INFLUENCE OF INVESTOR SENTIMENT MARKET FLUCTUATIONS

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ABSTRACT - Market volatility is a result of a plethora of influencing factors. One such factor is investor sentiment. In general, investors have certain perception and understanding of the macro-economic environment and its impact on stock markets. This cognition leads to investors in the market to trade in certain manner and as result contribute to market movement. The study first aims at identifying the bubbles in the stock market for which recursive unit root test was conducted. The results of the Augmented Dickey Fuller Test indicate that the stock index data is non-stationery and shows bubbles. These bubbles fall close to CPI. To further validate this, two indices viz., Consumer Price Index and Consumer Confidence Index were used as proxies for investor sentiments about the macro economic conditions and were studied alongside with BSE Index Values. Regression Analysis was done to evaluate the relationship between the Market Index and the investor sentiment variables CPI and CCI. It could be statistically established that there is a significant relationship between CPI and BSE Index, whereas the CCI was mildly contributing to the BSE market index. Hence, CPI can be effective indicator of stock market fluctuations and need to be used to understand the existence of bubbles and necessary precautions to avoid losses.

Key Words: Behavioural Finance,Investor Sentiment, CPI,CCI, Stock Market Bubbles

INTRODUCTION

"Investors are rational" is the proposition underlying almost all the traditional theories. The theory of rational investors as opposed by neo-classical economists with their proposition that every investor has limited access to information and an individual is bounded by external constraints as well as one's own behavioral aspects(Somil,2007). Hence, the decision making process is not a strictly rational one, where all relevant information is collected and objectively evaluated, rather, the decision maker makes mental shortcuts in the process(Tversky and kahneman,1974).

The behavioral finance asserted that investor market behavior derives from psychological principles of decision making to explain- why people buy or sell the stock (Al-Tamimi, 2005).

Investor Sentiments:

The mood of the investors in general is referred as investor sentiments. It is the prevailing attitude of investors towards a financial market or individual security. Also referred as market sentiment, it develops over time, and usually determined on the basis of huge information pool which is inclusive of both fundamental as well as technical factors. Market sentiment is a common mindset towards a financial market or individual security that drives its value in a given direction. The most common examples of this attitude include a bullish sentiment, which drives prices upward, and a bearish sentiment, which drives prices down.

Generally, investor sentiment is a long standing phenomenon which evolves over time as participants assimilate the available performance information. While there are a number of ways to measure market sentiment, the most common metric is the number of advancing versus declining stocks.

As it describes the outlook of investors in a market, investor sentiment is most evident in overall price trends. It is significant for investors as the nature of market psychology suggests that any given trend may

be more indicative of market sentiment than of fundamental gains or losses in the value of stocks.

Measuring Investor Sentiment:

Sentiment can be measured by direct or indirect approaches. Direct measures rely on information gained through surveys, seeking information from individuals regarding their feelings about the stock market and economic conditions, and electronic sources like internet and social media. On the other hand, indirect measures are based on financial and economic variables that depict investors' mindset.

Both the direct and indirect measures have been used extensively in empirical literature. For example, (Lemmon and Portniaguina, Brown and Cliff, Zhang, Lux, and Ali et al, Jan2015) surveys were used to measure sentiment. (Da et al.2015) constructed an index named as Financial and Economic Attitudes Revealed by Search (FEARS) by using daily internet search volume from millions of households as a measure of sentiment. It is pertinent to note here that recent literature has also interpreted information based on internet search, especially Google trends as an indicator of uncertainty rather than just a measure of sentiment. Sentiment could also be interpreted as fear. For example, (Ghosh et al.2014)have used the (VIX) constructed by Chicago Board of Options Exchange based on 30-day volatility and market expectations and interpreted it as a measure of fear rather than sentiment or uncertainty.

Some of the popular indirect measures used in empirical literature include number of IPOs, first-day returns on IPOs and closed-end fund discount , ratio of the number of advancing issues to the number of declining issues , mutual fund flows , turnover , dividend premium, trading volume and equity share in new issues , and bull-bear indicator of financial markets which includes relative strength index . Any single indicator of sentiment cannot capture the broad concept of sentiment but provides information on certain characteristics of firms such as performance, liquidity, activity level, etc. Therefore, the dominant opinion in the literature proposes to construct sentiment index using various individual indicators.

Another common measure for investor sentiment is the consumer confidence index (CCI). Though the respondents are not questioned regarding their opinion of securities markets,while ascertaining the CCI; yet it can be considered as a good proxy for investor sentiment. (Qiu and Welch,2004), (Lemmon and Portniaguina.,2006), (Schmeling, 2009) and (Wei-Pong, 2019) provided examples of Confidence Index's use.

In Indian context, Consumer Price Index can also be taken as a measure of investor sentiment. The Consumer Price Index (CPI) is a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food, and medical care. It is calculated by taking price changes for each item in the predetermined basket of goods and averaging them. Essentially it attempts to quantify the aggregate price level in an economy and thus measure the purchasing power of a country's unit of currency. The weighted average of the prices of goods and services that approximates an individual's consumption patterns is used to calculate CPI. As it captures the broader attitude of the consumer, it can be used as proxy for investor sentiment. There are hardly any studies with CPI and stock returns; hence an attempt is made to investigate the relationship between the CPI and stock market returns. Simultaneously we verify whether the CCI also acts as a directional factor for stock market returns.

The present study aims at understanding the investor sentiment using proxies like CCI and CPI. We then make an effort to evaluate the relationship between the

CCI & CPI with stock market returns using regression analysis. The BSE stock index values are also run with ADFT(Augmented Dickey Fuller Test) to ascertain whether the index is stationary or shows certain bubbles. Finally, a check is made whether this non-stationary movement of stock market is the result of investor sentiment. Regression Analysis results show that among the two proxies used for investor sentiment, CPI can prove to be better influential factor in predicting the future index value compared to CCI.

It is also observed from the ADFT results that, the index values are non-stationary and contain bubbles. When ordinary least squares regression was used to check the relationship between stock market bubbles and investor sentiment, it was found that investor sentiment were highest in the bubble periods identified during 2015& 2016.

DATA ANALYSIS:

Outline of the study:

To measure the investor sentiment and obtain robust results, we use two indices viz., consumer confidence index and consumer price index as proxies. The first proxy is Consumer Confidence Index is the resultant of consumer confidence survey, that has been conducted by RBI since 2010 with the objective to capture households' current perception and future expectations with respect to five parameters-economic conditions, employment scenario, general price levels, income and spending of the households. This survey coverage has been extended and currently, the survey is conducted in 13 cities covering 5400 households. A two stage probability sampling design is used, wherein at the first stage in a city, the polling booths are selected by systematic random sampling after arranging all polling booths according to their constituencies to ensure wider geographical coverage. In, the second stage, from each selected polling booth area,15 respondents are selected following the right-hand rule, skipping 10 houses.

Another measure is Consumer Price Index is a measure that examines the weighted average of prices of a basket of consumer goods and services. It is calculated by taking price changes for each item in the pre-determined basket of goods and averaging them. While it does measure the variation in price for retail goods and other items paid by consumers, it does not include things like savings and investments, yet it can be a good proxy for investor sentiment for the fact that if the CPI is at a favorable level, it indicates that general market sentiment is positive and vice versa.

Purchasers Manufacturing Index for manufacturing and service sectors are also studied as proxies for investor sentiments. PMI is an indicator of business activity in both manufacturing and service sector. It is also survey based measure that asks the companies about changes in perception of key business variables from the month before. It is calculated separately for manufacturing and service sectors and then made into a composite index. The PMI gives an indication of corporate earnings and is closely watched by investors. A good reading enhances the attractiveness of an economy vis-à-vis another economy.

As monthly observations are available for the present sample study period that starts from 1st Jan 2009 to 30th Sept 2019, however the beginning sample period for CCI starts from 2010 when compared to Jan 2009 of CPI for regressing process and PMI index values are available from Aug 2013 to Sept 2019.

The stock market variable viz., BSE Sensex historical prices were obtained from BSE official website.

Table No.1 Descriptive Statistics

Descriptive Statistics	BSE Index	CPI	CCI
Mean	29622.77	125.72	35.56
Standard Error	639.53	1.196	1.107
Median	28083.21	126.2	36.38
Standard Deviation	5501.47	10.28	6.458
Kurtosis	0.841	0.911	-0.121
Skewness	0.131	0.305	-0.051
Range	21094.48	36.2	27.1
Minimum	18619.72	104.6	22.4
Maximum	39714.2	140.8	49.5

Detecting Bubbles:

The term bubble is generally used when an asset is over-priced over a considerably short period. A bubble can be a result of rational expectations of market or asymmetrical under the assumptions of heterogeneous investors (Oehmke, 2013).

The overlapping of investor sentiment and stock bubbles can be identified only when the bubbles are identified and dated. The evaluation of the relationship can follow the identification process. As effectively proven and offered by PSY, a generalized ADF test is used for bubble identification.

It is not only necessary to identify the bubbles, but also equally essential to date them. In order to date the bubbles backward SADF strategy, again offered by PSY was used. We use the usual linear regression approach, except that when the null hypothesis holds the t coefficient doesn't follow a normal distribution. Instead, this coefficient follows a tau distribution, and so our test consists of determining whether the tau statistic τ (which is equivalent to the usual t statistic) is less than τ_{crit} based on a table of critical tau statistics values shown in Dickey-Fuller Table.

If the calculated tau value is less than the critical value in the table of critical values, then we have a significant result; otherwise we accept the null hypothesis that there is a unit root and the time series is not stationary.

Each version of the test uses a different set of critical values, as shown in the Dickey-Fuller Table. It is important to select the correct version of the test for the time series being analysed. Note that the type 2 test assumes there is a constant term (which may be significantly equal to zero).We start by assuming that the correct model is type 1, namely constant but no trend.

Since we are using the regression model, (constant, no trend) we use the Real Statistics **Linear Regression** data analysis tool. The output from the regression analysis is as shown in the table Table No.2

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-1210.608899	912.6247751	-1.32651	0.188026
39090.03	0.029586388	0.032606408	0.90738	0.366629

In particular, we see that the t statistic for the coefficient is -1.3265. This is the tau statistic. We now look up in the Dickey-Fuller Table, and find that the tau critical value for a type 1 test is -2.891 when $n = 92$ and $\alpha = .05$. Since $\tau_{crit} = -2.891 < -1.3265 = \tau$, we cannot reject the null hypothesis that the time series is not stationary.

We see that there is an apparent upward trend during the study period and so it is not surprising that the time series is not stationary. In fact, this leads us to choose

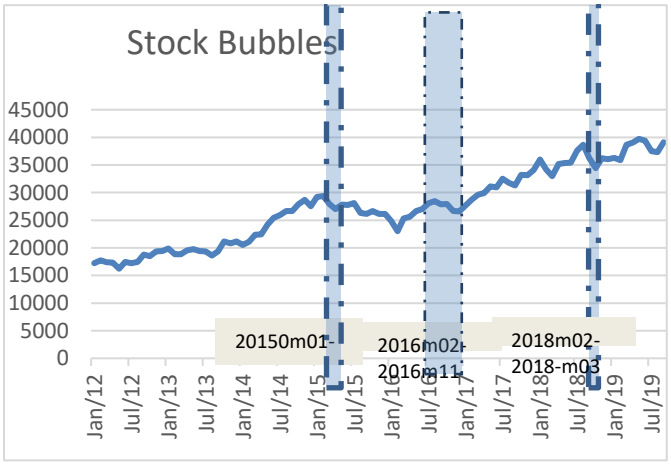
the type 2 Dickey-Fuller test (with constant and trend). The result of this test is shown in Table No.3

Table No.3

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-79402.6188	36411.29	-2.18071	0.031842
43709	2.000266754	0.931173	2.148115	0.034421
39090.03	-0.20592483	0.114203	-1.80315	0.074748

We see from Table No.3 that the t statistic for the coefficient is -2.1807. We now look up in the Dickey-Fuller Table, and find that the tau critical value is -3.452 for a type 2 test when $n = 92$ and $\alpha = .05$. Since $\tau_{crit} = -3.452 < -2.1807 = \tau$, we cannot reject the null hypothesis that the time series is not stationary.

Figure No.1 plots the detected bubble periods(shaded areas) using the PSY method.



There were three bubble periods identified as follows –

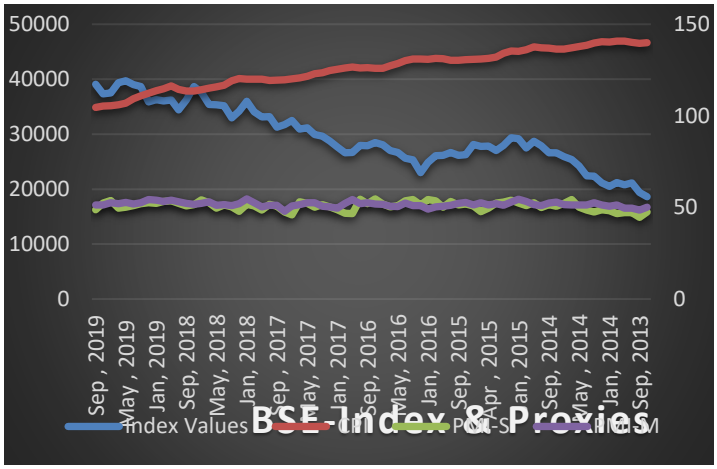
January 2015 to August 2015 ;February 2016-November 2016 ;February 2018 – March 2018

Bubbles and Investor Sentiment

Figure No.2 detected bubbles and Consumer Confidence Index

From the graph, it is clear that, the CCI can hardly be considered as an indicator for bubble formations. The three bubble periods to not show any correlation between the CCI and the market fluctuation.

Figure No.3 detected bubble periods with investor sentiment proxies



The bubbles are identified between 2013 and 2019. So, this period data is thoroughly analysed for any relationship of the stock index with the investment proxies. It is clearly found that CPI has inverse relationship with the BSE Index and for two bubbles identified during 2016 and 2018; whenever the index has inflated, the CPI has fallen.

It can be inferred graphically that the PMI both manufacturing and services are not that indicators of the bubbles. However, when the PMI –M and PMI-S are studied in comparison to BSE Index graphically as shown in the figure no.4 & 5; BSE Index moves more in line with PMI-S relative to PMI-M

Figure No.4BSE Index and PMI-M

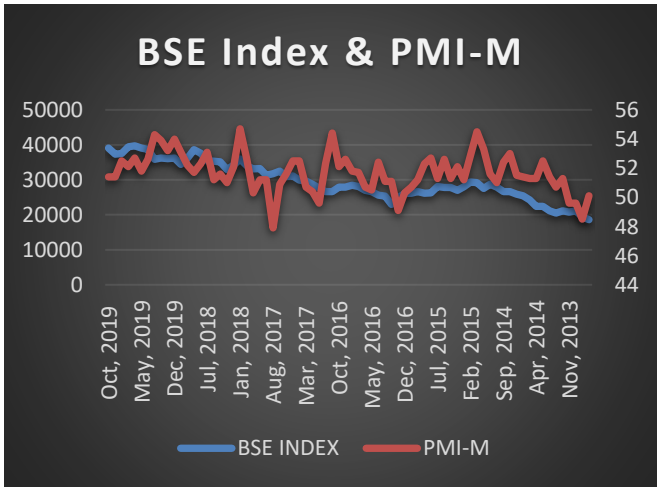
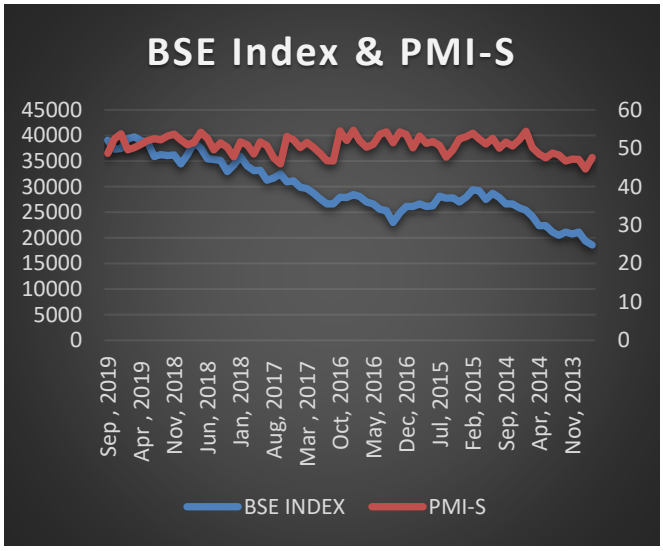


Figure No.5BSE Index and PMI-S



REGRESSION ANALYSIS:

BSE Sensex and CCI

We employee regression analysis to understand the relationship between the investor sentiment affects and the occurrence of stock market bubbles. Table No.4 shows the regression analysis of BSE Index values and Consumer Confidence Index Values.

Table No.4

Regression Statistics	
Multiple R	0.319024369
R Square	0.101776548
Adjusted R Square	0.072801598
Standard Error	5816.183332
Observations	33

R square value is 0.1017, which indicates that only 10.17% of the variations in the BSE sensex can be explained by the CCI. The closer this value is to one, the better regression line fits the data.

Hypothesis Testing:

To check if the results are reliable (statistically significant) the f-values are checked. If the f-value is less than 0.05, then the independent variable CCI can be considered good enough to have an influence on dependent variable BSE sensex. Hence, the following hypothesis is formulated-

H0: There is no significant relationship between BSE sensex and CCI

H1: There is significant relationship between BSE Sensex and CCI

Table No.5

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	18076.63185	5663.583384	3.191731	0.003234
37.4	294.1813534	156.9649301	1.874185	0.070357

The p-value is 0.003 and f-value is 0.07 at 95% confidence interval, which indicates that f-value if greater than the threshold value of 0.05.This provides no scope for acceptance of null hypothesis. Statistically the null hypothesis is rejected, implying that there exists a significant relationship between BSE Sensex and CCI.

BSE Sensex and CPI

Regression was also conducted to understand the relationship between the investor sentiment proxy, Consumer Price Index and BSE Sensex. Table No.6 shows the regression analysis of BSE Index values and Consumer Price Index Values.

Table No.6

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.931506744
R Square	0.867704814
Adjusted R Square	0.865841501
Standard Error	1986.848374
Observations	73

R square value is 0.8677, which indicates that almost 87% of the variations in the BSE sensex can be explained by the CPI. The closer this value is to one, the better regression line fits the data. Higher R square value implies that CPI can serve as a better independent variable that can explain the dependent variable BSE Sensex.

Hypothesis Testing:

To verify reliability, the f-values are checked. If the f-value is less than 0.05, then the independent variable CPI can be considered good enough to have an influence on dependent variable BSE sensex. Hence, the following hypothesis is formulated-

H0: There is no significant relationship between BSE sensex and CPI

H1: There is significant relationship between BSE Sensex and CPI

Table No.7

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-0.03924272	0.057868	-0.67814	0.4998
104.6	0.000393531	0.000458	0.859587	0.3930

The p-value is 0.499 and f-value is 0.392 at 95% confidence interval, which indicates that f-value if greater than the threshold value of 0.05.This provides no scope for acceptance of null hypothesis. Statistically the null hypothesis is rejected, implying that there exists a significant relationship between BSE Sensex and CPI.

BSE Sensex and PMI-M

We use regression analysis to understand the relationship between the investor sentiment affects and the occurrence of stock market bubbles. Table No.4 shows the regression analysis of BSE Index values and Manufacturing PMI- Index Values.

Table No.8

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.411959689
R Square	0.169710785
Adjusted R Square	0.158178991
Standard Error	5047.643958
Observations	74

R square value is 0.1697, which indicates that nearly17% of the variations in the BSE sensex can be explained by the PMI-M. The closer this value is to one, the better regression line fits the data.

Hypothesis Testing:

To check if the results are reliable the f-values are evaluated. If the f-value is less than 0.05, then the independent variable PMI-M can be considered to have an influence on dependent variable BSE sensex. Hence, the following hypothesis is formulated-

H0: There is no significant relationship between BSE sensex and CCI

H1: There is significant relationship between BSE Sensex and CCI

Table No.9

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-59360.9948	23202.961	-2.55834	0.01262
X Variable 1	1720.30160	448.43378	3.836244	0.00026

The p-value is 0.012 and f-value is 0.0002 at 95% confidence interval, which indicates that f-value if less than the threshold value of 0.05.This implies acceptance of null hypothesis. Statistically the null hypothesis impliesthat there is no significant relationship between BSE Sensex and PMI-M.

BSE Sensex and PMI-S

We use regression analysis to understand the relationship between the investor sentiment affects and the occurrence of stock market bubbles. Table No.4 shows the regression analysis of BSE Index values and Services PMI- Index Values.

Table No.10

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.303091114
R Square	0.091864223
Adjusted R Square	0.079251226
Standard Error	5278.972605
Observations	74

R square value is 0.091, which indicates that only 9.1% of the variations in the BSE sensex can be explained by the PMI-S. The closer this value is to one, the better regression line fits the data.

Hypothesis Testing:

To check if the results are reliable the f-values are evaluated. If the f-value is less than 0.05, then the independent variable PMI-M can be considered to have an influence on dependent variable BSE sensex. Hence, the following hypothesis is formulated-

H0: There is no significant relationship between BSE sensex and CCI

H1: There is significant relationship between BSE Sensex and CCI

Table No.11

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-6450.830004	13380.81627	-0.48211	0.6312
X Variable 1	709.37425	262.8520452	2.698758	0.00867

The p-value is 0.6312 and f-value is 0.008 at 95% confidence interval, which indicates that f-value if less than the threshold value of 0.05.This implies acceptance of null hypothesis. Statistically the null hypothesis implies that there is no significant relationship between BSE Sensex and PMI-S.

Conclusion:

In the present study, it can be carved out that investor sentiment's role as proxied by consumer confidence index and consumer price index can explain the fluctuations in stock index. We employed the recursive unit root test for the bubbles to successfully identify the bubbles during the study period.

Both CCI and CPI are good indicators of market fluctuations whereas CPI reflects the changes in the index much better. It is observed that whenever the investor sentiment peaks the market reaches high and then crashes with bubble burst.

It can be suggested from the results of the study that the market can be predicted based on the investor sentiments and such over optimism can be avoided to ensure unbiased behaviour by investors. Investor sentiment proxies can be well be used as early warning indicators and serve as precautionary tools to be conscious of undue circumstances. Further, with PMI as investor proxy to investor sentiment, it is found that, PMI-M can explain the market fluctuations to some extent compared to PMI-S.

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