

Assessing the price diversity from the market fundamentals: Evidence from India

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Abstract

The examination upon the association between a composite investor sentiment on the Largecap, Midcap, Smallcap from the NSE nifty indices, and disposable income are studied on a sample data starting from April, 2007 to August, 2020. It was found that there was a long-run association but no short-run association among the variables. However, when a shock is introduced on each variable, they showed a sign of mixed response. Arbitrage constrains were found during less economic activity as per the historical GDP trend from the Reserve Bank of India database. Overall, it was found that the sample taken under this study is indicating evidence of existence of neoclassical theory along with contagion effects as well as disposition effects.

Keywords— Principal component analysis, ARDL, Wald test, CUSUM test, Breusch-Godfrey test.

INTRODUCTION

The traditional financial theory does not acknowledge the importance of the cognitive bias or behavioral aspect of investment decision making yet its importance and influence on the underlying asset prices were largely found to play a prominent role in the recent documented literature. Studies that focused on the noise traders influence on the asset price return believes that the relation of those two gives a peek upon the behavior of the crowd affecting their choices in making investment decisions rather than where the market is fundamentally moving (Dash, and Mahakud, 2012; Kling, and Gao, 2008; Jiang, et al., 2017; Schemeling, 2009; Baker, and Wurgler, 2006, and 2007). Moreover, investor sentiment is a response to an accumulation of a variety of fundamental and technical factors, including price history, economic reports, seasonal factors, and national and world events along with the ratings of each country in terms of the status of the economic activities.

Studying price diversity from the market fundamentals on India is very niche as it is one of the emerging countries with vast opportunities, potential growth, has its financial

market closely watched with more institutional investors yet Tuyon, and Matahir (2016) reported that both retail, as well as institutional investors, are influenced by the sentiment wave. Additionally, Kelly (1997) mentioned that rational investor represents high-income households and noise traders as lower-income households. India belonging to a middle-income bracket (Statista Research Department, 2020), is found to have herd-like behavior among the investors in past studies. Such findings in the literature are very rare. It cannot be due to lack of access to the information as the country has 560 million internet subscribers in 2018 with mobile data, and users of such are found consuming 8.3 gigabits of data each month on average; higher than China and South Korea, both of which are an advanced digital economy (McKinsey & Company, 2019). With the presence of sentiments impacting stock market returns established especially by using different measurements which are noted in the review of literature section, more studies in the context of developing countries are felt needed to understand the temporal dynamics between sentiments and returns in the stock market. A new investor sentiment has been created by

using ten investor sentiment proxies relevant to the sample country and found that there is long run association between the newly built investor sentiment and the studied variables which are Largecap, Midcap, Smallcap, and the disposable income but no short run relations were found among them. The forecasted series has shown a wide gap from its actual trend during difficult economic times as per the GDP trend.

The content flow of the paper consists of Section I; the introduction part, and Section II highlights the past work related to the chosen topic. Section III gives a review of the research methodology adopted while Section IV, presents the data analysis which is followed by the conclusion of the paper in Section V.

Review of literature

Different investor having an influence on the stock price where optimistic (pessimistic) sentiment resulted in stock overpricing (underpricing) are found listed (Beaumont et al., 2008; Palomino et al., 2009; Stambaugh et al., 2012; Chen, Mei-Ping et al., 2013; Bathia and Bredin, 2013; Horta and Lobão, 2017; Zhu and Niu, 2016; and Rashid et al., 2014). While recapitulation from the timescale aspect has found evidence of the investor sentiment association on the stock price both in the long run and short-run (Dash and Mahakud, 2012) yet only short-run association are found in Kling and Gao, 2008; Siganos et al., 2014; Jiang et al., 2017; Fiti and Hadhri, 2019; Yao and Li, 2020. In terms of size-wise, different investor and their cognitive bias in making an investment decision is found in small stock, low-priced firm, heavily traded stocks, and individual investors (Fisher and Statman, 2000; Bandopadhyaya and Jones, 2006; Kumar and Lee, 2006; Chen et al., 2010; Ni, Z. et al., 2015; George and Suresh, 2015; Ryu et al., 2016; Tuyon and Matahir, 2016; and Yang et al., 2017). The evidence of arbitrage constraints associated with the investor sentiment and its effect on the stock price is documented in Barberis et al., 1998; Baker and Wurgler, 2007; Serpil and Serkan, 2009; Joseph et al., 2011; Finter et al., 2012; Hu, C. and Wang, Y., 2013; Carla et al., 2013; Sun et al., 2016; Mathur and

Rastogi, 2018. Herding behavior is noted from individual and institutional investors and even from the fund managers and its effect on the stock market prices, including the market liquidity and debunking the traditional approach in finding the influence of sentiment using accounting information can be found in the following work of Burghardt et al., 2008; Schmeling, 2009; Liao et al., 2011; Dergiades, Theologos, 2012; Huang et al., 2014; Rashid et al., 2019; Naik and Padhi, 2016; Debata et al., 2017; Anusakumar et al., 2017; and Seok et al., 2018.

The effect of investor speculation is also found during different economic times in Chung et al., (2012), Jiangshan Hu, Yunyun Sui, Fang Ma (2021) and Smales (2017). Based on the above literature reviewed, it is found that there is still some work to be documented on the chosen study parameters as only a handful of them have taken relevant sentiment proxies with consideration of the subject under study which is explained in the following research gap.

Research gap:

Studies concerning on investor sentiment and its effect on the stock price have led to different research conclusions yet the common aspect mentioned in them is not having a uniform or set sentiment index for measurement. Studies like Baker and Wurgler (2006), Ni, Z. et al., (2015), Naik and Padhi (2016), Anusakumar et al. (2017), Horta and Lobao (2017), Rashid et al. (2019), and others have conformed on the different investor sentiment proxies and their likeliness in influencing the investment decisions. They have created a new sentiment index using five or more related implicit indicators from the market, accounting information or qualitative indicators. Recommendations of including more such related implicit factors for new sentiment proxies or using direct survey data on investor sentiment to extend the study in the future can also be found in those mentioned work. Therefore, a new composite investor sentiment is built using ten investor sentiment proxies for this study after going through the relevant documented research work and the selected

sentiment proxies are chosen which are briefly explained under Section III.

The broad idea on the presence of noise traders can be found in; A: a market where there are more individual investors than institutional investors (Sun et al; 2016), B: investor's consisting from low-income category (Kelly; 1997), C: culturally prone to herd-like behavior (Hofstede, 2001 and others), and D: no access to information through internet use or social media (McKinsey & Company, 2019). When recounting India's economic journey, she is neither of the first two, as it has more institutional investors and promoter shareholdings in the recognized trading platform (Dash, and Mahakud, 2012) and it falls in the middle-income household (Statista Research Department, 2020) category having internet access and its users record surpassing China's record internet users (McKinsey & Company, 2019). Therefore, the researcher felt the need to understand the sentiment driven financial market using sentiment proxies as a yardstick. Furthermore, the impact of investor sentiment in the emerging markets might be more pronounced than in developed markets (Schmeling, 2009; Chui et al.; 2010) and if that is the case then on what timescale? The probing on the influence of noise traders in the Indian indices is therefore felt needed to answer the timescale, forecasting ability and if something happens to the selected series under study, then how the individual series might respond.

The different opinions shared by researchers over the years on whether a seasoned investor or institutional investor is influenced by their counterpart, the unseasoned trader or individual investors (Yang et al., 2017; Carla et al., 2013) also is felt to be validated. To study that, India is the perfect example where there is more promoter shareholding than the individual investor. Moreover, researchers over the years have also suggested more work on the same to validate or understand the influence of the investor sentiments on the stock price behavior (Schmeling, 2009; Stambaugh, et al., 2012; and Tuyon, and Matahir, 2016).

Research Methodology

The composite investor sentiment is built similar to Baker and Wurgler, 2006, and 2007; Dash and Mahakud, 2012; Ni, Z. et al., 2015; Jiang et al., 2017; Rashid et al., 2019 by using the principal component approach. The multicollinearity problem was assessed using correlation analysis on the investor sentiment proxies and they were then further tested with KMO and Bartlett's tests to find the suitability of the investor sentiment proxies for constructing the composite sentiment index. The determined composite sentiment index is then orthogonalized by using Varimax with Kaiser Normalization.

The composition of the Investor sentiment index:

There have been numerous studies on Investor sentiment since the early 1990s and they all have confirmed with different measures of understanding the cross-section of its effect on stock returns or capital markets (Baker and Wurgler, 2006; Kumari and Mahakud, 2016; Dash and Mahakud, 2012). Based on the above, the most likely factors driving the investor sentiment from market-related and accounting related were chosen as proxies under this study. They are the advance-decline ratio (ADR) of Brown and Cliff (2004), Nifty 500 index market turnover ratio as equity issuance, a net mutual fund of (Brown and Cliff, 2004; Dash and Mahakud, 2012; and Neal and Wheatley, 1998), trading volume (TV) and turnover ratio as the NSE Turnover of Baker, and Wurgler (2006, and 2007), the price-earnings ratio (P/E), price to book ratio (P/B), and a dividend yield of Bekaert et al. (2007) and Baker, and Wurgler (2006; 2007), and Dash and Mahakud (2012), Initial Public Offering (IPO) and first day returns of the IPO of (Baker, and Wurgler, 2006 and 2007; Finter et al, 2012), and turnover ratio (TVR) of Datar et al. (1998).

Measurement of the investor sentiment proxies:

TV is measured as the NSE Nifty turnover, TVR is the turnover ratio divided by the standard deviation of the market returns of that particular month. Both are used to study the market liquidity as the irrational investors are

assumed to liquidate during short sale limitations thereby showing signs of speculation leading to price overvaluation. IPO and its first day returns are the number of IPO issued, and its first day returns. The number of IPO and its first day returns along with the share issuance are used to understand the investors' enthusiasm for future performance. Shares are issued or re-issued when there is a better future outlook. Whereas Equity issuance is defined as the gross equity issuance which is divided by gross equity plus gross long-term debt issuance. P/E is the ratio of market value per share to earnings per share, P/B is the ratio of market price per share to book value per share, and dividend yield can be a measure in annual dividends per share by price per share. Further, P/E, P/B, Dividend yield, and ADR can indicate future growth opportunities and market directions, and thereby the investor's willingness to invest for a rupee gain in return can be known. Respectively, ADR is the ratio of the number of advances and decline in stock prices. Whereas, Mutual fund is the net purchase of the mutual fund and it indicates the investment prospect in terms of small and large difference and size factor.

Variables under study are:

Following are the independent variables chosen for the study: Indian disposable income, Largecap, Midcap, and Smallcap indices. The dependent variable is the composite investor sentiment proxy consisting of ten probable sentiment proxies selected through a principal component analysis. The secondary data is collected from various sources, including Mutual fund association of India databases, RBI Database, Thomson Reuters, the Ministry of Statistics and the Program Implementation and Ministry of Commerce & Industry, Money control, and EMIS. The reason behind considering the household disposable income is to understand the behavior of individual investor sentiment from income perspectives as studying only the different capitalization gives perspectives on the investment characteristics of the high promoter holdings existing in the Indian stock market (Dash and Mahakud,

2012). Instead of using daily or weekly data to reduce the volatility and unnecessary noise (Chen et al., 2010), monthly data was collected from April 2007 to August 2020 on the basis of the availability of data. Some of the variables under consideration are in the annual series which were converted from low-frequency data to high frequency using Constant Match Average interpolation based on the last available values (Schemeling, 2009 and Baker, and Wurgler, 2006). The yearly data were converted into monthly for the number of IPO Issuances and disposable household income variables in particular. The household disposable income is converted into rupee by multiplying the series with each year's relevant exchange rate. The rest of the raw data were converted into monthly by taking its average from the daily series. The empirical test used in this study are the principal component analysis, correlation analysis, Phillip Perron tests, impulse response function, CUSUM test, Breush Godfrey tests, ARDL and short-run tests by using Wald tests on ARDL models on the log of stock returns and disposable household income.

Relative to the empirical tests mentioned above, the research was able to answer questions on the existence of influence of the investor sentiment on the different stock market capitalization returns and disposable household income. If the long run or short run relationship exists among the variables and finding if herd-like behavior can be found on the study timescales in addition to that if a shock is introduced on the chosen variables then how long does the variables under study takes to respond?

Data Analysis:

The principal component analysis resulted in the KMO of .654 and significant Bartlett's Test with a .000 p-value. The sample variance resulted in 35 percent explained by the first principal component. Therefore, that factor is chosen as the composite investor sentiment proxy since it is capturing much of the common variation among other factors. The sentiment proxies have undergone correlation analysis to detect multicollinearity problem (the value above .8) (correlation analysis details can be

shared on request). Therefore, a clean composite sentiment index has been formed.

UNIT ROOT TESTS:

Phillip Perron test is employed to check stationarity (**Table 1**) and it was found that the variables are having a mixed order of differencing resulting in $I(0)$ and $I(1)$ as follows:

Table 1: Stationarity order

Variables	differencing
Sentiment	$I(1)$
Largecap	$I(1)$
Midcap	$I(0)$
Smallcap	$I(0)$
Disposable Income	$I(1)$

Source: Author's own

Long-run model:

SENTIMENT = 0.002 - 0.11*SENTIMENT(-1) + 0.05*SENTIMENT(-2) - 0.09*LARGCAP(-1) - 1.31*LARGCAP(-2) - 0.99*MIDCAP(-1) + 0.56*MIDCAP(-2) - 0.36*SMALLCAP(-1) + 0.02*SMALLCAP(-2) + 0.13*DISI(-1) + 0.94*DISI(-2) - 0.74*ECT(-1)

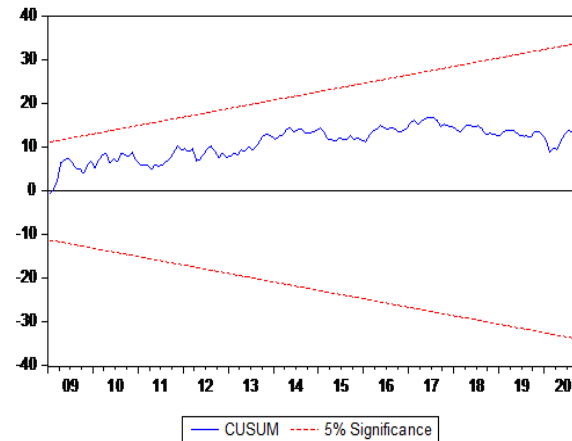
Table 2: ARDL model

F-Statistics	95%	
	I(0)	I(1)
5.385514	2.86	4.01

Source: Author's own

The test results under **Table 2** are showing evidence of a long-run relationship between studied variables as the F-statistics is more than the upper bound value under unrestricted intercept and notrend table based on the Pesaran and the bounds table value with the satisfactory model (refer **Figure 1**, and **Table no. 3**). Therefore the null hypothesis is rejected (Dash and Mahakud, 2012). It is found that the speed of adjustment towards the long-run equilibrium among the selected variables is showing 74 percent with a significant p-value.

Figure 1: CUSUM testTable 3: Breusch-Godfrey test



F-statistic	1.19	Prob. F(2,139)	0.31
Obs*R-squared	2.66	Prob. Chi-Square(2)	0.27

Source: Author's own

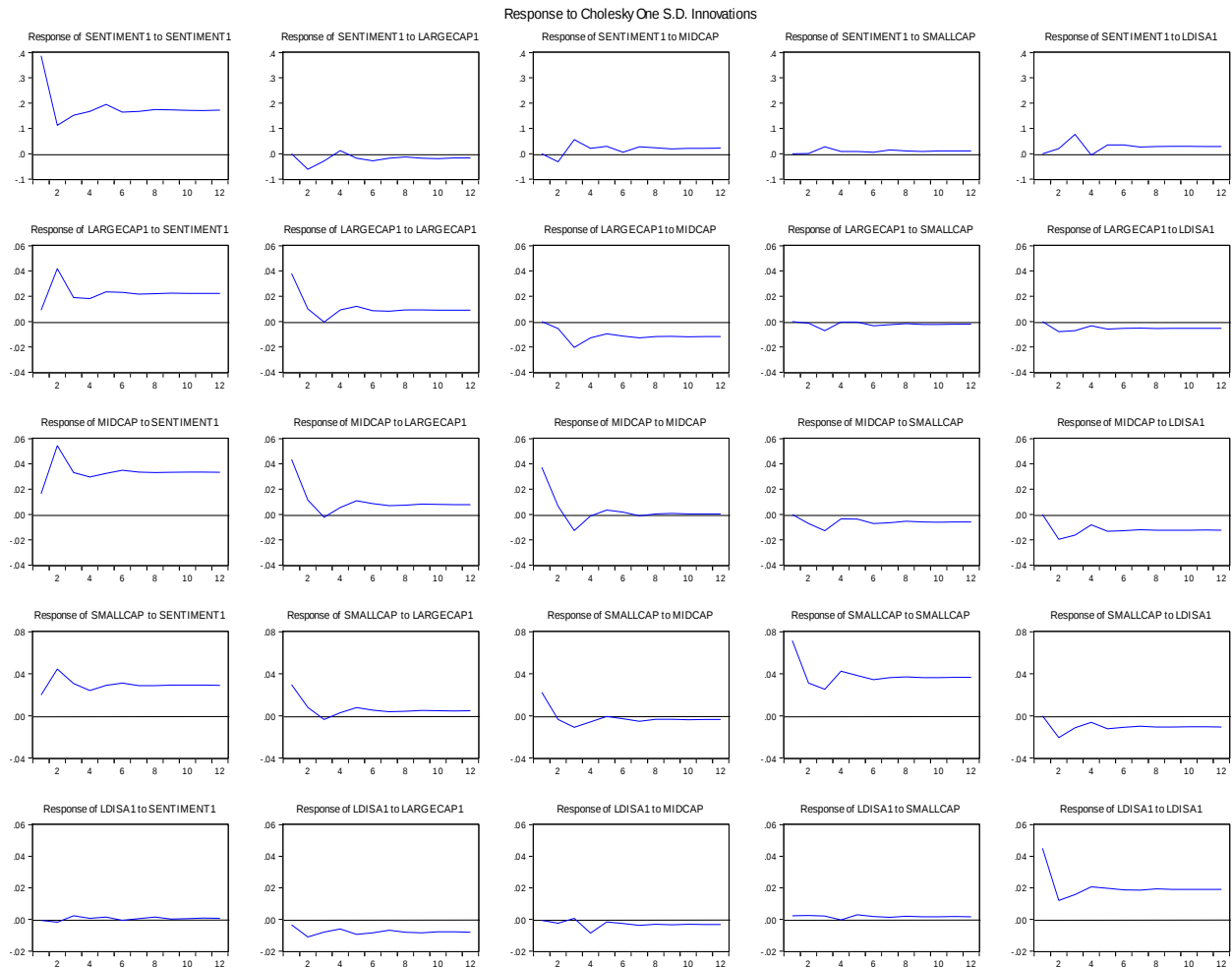
Table 4: WALT Test

Variables	F-statistics	Chi-square	p-value	
			F-statistic	Chi-square
Largecap to Sentiment	0.947267	1.894534	0.3902	0.3878
Midcap to Sentiment	1.622805	3.245610	0.2009	0.1973
Smallcap to Sentiment	0.465588	0.931176	0.6287	0.6278
Disposable income to Sentiment	1.385681	2.771362	0.2534	0.2502

Source: Author's own

Table 4 shows that there is no short-run association running from the Largecap, Midcap, Smallcap, and Disposable Income to the composite sentiment index (Jiang et al, 2017). It may be due to the high composition of the promoter stake holdings in the Indian capital market resulting in the less influence of the composite sentiment index on the Largecap, Midcap, Smallcap and disposable income in the shorter time scale.

Figure 2: Impulse Response Function:



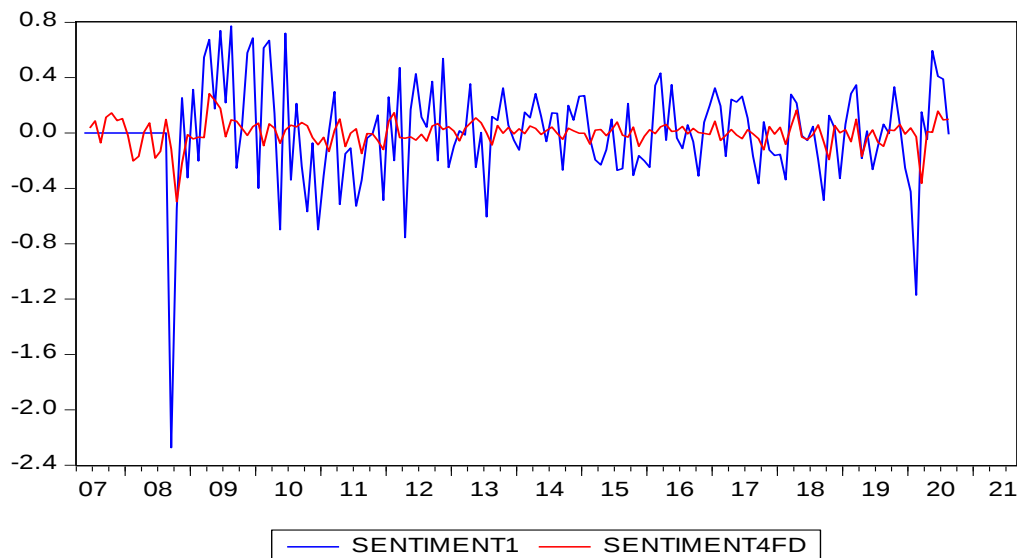
It can be understood from the **Figure 2** that following a shock, all the variables are underreacting for at least for the first three months, yet there is an opposite response from a shock to the Largecap indices from disposable household income and the composite investor sentiment. Such negative reaction shows evidence of the existence of neoclassical theory. Whereas a contagion effect has been found in response to a shock on the Midcap and Disposable household income on other variables under study.

Source: Author's own

Multiple regression model: $\text{SENTIMENT1} = -0.01 + 0.64 \cdot \text{LARGECAP} + 0.05 \cdot \text{MIDCAP} + 0.67 \cdot \text{SMALLCAP} + 0.19 \cdot \text{DISI} - 0.08 \cdot \text{SENTIMENT}(-1)$

Figure 3: Forecasting trends

The **figure 3** shows the forecasted series (Sentiment4fd) of the composite investor sentiment and its actual historical series trend. During the recession or economic tumult, the gap between the observed series can be seen wider (2008-2011, and mid-2019 periods onwards). The wide gap from both the trends when analyzed from the country's economic activity timeline can be seen to occur when India's Gross Domestic Product (the Reserve Bank of India database, 2020) is falling or lowest (Chung et al., 2012; Smales, 2017). Therefore, under this analysis also the contagion effect can be noticed during an economic recession leading to a gap between the forecasted and the actual series.



Source: Author's own

Conclusions

Based on the empirical analysis, it can be concluded that there exists an evidence of a long-run relationship among the selected variables (composite investor sentiment, Largecap, Midcap, Smallcap, and Disposable Income) but no short-run relation among them was detected. It was found that the limitations of arbitrage are occurring prominently during a recession or when there is a slowdown in the economy which is noticed from the large gap in the forecasted series from the historical series. Thereby, the present study confirms the existence of the arbitrage constraints from the timescale study as well as from the forecasted analysis, a contagion effect can also be found when a shock is induced on the series that resulted in negative responses on almost all the variables and furthermore neoclassical theory can be seen from the evidence of a negative relation between the Largecap stock return indices and disposable household income, especially during economic constraints.

Disclosure statement:

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