

## Market mood index and stock market. Evidence from National Stock Exchange

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**Abstract.** *This study examines the time-series relationship between investor sentiment and the Indian stock market. Investor sentiment is measured through the market mood index (MMI); MII is a tool that shows the investor's emotions regarding the market and helps the investor, traders, etc., to know the current state of the market, i.e., extreme fear, fear, greed, extreme greed. Empirical results show that market sentiment generally lies between fear and greed mood. To check long-run relationships, we apply the Autoregressive Distributed lag test; the result shows a long-term relationship. Empirical results also show a bi-directional Granger causality relationship exists between the variables.*

**Keywords:** investor sentiment, market mood index, market return, ARDL, Granger causality.

**JEL Classification:** G11, G15, G17, G40, G41.

## Introduction

Traditional finance theories consider the market participants to be the rational economic agents who make decisions by trading off the cost and benefits. It is based on the assumption that the market is efficient and the stock market cannot deviate from its intrinsic or fundamental value. But this is not the case with behavioural finance. According to behavioural finance theory, market participants are irrational and are prone to psychological and sociological biases. Due to these biases, prices of the securities deviate from their intrinsic values, and arbitragers enjoy profits. But the arbitragers are risk-averse, and their risk appetite is limited against the noise traders. Due to the limit of arbitrage, the role of investor sentiment increases in determining the price of the securities. Brown (1999) suggests that if the noise signal affects the price of the securities, then the noise signal is sentiment and the risk cause becomes volatility. Hence the sentiment is related to volatility in the market.

Investor sentiment plays a vital role in determining the prices of assets. Jiang and Jin (2021) found that an increase in investor sentiment also increases the volatility in the Istanbul stock exchange. Hence investor sentiment causes both, i.e., price and volatility in the stock market.

We use MMI as a proxy for measuring investor sentiment. It is a market-based measure that helps the investors understand the market's current mood, and investors can make buy and sell decisions. The study examines the relationship between the MMI and the Nifty index. It is a 100-point scale divided into four equal parts, i.e., extreme fear, fear, greed, and extreme greed. The lowest value suggests extreme fear, and the highest value suggests extreme greed in the market. Extreme fear (below 30) suggests an excellent opportunity to open a new position because during the extreme fear zone market is oversold, and there is a high chance that the market will bounce back in the upward direction. The fear range (30-50) shows investors are worried about the market. If the indicator further drops to extreme fear or from greed to fear, it shows that the market is more fearful. The greed range lies between 50-70, suggesting that investors behave irrationally while taking a trade. If the market comes down from extreme greed to greed, it suggests market greediness is decreasing, and if it comes from the fear to greed, then it shows that the market greediness is increasing. Also, in the Extreme greed zone (above 70) market is overbought, and it is suggested that investors should avoid to open a fresh position because there might be the possibility that the market will turn downwards. So, it shows the overall psychology of the investor or traders or the mood or tone of the market.

### 1. Market mood index

The market mood index includes six crucial factors to present a clear market picture, based on these factors, MMI is calculated. It includes foreign institutional investors (FII) activity, volatility and skew, momentum, market breadth, price strength, and demand for gold. Each indicator is assigned equal weight, and then MMI is formed.

FII's activity: In this the interest is checked in the Indian market and is tracked through their net open position in the future index on the national stock exchange (NSE). If their net open position in the future index is more than the average value, then FIIs have a bullish view of the market.

Volatility and skew: It is based on out of the money (OTM) call options and OTM put options of nifty. If the difference value is higher, then it represents high average value skew. It means there is a high chance that the market will show a downward movement, and the market will come in a fearful mood.

Momentum: It is based on an exponential moving average of nifty. In this, the difference of 90 and 30 days exponential moving average of nifty is divided by 90 days moving average. The positive result shows positive momentum, and it shows a bullish trend, and MMI is going into the greed zone.

Market Breadth: It is calculated on the basis of the Advance-Decline (AD) ratio and Advance decline is calculated by price and volume. If both the ratios are more than one, it means AD price is supported by AD volume and market movement is real, and it will stay for a long time.

Price strength: It is calculated on the basis of the difference between the percentage of 52-week high stock and 52-week low stock. A positive result shows that the market is moving toward a bullish trend and vice versa.

Demand for gold: If the price return from the nifty is less than the price return from the gold over the last 2 weeks, it shows investors prefer investing in gold over equity. It shows MMI in the fear zone because investors are shifting towards other investments.

MMI is based on different market indicators and investor trading habits, so it shows both the state of the market and investor mood, so it is used as a sentiment for the study. The empirical data found a long-run relationship between nifty and the market mood index. Also, there is a bi-directional Granger causal relationship between them.

The rest of the study describes in the following section. The next section of the paper provides the literature review. In section 3, we discuss the Data of the study. Section 4 of the paper is related to the analyses of the data. Section 5 concludes the paper.

## 2. Review of literature

Several researchers studied investor sentiment and its effects on the share market. Researchers used different proxies for investor sentiment. Several studies suggest different proxies for measuring investor sentiment. Khan and Ahmad (2018) suggest two approaches for measuring investor sentiment, i.e., direct and indirect. The direct approach includes the information received through the survey, getting information through social media and the internet regarding their feelings or mood about the stock market and economic situation. The indirect approach includes the economic and financial variables other than the investors' mindset.

Researchers use both approaches in estimating investor sentiment. Fisher et al. (2015), Otoo (1999), Jansen and Nahuis (2003), Ferrer et al. (2016), Balwani et al. (2017) use consumer sentiment index (CSI) as a proxy for investor sentiment while Khan and Ahmad (2018) used both the methods for sentiment analysis and analysis its effect on Pakistan stock market. Kumari Mahakud (2015). Dash and Mahakud (2013) used financial indicators as a proxy for investor sentiment like put-call ratio, advance-decline ratio, turnover ratio, dividend premium, number of initial public offerings, turnover velocity, etc. Chakraborty and Subramaniam (2020) take the consumer confidence index and market mood index to examine the cross-sectional effect in the Indian stock market. Beyaz et al. (2019) use the volatility index as a market mood indicator for investor sentiment.

Gude et al. (2017) studied the impact of CSI on Indian nifty volatility. This study shows that a short- and long-term relationship exists between CSI and the national stock exchange (NSE) nifty. Indian investors behave so quickly in response to CSI that this short-run relationship adjusts quickly, and the stock market returns to equilibrium. Ferrer et al. (2016) investigated the time-varying pattern of consumer confidence and the stock market post the dot-com bubble and during the financial crisis in the USA and European countries. He observed that the Stock market and consumer confidence relationship is decreased in European countries and unaffected in the USA post the dotcom bubble crash, concluding that consumer confidence is not a suitable proxy for investor sentiment. Hsu et al. (2011) find a granger causal relationship between consumer confidence and the stock market in 21 countries. He finds that in globalization, news and information spread quickly, which may lead the stock prices and consumer confidence to behave in the same pattern in all the countries. It shows that investors' behaviour is common in all the nations. Fisher et al. (2015) find that higher consumer confidence leads to lower stock returns as there is a negative relationship between them. Empirical results also show a positive relationship between the CCI change and contemporaneous stock return. Otoo (1999) finds that consumer sentiment and stock price have a contemporaneous relationship.

Khan and Ahmad (2018) study the emerging market of Pakistan to check the relationship between investor sentiment and stock return. He used ten proxies for measuring the investor sentiment and found that seven proxies positively relate to the investor sentiment while the other three are negatively related. Also, he used both the direct and indirect methods of sentiment for measuring the investor sentiment and found the bio-directional causal relationship between them. The result also shows that contemporaneous relation between them also exists and suggests that the sentiment immediately affects stock return and vice versa. Beyaz et al. (2019) use machine learning techniques to forecast the state of the market. He uses market mood indicators i.e., the volatility index (VIX), for identifying and forecasting the market state for various companies. Jansen and Nahuis (2003) study 11 European countries, showing that investor sentiment and stock return in nine countries are positively correlated. He takes consumer confidence as a proxy for investor sentiment and establishes the relationship with the stock market. Nguyen et al. (2015) studied the impact of consumer and business confidence on stock market risk premium. He found that consumer confidence has a significant positive effect on stock market risk premium, but he has not found any evidence of business impact on stock market risk premium. Hsu et al. (2011) Sum (2013) also studied the effect of consumer and business confidence on the

stock market premium. Yelamanchili (2019) examines the impact of CCI on the Indian stock market. He checks the effect index of consumer sentiment (ICS) on nine sectoral indices and six market indices. He finds that ICS has predictive power on some market indices returns (small-cap, mid-cap, and BSE 500 index); however, the effect is negative. Chakraborty and Subramaniam (2020) study the stock return and volatility using the market mood index and index of consumer sentiment as sentiment indicators. He finds stock volatility caused due to the asymmetric effect on the Market mood index.

### 2.1. Objective and hypothesis

The researcher used various indicators for measuring investor sentiment and its effect on the stock market. The most commonly used indicators are Put call ratio, advance-decline ration, dividend premium, interest rate, price-earning ratio, turnover, consumer confidence index, etc. Numerous papers show the fluctuation in the stock market through different sentiment indicators. Only a few studies are based on market indicators, i.e., market mood index. It is a novel indicator for measuring investor sentiment, and limited studies exist.

The market mood indicator shows the mindset of the investor with respect to the stock market. It shows the level of fearness and greediness among the investors. In this study market mood index is used to measure the investor sentiment and check its relationship with the Indian stock market. In this, we will also check, is there any causal relationship between the MMI and Stock return?

H01: There is no long-run relationship between the Market mood index and the Nifty index.

H02: The market mood index does cause the Nifty Index or vice versa.

## 3. Research methodology

This paper examines the relationship between the market mood index and the Indian nifty index. This study use multiple econometric tests for further analysis. First of all, the unit root test was applied to check the stationarity of the data so we could avoid spurious results. Based on the unit root test long-run relation is checked through ARDL long-run bound test post lag selection. This study also employed Granger's causality for short-run causal and effect relationships. All the test related to this study is discussed below.

### 3.1. Unit root test

As this study is based on time series data, the basic condition for time series data is that it is free from the unit root and should be stationary. Stationary data means that data has a constant mean, variance, and covariance with respect to time. If data do not follow this condition, then it is said to be a non-stationary series, and the series does not follow any trend. A non-stationary series gives spurious results, so it is necessary series is stationary (Baumohl and Lyocsa, 2011).

As this study is based on time series data, it is important to check the stationary properties of the data. For this purpose, we employed Fisher's Phillips-Perron and augmented Dickey-Fuller unit root tests (Phillips and Perron, 1988). The null hypothesis of both tests is that the series has a unit root or is non-stationary.

### 3.2. Lag length selection

An optimal lag length selection is important for the analysis as Johansen's cointegration and granger causality test results are sensitive to lag length. The lag length selection is based on the Final prediction error(FPE), and the Akaike information criterion(AIC) as both criteria are considered superior to the other criteria (Khim and Liew, 2004), and lag eleven is used for further analysis.

### 3.3. Autoregressive distributed lag long run bound test

This study would apply the Autoregressive distributed lag (ARDL) test to check the long-run relationship (Pesaran, 2008). As our series is stationary at a different order of integration, i.e., the market mood index is stationary at the level, in contrast, the nifty index is stationary at the first level. The null hypothesis for the ARDL long-run bound test assumes no cointegration between the variables. In this test, we compare the f statistics value with upper and lower bound and gets three type of results, viz., cointegration between the variables, inconclusive results and no cointegration. If the value of f statistics is greater than the upper bound, in that case, the cointegration exists or series is cointegrated in long-run, but if the value is less than or in between the lower and upper bound, then the results are no cointegration, and inconclusive respectively.

### 3.4. Granger's causality test

The Granger causality test helps us to determine the cause-and-effect relationship between the two variables (Granger, 1969). This test is carried out to predict the current value of one variable based on the lag responses. The causality gives us three results: uni-directional causality, bi-directional causality, and no causality between the variables. For example, if there are two variables, x, and y, if any increase or decrease in variable x due to variable y, then it is uni-directional Granger causality. Also, if both variables affect each other, then it is called bi-directional. If neither x nor y affects each other, it is called no granger causality between the variables. The null hypothesis of the test assumes that there is no granger causal relationship between variables. As our study is based on two variables, we follow a simple two-variable model of granger causality explained in his study (Granger, 1969). The below equation determines whether the X series granger causes the Y series or vice versa and  $\varepsilon_t$ , and  $\eta_t$ , shows the error term.

$$X_t = \sum_{j=1}^m a_j X_{t-j} + \sum_{j=1}^m b_j Y_{t-j} + \varepsilon_t,$$

$$Y_t = \sum_{j=1}^m c_j X_{t-j} + \sum_{j=1}^m d_j Y_{t-j} + \eta_t,$$

### 3.5. Data

This study measures Investors sentiment through the Market mood index. The data is published by Economics times now small case. This data is also available on the tickertape application that Zerodha owns. It is a 100-point scale divided into four equal parts, i.e.,

extreme fear, fear, greed, and extreme greed. The index is based on six parameters: foreign institutional investors (FII) activity, volatility and skew in the market, momentum, market breadth, price strength, and demand for gold. Each indicator is assigned equal weight, and then MMI is formed. The daily data of the market mood index is used from May 2012 to May 2022.

Daily data of Nifty is obtained from the national stock exchange website (NSE). The index's closing value is used to check the effect of market mood on the trading day. The nifty closing value shows all the sentiment for that day that's why the closing value of the nifty is chosen for the study. Hence, 10 years of MMI and Nifty data is considered to examine the relation between them.

#### 4. Data analysis and interpretation

Table 1 shows the descriptive statistics of the MMI and Nifty index. The result indicates that investors normally behave rationally as it lies between fear and greed. Investors are in extreme fear in April 2018 as the MMI value is lowest in this month and are in extreme greed in June 2021 as the value of the index is highest in this month. A normal distribution has a kurtosis value is 3. The Kurtosis value of Nifty index is more than 3, which shows that the distribution is more peaked and has a fatter tail, whereas the market mood index value is less than 3, which shows the distribution has a thinner tail and is less peaked. Such distribution is called leptokurtic and platykurtic, respectively.

Further, the null hypothesis of the Jarque-Bera test is data is normally distributed. But the probability value of our result is less than 0.05. It means the Nifty 50 and BEER is not normally distributed.

**Table 1.** Descriptive statistics

	Nifty_Index	Market_Mood_Index
Mean	9900.721	50.38099
Median	9256.675	51.16382
Maximum	18477.05	88.17933
Minimum	4835.65	12.35739
Std. Dev.	3311.057	17.68799
Skewness	0.778944	-0.090193
Kurtosis	3.012615	2.079707
Jarque-Bera	248.785	90.14649
Probability	0	0
Sum	24355774	123937.2
Sum Sq. Dev.	2.70E+10	769334.9
Observations	2460	2460

Source: Author's compilation.

##### 4.1. Unit root test

Before performing an econometric analysis, it is necessary to check the stationary of the data. The data must be free from the unit root. Table 2 shows the stationary test result. Data should be stationary for a reliable result. The stationary of the series is checked through the augment dickey fuller test ADF and Philip Perron (PP) test. The market mood index is stationary at level I(0), and the Nifty index is at the first difference I(1). In stationary, we get the mixed result as one variable is stationary at the level and another at first.

**Table 2.** Unit root test

Unit Root Test				
ADF Test			PP Test	
At I (0)	t-Statistic	Prob.*	t-Statistic	Prob.*
Market_Mood_Index I (0)	-9.058597	0	-9.050842	0
Infty Index I (0)	-0.400541	0.9067	-0.222264	0.9332
At I (1)				
D(Nifty_Index)	-12.04669	0	-49.39712	0.0001

Source: Author's compilation.

#### 4.2. Lag selection

Table 3 shows the lag selection criteria. Lag selection was based on Akaike information criterion (AIC) and finite sample (FPE). The lag length was selected for a model where the value of AIC is less. Here the AIC value (18.32152) and FPE (310446.9) is minimum at 11 lags. So, lag 11 is selected for further test.

**Table 3.** VAR lag selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-25403.21	NA	3823696.	20.83248	20.83724	20.83421
1	-22427.46	5944.180	334324.9	18.39562	18.40989	18.40081
2	-22407.69	39.47137	330027.7	18.38269	18.40646	18.39133
3	-22361.43	92.25426	318787.0	18.34803	18.38132*	18.36013
4	-22349.8	23.15810	316800.8	18.34178	18.38458	18.35734
5	-22332.32	34.80541	313317.9	18.33073	18.38304	18.34974
6	-22322.21	20.12202	311750.7	18.32571	18.38753	18.34819*
7	-22319.11	6.159506	311981.2	18.32645	18.39778	18.35238
8	-22319.05	0.122177	312990.5	18.32968	18.41053	18.35907
9	-22314.03	9.955128	312729.7	18.32885	18.41920	18.36169
10	-22301.28	25.28285	310493.7	18.32167	18.42154	18.35797
11	-22297.1	8.288765	310446.9*	18.32152*	18.43090	18.36128
12	-22293.41	7.289416	310527.9	18.32178	18.44067	18.36500

Source: Author's compilation.

#### 4.3. ARDL long run form and bounds test

As the unit root shows, one variable is stationary at the level  $I(0)$  and another at the first difference  $I(1)$ , so the Autoregressive Distributed lag (ARDL) test is applied for cointegration. Table 4 shows the result of the ARDL long-run bound test. The test shows the long-run relationship that exists between MMI and Infty index. The f-statistic value 12.91801 is greater than the upper bound value  $I(1)$ . So the long-run relationship significantly exists at 5% level. Hence we reject the null hypothesis ( $H_0$ ), and there is a long-run relationship between MMI and the Nifty index.

**Table 4.** ARDL long run form and bounds test

F-bound Test				
	Value	Signif.	I(0)	I(1)
F-statistic	12.91801	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Source: Author's compilation.



#### 4.4. Granger causality test

To check the causal relationship between MMI and the nifty index, we apply the pairwise granger causality test. Table 5 shows the result of the pairwise granger causality test. In the granger test, the null hypothesis is market mood index does not Granger cause nifty index, and the second null hypothesis is nifty index does not granger cause. The result shows that the p-value is less than 0.05, so we reject the null hypothesis. The result shows MMI granger causes the nifty index and vice versa. It shows a bio-directional granger causality because both variables cause each other.

So, we reject H02: Market mood does not cause nifty index, and both the variables cause each other in the short run.

**Table 5.** *Pairwise Granger causality tests*

Null Hypothesis:	Obs.	F-Statistic	Prob.
Market Mood Index does not Granger Cause Nifty_Index	2449	3.02734	0.0005
Nifty Index does not Granger cause Market Mood Index		10.9296	6.00E-20

**Source:** Author's compilation.

#### 5. Conclusion

Sentiment plays a powerful role in deviating the price of securities from its intrinsic value. When sentiment leads in the market, the fundamental and technical indicators do not work accurately. This study shows that MMI deviate the market from its intrinsic value but it seems investor mood usually lies between fear and greed. It is found that the market mood index and nifty index are negatively correlated. It shows that when investors are in extreme fear, the stock market is oversold, and prices of the securities come below their intrinsic value. When prices of the securities come below their fundamental value, then rational investors start buying, and the stock market returns to its fundamental value and vice versa in case of extreme greed.

The study examines the long-run and short-run relationship between the market mood index and the nifty index. The sentiment index, i.e., the Market mood index, is constituted by six market variables, so this indicator shows the broad area of the market. The study indicates that MMI has a long-run relationship with the Indian nifty index. In the long-run market, the mood index affects the share market. Our empirical result shows that the market mood index granger-cause the change in the nifty index and vice versa. Granger causality test shows that there is a bi-directional causal relation between them.

This study is beneficial for investors, academicians, and traders. As per the behavioural theory, the market is inefficient, and it's beneficial for them to make profits and good investments. This study also helps the arbitrageur to make a profit due to the inefficiencies in the market. This study uses only one indicator for sentiment measure, i.e., the market mood index. MMI is a new indicator for sentiment measure, but it is recommended that researchers use other sentiment indicators for future research. Some of the variables on which less study is published in the Indian context are consumer confidence index, Business confidence index, etc. sector-wise impact is not examined in this research so researchers can work in this area also.

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