	.002	5.046	.000	.012
MARKCOND	-.045	.007	-6.854	.000	-.045
PC1	.000	.008	-.046	.964	.000
PC1.MARKCOND	.051	.018	2.865	.005	.051
PC2	-.052	.018	-2.875	.005	-.052
PC2.MARKCOND	.017	.005	3.387	.001	.017
PC3	-.011	.006	-1.881	.062	-.011
PC3.MARKCOND	-.029	.009	-3.311	.001	-.029
PC4	.022	.009	2.399	.018	.022
PC4.MARKCOND	.002	.004	.393	.695	.002
PC5	-.001	.005	-.267	.790	-.001
PC5.MARKCOND	-.001	.007	-.079	.937	-.001
PC6	-.003	.008	-.336	.738	-.003
PC6.MARKCOND	.010	.009	1.088	.279	.010
PC7	-.012	.010	-1.183	.239	-.012
PC7.MARKCOND	-.010	.007	-1.432	.155	-.010
PC8	.011	.008	1.484	.140	.011
PC8.MARKCOND	.034	.012	2.718	.008	.034
PC9	-.033	.013	-2.618	.010	-.033
PC9.MARKCOND	.016	.013	1.295	.198	.016
PC10	-.018	.013	-1.437	.153	-.018
PC10.MARKCOND	-.072	.031	-2.346	.021	-.072
PC11	.069	.031	2.232	.028	.069
PC11.MARKCOND	-.045	.007	-6.854	.000	-.045

(Source: Author’s own calculations)

Table X: Impact of Bull and Bear on Portfolio Return

Sentiment proxies	Slope for the bull period	Differential slope	Slope for the bear period
	-.045*	.000	-0.045*
PC2 (Market Ratios)	.051*	-.052*	-0.001*
PC3 (Advance-Divide Ratio and High-Low Index)	.017*	-.011**	0.006*
PC4 (Price to Book Value Ratio and Liquidity in Economy)	-.029*	.022**	-0.007*
PC5 (Oil Price and Industrial Production Index)	.002	-.001	0.001
PC6 (Put-Call Ratio)	-.001	-.003	-0.004
PC7 (Ratio of Equity in Total Issues and Total Number of Issues)	.010	-.012	-0.002
PC8 (Buy-Sell Imbalance and Foreign Direct Investment)	-.010	.011	0.001
PC9 (Trading-Volume Ratio)	.034*	-.033*	0.001*
PC10 (Extra Return on Market Portfolio)	.016	-.018	-0.002
PC11 (Term-Spread)	-.072**	.069**	-0.003**

*Significant at 1%, **Significant at 5%, ***Significant at 10%

(Source: Author’s own calculation)

The results are given in table X. Results demonstrate that independent variable PC1 (Market and Economic Variables) has a significant negative bearing on portfolio return in different market conditions *i.e.* bear and bull period at 1%. Further, with the help of dummy regression, we found that there is no difference in the coefficient of slope of PC1 during both bear as well as bull. This means that PC1 affects the portfolio return in the same way over different market conditions. Thus, we have no reason to reject our first secondary hypothesis. The PC2 (Market Ratios) has a

significant positive impact on portfolio return under different market conditions at 1%. With the help of dummy regression, we found that there is a difference in the coefficient of slope of PC2 during bear and bull period, and it is statistically significant. This means that the effect of PC2 on portfolio return under bear and bull periods is different. Thus, we have rejected the third secondary hypothesis (H_{OP3S2}).



The PC3 (Advance–Decline Ratio and High–Low Index) has a positive impact on portfolio return at 1% level of significance. Dummy regression results inform us that there is a difference in the coefficient of slope of PC3 and this difference is statistically significant at 5% level. It implies that the effect of PC3 on portfolio return is different under bull and bear conditions. Thus, we reject the third secondary hypothesis (H_{OP3S3}). The PC4 (Price to Book Value Ratio and Liquidity in Economy) has a significant negative impact on portfolio return in bear and bull periods at 1%. Further, with the help of dummy regression, we found that there is a significant difference in the coefficient of slope of PC4 during both bear as well as bull period and this difference is statistically significant at 5%. This implicates that the effect of PC4 on portfolio return is different under different market conditions. Thus, the fourth secondary hypothesis is rejected (H_{OP3S4}). The PC9 (Trading Volume Ratio) has a significant positive impact on portfolio return under different market conditions at 1%. With the help of dummy regression, we found that there is a difference in the coefficient of slope of PC9 during bear and bull period, and this is statistically significant at 1%. This means that the effect of PC9 is not the same on portfolio return under bear and bull period. Thus, we reject the ninth secondary hypothesis (H_{OP3S9}). The PC11 (Term–Spread) has a significant negative impact on portfolio return under bear and bull period at 5%. The dummy regression suggested that there is a difference in the coefficient of slope of PC11 during bear and bull period, and it is statistically significant. This implies that the effect of PC11 is different on portfolio return under bear and bull period. Thus, we reject the eleventh secondary hypothesis (H_{OP3S11}). So far as PC5 (Oil Price and Industrial Production Index), PC6 (Put–Call Ratio), PC7 (Ratio of Equity in Total Issues and Total Number of Issues), PC8 (Buy–Sell Imbalance and Foreign Direct Investment) and PC10 (Extra Return on Market Portfolio) are concerned, they do not affect the portfolio return under bear and bull period, as these are statistically insignificant. Further, the dummy regression demonstrated that the difference in the coefficients of slope of PC5, PC6, PC7, PC8 and PC10 are insignificant. It implies that these PCs do not affect the portfolio return differently under bear and bull periods. Thus, there is no reason to reject the H_{OP3S5} , H_{OP3S6} , H_{OP3S7} , H_{OP3S8} and H_{OP3S10} secondary hypotheses.

V. CONCLUSION

The study deals with the relationship between sentiment and portfolio return under different economic and market conditions. S&P BSE SENSEX has been used as proxy to the portfolio return. Principal component analysis has been employed for obtaining sentiment sub–indices. For finding out impact of sentiment on portfolio return we have used GLS method as it improves the model fitting in terms of improved values of r , r^2 and adjusted r^2 . The results from GLS estimation indicate that sentiment significantly affects the portfolio returns. Our results suggest that when investors are more hopeful about the market, they earn more return and lose the money when sentiment is bearish. It may turn into a snowball effect also. We have established that portfolio return can be predicted using some selected final

sentiment sub–indices viz. “Market and Economic Variables (PC1)”, “Advance–Decline Ratio and High–Low Index (PC3)”, “Price to Book Value Ratio and Liquidity in Economy (PC4)”, “Oil Price and Industrial Production Index (PC5)” and “Term–Spread (PC11)”. These sentiment sub–indices were found to be significant predictors of the portfolio return. Further, the slope of the proxies viz. “Market Ratios (PC2)” and “Extra Return on Market Portfolio (PC10)” were significantly increased in the boom period. The slope of “Price to Book Value Ratio and Liquidity in Economy (PC4)” found to be the same under boom as well as recession. It is concluded that the impact of above selected sub–indices (except (PC4)) on portfolio return is different under business economic conditions and these sub–indices can be used to predict the portfolio return differently under boom and recession periods. Slope of the sub–index “Market and Economic Variables (PC1)” is same under bull and bear periods. However, the slope of “Market Ratios (PC2)”, “Advance–Decline Ratio and High–Low Index (PC3)”, “Price to Book Value Ratio and Liquidity in Economy (PC4)”, “Trading–Volume Ratio (PC9)” and “Term–Spread (PC11)” has significantly increased in the bull period. Though it corroborates that the impact of above sub–indices on portfolio return is different under bull and bear conditions but the impact is stronger under bull period. “Market and Economic Variables (PC1)” and “Term–Spread (PC11)” have a stronger negative impact and “Market Ratios (PC2)”, “Advance–Decline Ratio and High–Low Index (PC3)”, “Price to Book Value Ratio and Liquidity in Economy (PC4)” and “Trading–Volume Ratio (PC9)” have a stronger positive impact on portfolio return. Findings of the study are helpful for investors and other decision makers in the Indian stock market. Investors can identify the sub–indices which are relevant in predicting portfolio return under different economic and market conditions. Further, researchers and professionals need to pay more attention to the sentiment sub–indices as it is an important factor in predicting portfolio return. Most of the research works suffer with limitations and ours is not an exception. In the present study the effect of sentiment has been analyzed on S&P BSE Sensex only, in future research sectoral indices can be added to analyze the impact of sentiment. Also, the sentiment can be used to explain the trends of the market due to high/low volatility in the Indian stock market. In future, a study can be conducted by taking data from the pandemic period which will help in analyzing the impact of sentiment on market return at the time of high volatility.

REFERENCES

1. Aggarwal, D. (2017). Exploring Relation Between Indian Market Sentiments and Stock Market Returns. *Asian Journal of Empirical Research*, 7(7), 147–159. doi:10.18488/journal.1007/2017.7.7/1007.7.147.159 [CrossRef]
2. Ahmed, S., & Ullah, N. (2013). Investor Sentiment and Stock Market Dynamics: A Case of Pakistan. *Journal of Public Administration, Finance and Law*(4), 126–135.
3. Baker, M., & Wurgler, J. (2004a, June). A Catering Theory of Dividends. (S. Nagel, Ed.) *The Journal of Finance*, LIX(3), 1125–1166. doi:10.1111/j.1540-6261.2004.00658.x [CrossRef]



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4. Baker, M., & Wurgler, J. (2004b). Appearing and Disappearing Dividends: The Link to Catering Incentives. (G. W. Schwert, Ed.) *Journal of Financial Economics*, 73, 271-288. doi:10.1016/j.jfineco.2003.08.001 [CrossRef]
5. Baker, M., & Wurgler, J. (2006). Investor Sentiment and the Cross-Section of Stock Returns. *Journal of Finance*, 61, 1645-1680. [CrossRef]
6. Baker, M., & Wurgler, J. (Spring 2007). Investor Sentiment in the Stock Market. *Journal of Economic Perspectives*, 21(2), 129-152. [CrossRef]
7. Baker, M., Wurgler, J., & Yuan, Y. (2012, May). Global, local, and contagious investor sentiment. *Journal of Financial Economics*, 104(2), 272-287. doi:10.1016/j.jfineco.2011.11.002 [CrossRef]
8. Bennet, E. (2011b). Sentiments of Indian Equity Investors. Bharathidasan University, Department of Commerce and Financial Studies. Tiruchirappalli: <https://shodhganga.inflibnet.ac.in/>.
9. Bennet, E., & Selvam, M. (2011a). Factors Influencing Retail Investors Attitude towards Investing in Equity Stocks: A Study In Tamil Nadu. *Journal of Modern Accounting and Auditing*, 7(3), 316-321.
10. Black, F. (1986). Noise. *Journal of Finance*, 41, 529-543. [CrossRef]
11. Brown, G. W., & Cliff, M. T. (2004, January). Investor Sentiment and the Near-Term Stock Market. *Journal of Empirical Finance*, 11(1), 1-27. [CrossRef]
12. Concetto, C. ., & Ravazzolo, F. (2019, May 13). Optimism in Financial Markets: Stock Market Returns and Investor Sentiments. *Journal of Risk Financial Management*, 12(2), 1-14. doi:10.3390/jrfm12020085 [CrossRef]
13. Dash, S. R., & Mahakud, J. (2013a). Investor Sentiment and Stock Return: Do Industries Matter? *Margin-The Journal of Applied Economic Research*, 7(3), 315–349. doi:10.1177/0973801013491530 [CrossRef]
14. Dash, S. R., & Mahakud, J. (2013b). Investor Sentiment, Risk and Stock Return: Evidence from Indian Non-Financial Companies. *Journal of Indian Business Research*, 4(3), 194-218. [CrossRef]
15. De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990, August). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, 98(4), 703-738. doi:10.1086/261703 [CrossRef]
16. Giot, P. (Summer 2005). Implied Volatility Indexes And Daily Value At Risk Models. *The Journal of Derivatives*, 12(4), 56-64. doi:doi.org/10.3905/jod.2005.517186 [CrossRef]
17. Gupta, L., & Maurya, S. (2021, July-September). Trends and Determinants of Primary Market Activities: Evidences from India. *Orissa Journal of Commerce*, 43(3), 27-41. doi:https://doi.org/10.54063/ojc.2021.v42i03.03 [CrossRef]
18. Kaiser, H. F. (1960, April 1). The Application of Electronic Computers to Factor Analysis. *Educational and Psychological Measurement*, 20(1), 141-151. doi:10.1177/001316446002000116 [CrossRef]
19. Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. London: Macmillan.
20. Kumari, J., & Mahakud, J. (2016). Investor Sentiment and Stock Market Volatility: Evidence from India. (R. A. Ajami, Ed.) *Journal of Asia-Pacific Business*, 17(2), 173-202. doi:10.1080/10599231.2016.1166024 [CrossRef]
21. Lee, W. Y., Jiang, C. X., & Indro, D. C. (2002). Stock Market Volatility, Excess Returns, and the Role of Investor Sentiment. *Journal of Banking and Finance*, 26(12), 2277-2299. doi:10.1016/S0378-4266(01)00202-3 [CrossRef]
22. Liu, H.-H., Wu, C.-C., & Su, Y.-K. (2011). The Role of Extreme Investor Sentiment on Stock and Futures Market Returns and Volatilities in Taiwan. *British Journal of Politics and International Relations*, 11(1), 504-551. Retrieved June 2, 2018, from https://pdfs.semanticscholar.org/2f5d/285e9d6e5160afba882d746b4c35f15b3360.pdf?_ga=2.107459202.1098554249.1559630751-1104344864.1559630751
23. McClure, B. (2020, August 20). Using Price-to-Book Ratio to Evaluate Companies. Retrieved November 13, 2020, from Investopedia: <https://www.investopedia.com/investing/using-price-to-book-ratio-evaluate-companies/>
24. Montone, M., & Zwinkels, R. C. (2015, March). Investor Sentiment and Employment. *Duisenberg school of finance - Tinbergen Institute Discussion Paper*, 1-43. Retrieved June 29, 2018, from <https://papers.tinbergen.nl/15046.pdf>
25. Naik, P. K., & Padhi, P. (2016). Investor Sentiment, Stock Market Returns and Volatility: Evidence from National Stock Exchange India. *International Journal of Management Practice*, 9(3), 213-237. doi:10.1504/IJMP.2016.077816 [CrossRef]
26. Pandey, P., & Sehgal, S. (2019, June). Investor Sentiment and its Role in Asset Pricing: An Empirical Study for India. (D. Thampy, Ed.) *IIMB Management Review*, 31(2), 127-144. doi:10.1016/j.iimb.2019.03.009 [CrossRef]
27. Pätäri, E., & Vilksa, M. (2014, May 8). Performance of moving average trading strategies over varying stock market conditions: the Finnish evidence. *Applied Economics*, 46(24), 2851-2872. doi:10.1080/00036846.2014.914145 [CrossRef]
28. Pescatori, A., & Mowry, B. (2008). Do Oil Prices Directly Affect the Stock Market? Cleveland: Federal Reserve Bank of Cleveland. Retrieved from <https://www.clevelandfed.org/newsroom-and-events/publications/economic-trends/economic-trends-archives/2008-economic-trends/et-20080912-do-oil-prices-directly-affect-the-stock-market.aspx>
29. Qiu, L. X., & Welch, I. (2004, October). Investor Sentiment Measures. *SSRN Electronic Journal*, 1-52. doi:10.2139/ssrn.589641 [CrossRef]
30. Rawlings, J. O., Pantula, S. G., & Dickey, D. A. (1998). *Applied Regression Analysis : A Research Tool* (2nd ed.). (G. Casella, S. Fienberg, & I. Olkin, Eds.) Raleigh, North Carolina, USA: Wadsworth Inc., Springer-Verlag Newyork. Retrieved March 3, 2021 [CrossRef]
31. Schmeling, M. (2009, June). Investor Sentiment and Stock Returns: Some International Evidence. *Journal of Empirical Finance*, 16(3), 394-408. doi:10.1016/j.jempfin.2009.01.002 [CrossRef]
32. Sehgal, S., Sood, G. S., & Rajput, N. (2009, April-June). Investor Sentiment in India: A Survey. *VISION-The Journal of Business Perspective*, 13(2), 13-23. doi:10.1177/097226290901300202 [CrossRef]
33. Sehgal, S., Sood, G. S., & Rajput, N. (2010, January-June and July December). Developing Investor Sentiment for India. *Osmania Journal of International Business Studies*, 5(1 and 2), 49-55. Retrieved May 30, 2019, from <http://www.indianjournals.com/ijor.aspx?target=ijor:ojsb&volume=5&issue=1and2&article=005&type=pdf>
34. Simon, D. P., & Wiggins III, R. A. (2001, May). S&P futures returns and contrary sentiment indicators. *The Journal of Futures Markets*, 21(5), 447-462. doi:doi.org/10.1002/fut.4 [CrossRef]
35. Smidt, S. (1968). A New Look at the Random Walk Hypothesis. *Journal of Financial and Quantitative Analysis*, 3(3), 235-261. [CrossRef]
36. Wang, Y.-H., Keswani, A., & Taylor, J. S. (2006, January-March). The Relationships between Sentiment, Returns and Volatility. *International Journal of Forecasting*, 22(1), 109-123. doi:https://doi.org/10.1016/j.ijforecast.2005.04.019 [CrossRef]
37. Whaley, R. E. (2009, April 30). Understanding the VIX. *The Journal of Portfolio*, 35(3), 98-105. doi:10.1080/09603107.2013.804163 [CrossRef]
38. Yang, Y., & Hasuike, T. (2017). Construction of Investor Sentiment Index in the Chinese Stock Market. *International Journal of Service and Knowledge Management*, 1(2), 49-61. [CrossRef]
39. Yoshinaga, C. E., & Castro Junior, F. H. (2012, April-June). The relationship between market sentiment index and stock rates of return: A panel data analysis. (C. G. Bellini, Ed.) *Brazilian Administration Review*, 9(2), 189-210. doi:10.1590/S1807-76922012000200005 [CrossRef]
40. Zakamulin, V. (2015, December 11). A Comprehensive Look at the Real-Life Performance of Moving Average Trading Strategies. *SSRN Electronic Journal*. doi:10.2139/ssrn.2677212 [CrossRef]
41. Zhou, G. (2018, November 1). Measuring Investor Sentiment. *Annual Review of Financial Economics*, 10, 239-259. [CrossRef]
42. Zweig, M. E. (1973). An Investor Expectations Stock Price Predictive Model Using Closed-End Fund Premiums. *The Journal of Finance*, 28(1), 67-68. [CrossRef]

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APPENDIX-A

Details of 32 variables used as proxy to the investor sentiment is as follows-

Sr. No.	Variable	Description
1	MKTTURN	Market turnover (₹)
2	NUMTRADE	Number of trades
3	TRADEQTY	30 days moving average of traded quantity of shares
4	TVR	Trading volume ratio (the ratio of turnover ratio to standard deviation of the market returns for the particular month)
5	ADR	Ratio of number of advancing shares to number of declining shares
6	COMPTRAD	Proportion of number of companies traded to total number of companies listed
7	VIX	VIX™ (Volatility index)
8	FPI	Foreign portfolio investment (₹)
9	PCR	Ratio of number of put options to number of call options
10	PER	Price-earning ratio (Market price/Earning per share)
11	PBR	Price to book value ratio (Market price/Book price)
12	DIVYIELD	Dividend yield (Dividend distributed/Market price per share)
13	BSI	Buy-sell imbalance
14	FDI	Foreign direct investment (₹)
15	RTVOL	Retail trading volume (₹)
16	HLI	High-low index (10 days simple moving average of the record high percentage indicator)
17	EQRATIO	Ratio of equity (₹) in the total issue (₹)
18	NIFPO	Number of IPOs and FPOs in a month
19	ECORPREM	Difference between market return and risk-free rate of return
20	XRETMP	Difference between return on market portfolio and market return
21	OILPRICE	Oil prices (₹)
22	BDEPMCAP	Ratio of bank deposit (₹) to market capitalization (₹)
23	EQMF	Net investment in equity by mutual fund companies (₹)
24	LIQECO	Liquidity in the economy as measured through M3 (₹)
25	INFLAT	Inflation in the economy as measured through whole sales price index
26	PLR	Level of interest rate as measured through prime lending rate
27	TERMSPRE	Term spread measured as difference between 364 days treasury bills and 91 days treasury bills
28	IPI	Level of industrial production as measured through industrial production index
29	SHORTINT	Short-term interest rate as measured through Short-term deposit interest rate
30	EXRATE	Exchange rate of the Indian rupee (₹) to US dollar (\$)
31	FEXRES	Foreign exchange reserves of India (₹)
32	GDP	Gross domestic product

APPENDIX-B

Secondary Hypothesis to First Primary Hypothesis

- H_{0P1S1}: There is no significant relationship between “Market and Economic Variables (PC1)” and portfolio return.
- H_{0P1S2}: There is no significant relationship between “Market Ratios (PC2)” and portfolio return.
- H_{0P1S3}: There is no significant relationship between “Advance-Divide Ratio and High-Low Index (PC3)” and portfolio return.
- H_{0P1S4}: There is no significant relationship between “Price to Book Value Ratio and Liquidity in Economy (PC4)” and portfolio return.
- H_{0P1S5}: There is no significant relationship between “Oil Price and Industrial Production Index (PC5)” and portfolio return.
- H_{0P1S6}: There is no significant relationship between “Put-Call Ratio (PC6)” and portfolio return.
- H_{0P1S7}: There is no significant relationship between “Ratio of Equity in Total Issues and Total Number of Issues (PC7)” and portfolio return.
- H_{0P1S8}: There is no significant relationship between “Buy-Sell Imbalance and Foreign Direct Investment (PC8)” and portfolio return.
- H_{0P1S9}: There is no significant relationship between “Trading-Volume Ratio (PC9)” and portfolio return.
- H_{0P1S10}: There is no significant relationship between “Extra Return on Market Portfolio (PC10)” and portfolio return.
- H_{0P1S11}: There is no significant relationship between “Term-Spread (PC11)” and portfolio return.

Secondary Hypothesis to Second Primary Hypothesis

- H_{0P2S1}: The effect of “Market and Economic Variables (PC1)” on portfolio return is the same for different economic conditions.
- H_{0P2S2}: The effect of “Market Ratios (PC2)” on portfolio return is the same for different economic conditions.
- H_{0P2S3}: The effect of “Advance-Divide Ratio and High-Low Index (PC3)” on portfolio return is the same for different economic conditions.
- H_{0P2S4}: The effect of “Price to Book Value Ratio and Liquidity in Economy (PC4)” on portfolio return is the same for different economic conditions.

Impact of Investor Sentiment on Portfolio Return–Do Economic and Market Conditions Matter?

H_{0P2S5}: The effect of “Oil Price and Industrial Production Index (PC5)” on portfolio return is the same for different economic conditions.

H_{0P2S6}: The effect of “Put-Call Ratio (PC6)” on portfolio return is the same for different economic conditions.

H_{0P2S7}: The effect of “Ratio of Equity in Total Issues and Total Number of Issues (PC7)” on portfolio return is the same for different economic conditions.

H_{0P2S8}: The effect of “Buy-Sell Imbalance and Foreign Direct Investment (PC8)” on portfolio return is the same for different economic conditions.

H_{0P2S9}: The effect of “Trading-Volume Ratio (PC9)” on portfolio return is the same for different economic conditions.

H_{0P2S10}: The effect of “Extra Return on Market Portfolio (PC10)” on portfolio return is the same for different economic conditions.

H_{0P2S11}: The effect of “Term-Spread (PC11)” on portfolio return is the same for different economic conditions.

Secondary Hypothesis to Third Primary Hypothesis

H_{0P3S1}: The effect of “Market and Economic Variables (PC1)” on portfolio return is the same for different market conditions.

H_{0P3S2}: The effect of “Market Ratios (PC2)” on portfolio return is the same for different market conditions.

H_{0P3S3}: The effect of “Advance-Decline Ratio and High-Low Index (PC3)” on portfolio return is the same for different market conditions.

H_{0P3S4}: The effect of “Price to Book Value Ratio and Liquidity in Economy (PC4)” on portfolio return is the same for different market conditions.

H_{0P3S5}: The effect of “Oil Price and Industrial Production Index(PC5)” on portfolio return is the same for different market conditions.

H_{0P3S6}: The effect of “Put-Call Ratio (PC6)” on portfolio return is the same for different market conditions.

H_{0P3S7}: The effect of “Ratio of Equity in Total Issues and Total Number of Issues (PC7)” on portfolio return is the same for different market conditions.

H_{0P3S8}: The effect of “Buy-Sell Imbalance and Foreign Direct Investment (PC8)” on portfolio return is the same for different market conditions.

H_{0P3S9}: The effect of “Trading-Volume Ratio (PC9)” on portfolio return is the same for different market conditions.

H_{0P3S10}: The effect of “Extra Return on Market Portfolio (PC10)” on portfolio return is the same for different market conditions.

H_{0P3S11}: The effect of “Term-Spread (PC11)” on portfolio return is the same for different market conditions.