Investor Overconfidence and Disposition Effect : An Evidence from India

* Sushmita
** Rishabh Bhatia
*** Sanchit Sharma

Abstract

Behavioral finance, as a field of study, has emerged in order to explain the irrationality exhibited by investors in the financial markets to better understand the market and formulate trading and investing strategies. This study aimed to delve into the behavioral biases present in the Indian financial system and their impact on the same. The study focused on quantifying the influence of overconfidence and disposition effect on the Bombay Stock Exchange. These biases lead to outcomes that were inconsistent with the outcomes obtained by applying the traditional expected utility theory. Analysis was done by finding the relationships between the volume of stock traded, stock returns, and the market returns using basic OLS regression on lagged values of these variables. The analysis suggested that disposition effect and overconfidence were extant in the Indian stock market (BSE SENSEX, in particular) and had huge bearing on the investors' decision making. Also, apart from the basic fundamental and technical analysis, an investor's decision is driven by heuristics and mental biases, which shows that there is no particular mathematical formula to arrive at the investment decision taken by investors. It also suggested the need to formulate algorithms and trading strategies which take into account the impact of these biases and also to enhance accuracy. The results of this study were found to be in tandem with many other research studies and revealed that India is no exception when it comes to biases.

Keywords: behavioural finance, biases, disposition effect, overconfidence, prospect theory

JEL Classification: C58, D53, D91, G4, G41

Paper Submission Date : May 23, 2018 ; Paper sent back for Revision : September 17, 2018 ; Paper Acceptance Date : September 25, 2018

Behavioral finance studies the impact of human psychology on price movements in the stock market. This theory is of great importance as it explains why people (financial practitioners) behave the way they do, at times going against rationality. Thus, it helps explain the various anomalies observed in the securities market by blending psychological as well as financial theories together. Behavioral finance ascribes the irrationalities in the market to several psychological biases that human beings possess. It does not predict the future, but certainly helps in understanding past trends and in turn, tells investors to be careful of their market behavior in order to prevent making mistakes.

Prospect theory, a behavioral theory developed by Kahneman and Tversky (1979), tries to explain how

* Assistant Professor, Department of Management Studies, Shaheed Sukhdev College of Business Studies, University of Delhi, PSP Area - IV, Dr. K.N. Katju Marg, Sector-16 Rohini, New Delhi -110 089.
E-mail: sushmita.bhu@sscbsdu.ac.in , sushmita.bhu@gmail.com

** Student Researcher, Department of Management Studies, Shaheed Sukhdev College of Business Studies, University of Delhi, PSP Area - IV, Dr. K.N. Katju Marg, Sector-16 Rohini, New Delhi-110 089 . E-mail: bhatiarishabh105@gmail.com

*** Student Researcher, Department of Management Studies, Shaheed Sukhdev College of Business Studies, University of Delhi, PSP Area - IV, Dr. K.N. Katju Marg, Sector-16 Rohini, New Delhi-110089. E-mail: sanchitsharma2101@gmail.com

Figure 1. Prospect Theory

Value

Losses

Gains
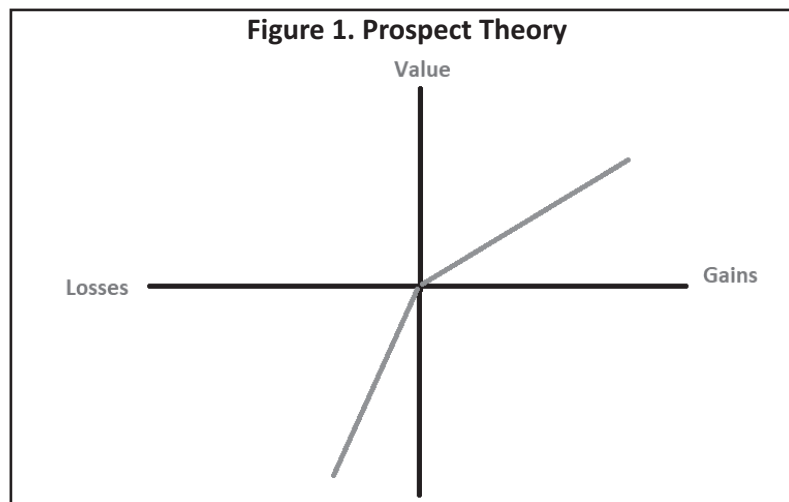
individuals take decisions when faced with options that involve risk, and the probabilities of the outcomes are unknown. It is a descriptive concept in the sense that it tries to examine and explain real life behavior in place of idealistic situations, an area explained by normative models. This theory contends that people value gains and losses differently, and, as such, will base decisions on perceived gains rather than perceived losses.

Thus, if a person were given two equal choices, one expressed in terms of possible gains and the other in possible losses, people would choose the former, even when they achieve the same economic end result. In other words, losses are weighted more heavily than equivalent amount of gains. One can be risk-seeking when we face losses, and risk-averse when one faces gains.

This gives rise to what is known as the 'framing effect.' This basically means that people react to a situation depending on the way it is framed, e.g., as a loss or a gain. People tend to avoid risk when a positive frame is presented but seek risks when a negative frame is presented.

The Figure 1 shows a value function that is in line with the prospect theory. This graph shows that losses hurt more than gains of the same amount ; thus, indicating a psychological phenomenon that has a bearing on the decision-making process of an individual.

Stock markets are not an exception here. Agrawal, Singhal, and Swarup (2016) observed that since behavioral finance assumes that characteristics of individual market participants and structure of information systematically has an influence on investment decisions of individuals, thereby 'herding behavior,' which is a tendency of individual investors to follow decisions of other investors, and also has major influence over investment decision making in stock markets.

Investor's decision to buy stocks is therefore affected by various biases, which explains why sometimes markets react differently than expected. Research shows that primary phenomena affecting the judgement of an individual are two, namely, overconfidence and disposition effect.

Overconfidence happens when an investor overestimates his/her ability to take decisions in the market. This usually happens with new investors. When they start gaining due to favorable market conditions/luck, they believe that they can take sound decisions. This motivates them to increase the amount they invest and the volume they trade as and when the return increases. However, like a bubble, it breaks down and the investor slips into losses. Due to the presence of new investors in huge numbers, this effect goes on to influence the movement of indicators in the market.

The tendency of investors to sell winning stocks too soon and hold on to losing stocks has been termed as disposition effect. This has been described as "one of the most robust facts about the trading of individual investors." The effect is observed in experiments and over different time periods, investor types, asset classes, and

countries. It is considered an irrational behavior, because selling and holding decisions should depend on the perceived future value of a security, not the purchase price. The cause of the disposition effect has been routed to prospect theory. This means that if a person is presented with two alternatives of equal magnitude, one described in terms of possible gains and the other described in terms of possible losses, the person would choose the former, even though both yield the same economic end result. This study focuses on investigating the presence of overconfidence and disposition effect in the Indian stock market.

Review of Literature

Siwar (2011) detected, inter alia, the presence of overconfidence and disposition effect as primary biases affecting the volume of trade in the French stock market. He used T-GARCH and VAR analyses and formed statistically significant relationships between variables. He managed to show that these biases are almost omnipresent across different methods.

In their paper, Shumway and Wu (2006) investigated the presence of disposition effect in a sample of 13,460 Chinese investors and firms. They not only established the presence of disposition effect, they also found out that investors who tended to showcase disposition effect in the market are bound to suffer losses in the subsequent periods ; hence, this psychological phenomenon is costly as compared to other psychological biases.

Zaiane and Abaoub (2009) presented conflicting views on the overconfidence hypothesis. They tested the presence of overconfidence bias in the Tunisian stock market by taking monthly data of volume and past returns. They could not establish a significant relation between the two and hence, rejected the prevalence of hypothesis in the Tunisian stock market. One possible explanation of this could be the fact that taking monthly data wipes out of all the fluctuations that would have been taken into account had they used daily data of returns and volume.

Odean (1998) noted that overconfidence is a feature of people, not markets. In his multifaceted research, he analyzed the impact of overconfidence in varied participants - price traders where information is widely spread, strategic trading insiders with concentrated information, and market makers on financial markets. The most robust effect of overconfidence was the increase in volume of trading. It could even influence markets to underreact or overreact depending on whether traders underweighed or overweighed information. Another inference was that overconfident insiders augment price quality as against overconfident price takers who tend to worsen it. Overconfidence was also seen to increase volatility in the market.

Chu, Im, and Jang (2012) observed that the overconfidence, as a bias, can also be a cause for disposition effect and that disposition effect is also caused due to feelings of 'pride' and 'shame' in an individual investor apart from less self-control and loss aversion. They also showed that overconfident people have an 'illusion of control.'

Dharma and Koesrindartoto (2018) proved the presence of disposition effect in the Indonesian market and that the demographic factors have a significant role to play in the same. They also claimed that the impact could be reversed by stimulating 'personal responsibility.'

Jain, Jain, and Jain (2015) conducted a comprehensive study of various behavioral biases present in the Indian stock market. These included disposition effect, mental accounting, investors' overconfidence, representativeness, narrow framing, aversion to ambiguity, anchoring, availability bias, and regret aversion. They focused more on the individual investor than on the market as a whole.

Metwally and Darvish (2015) used several time series analyses to show the presence of biases in the Egyptian stock market as well. They showed that biases were unaffected by variations in the market stages and demographics and were basically 'basic human nature.'

Patni, Choudhary, and Choubay (2015) observed that people had the inclination of relying too much on the accuracy of their own judgments. This trait of 'overconfidence' was seen by them as one of the major behavioral traits, which leads an individual to make poor investment decisions without doing an unbiased analysis of the all available options. In this study, interpretive structural modeling was used to develop a framework which clearly

indicated the robust factors of overconfidence in an orderly manner in the stock market, which supposedly distorted the investment decision making process.

Ghosh (2017) studied S&P BSE 100 of the Indian capital market. According to him, this stock index had diverse investor groups investing on a daily basis with contrasting ideas, knowledge bases, information inputs, and organic expertise. This study attempted to construct a reasonably accurate prediction model by finding out traces of all behavioral biases such as overconfidence, familiarity, and heuristic biases by using neural networks on S&P BSE 100.

Objectives of the Study

This study aims to achieve the following objectives :

(1) To investigate the presence of overconfidence in the Bombay Stock Exchange and determine the degree to which it affects trading volume of individual stocks for a specified period in the market. This can be determined by observing the relationship between volume of individual stocks and the lagged daily returns of the index.

(2) To investigate the presence of disposition effect within separate trading stocks of the constituents of SENSEX for a specified period. This can be determined by observing the relationship between volume of individual stocks and the lagged daily returns of the stock taken into consideration.

Data, Methodological Framework, and Modeling

(1) Hypotheses

This study will focus on establishing the following hypotheses :

(i) Overconfidence

✤ H_{01} : There is no significant positive relation between the lagged daily return of the index and the daily volume of the individual stock and the trend of volume traded is independent of the lagged daily return of the index.

OR

✤ H_{01} : There is no overconfidence bias prevailing in the market.

✤ H_{A1} : There is a significant positive relation between the lagged daily return of the index and the daily volume of the individual stock, and the trend of volume traded is dependent (fully or partially) on the trend of the lagged daily return of the index.

OR

✤ H_{A1} : There is overconfidence bias prevailing in the market.

(ii) Disposition Effect

✤ H_{02} : There is no significant positive relation between the lagged daily returns of the stock and its daily volume and the trend of volume traded is independent of the lagged daily return of the stock.

OR

✎ **H$_{02}$:** There is no disposition effect prevailing in the market.

✎ **H$_{A2}$:** There is a significant positive relation between the lagged daily return of the stock and its daily volume, and the trend of volume traded is dependent (fully or partially) on the trend of the lagged daily return of the stock.

OR

✎ **H$_{A2}$:** There is disposition effect prevailing in the market.

(2) Variables Studied

In order to establish the above-mentioned hypotheses, we shall study the following variables :

(i) Volume Traded : The number of shares traded was taken as a measure of the volume of the stock because it indicates the number of shares that change hands during a day. Thus, it is an indicator of the overall activity of the security for a given period.

(ii) Daily Returns of the Stock : The daily return of each stock was taken as A2/A1, where A2 is the closing price of the stock on a given day and A1 is the closing price of the stock on the previous day. This shows the proportional increase or decrease in the closing price of the given day as compared to the previous day. The cumulative effect of daily returns of every 5 day period has been captured using A6/A1, where A6 is the closing price of the given day and A1 is the closing price 5 days before A6.

(iii) Daily Returns of Index : The daily return of the index has been taken as B2/B1, where B2 is the closing price of the index on a given day and B1 is the closing price of the index the previous day. This shows the proportional increase or decrease in the closing price of the given day as compared to the previous day. The cumulative effect of daily returns of every 5 day period has been captured by using B6/B1, where B6 is the closing price of the given day and B1 is the closing price 5 days before B6 (Last Name, Year).

(3) Data : We studied the overconfidence and disposition effect on the S&P BSE SENSEX. It consists of the 31 largest and most actively traded stocks (Table 1) and is a worthy representative of various industrial sectors of the nation's economy. This makes it an apt barometer of the nation's economic sentiment. Prevalence of behavioral biases in SENSEX has significant implications on the overall trading in the economy as well. We collected data pertaining to the 31 constituents of S&P BSE Sensex Index (mentioned herewith) ranging from 10/04/2014 to 31/03/2017.

(4) Statistical Techniques Used : The primary technique used for research is ordinary least squares (OLS) regression. We also conducted a stationarity test to ensure the validity of the relationships established.

(i) OLS Regression : In the field of statistics, the unknown parameters of a linear regression model are estimated via the ordinary least squares (OLS) method. The method estimates the relationship between one or more independent variables and a dependent variable by minimizing the sum of squares in the difference between the observed and predicted values of the dependent variable configured as a straight line - smaller the differences, the better the model fits the data. A simple linear regression is expressed using the equation $Y = \alpha + \beta x$, wherein Y is predicted using X. In our study, we attempt to find a relation between the volume of individual stocks, the lagged daily returns of that stock, and the lagged daily returns of the index.
    The equation we use is :

Table 1. Constituents of SENSEX

Company Name	Sector
Adani Ports	Infrastructure - General
Asian Paints	Paints & Varnishes
Axis Bank	Banks - Private Sector
Bajaj Auto	Auto - 2 & 3 Wheelers
Bharti Airtel	Telecommunications - Service
BHEL	Infrastructure - General
Coal India	Mining & Mineral
Dr. Reddy's Labs	Pharmaceuticals
HDFC	Finance - Housing
HDFC Bank	Banks - Private Sector
Hero MotoCorp	Auto - 2 & 3 Wheelers
HUL	Personal Care
ICICI Bank	Banks - Private Sector
IndusInd Bank	Banks - Private Sector
Infosys	Computers - Software
ITC	Cigarettes
Kotak Mahindra	Banks - Private Sector
Larsen	Infrastructure - General
M&M	Auto - Cars & Jeeps
Maruti Suzuki	Auto - Cars & Jeeps
NTPC	Power - Generation & Distribution
ONGC	Oil Drilling And Exploration
Reliance	Refineries
SBI	Banks - Public Sector
Sun Pharma	Pharmaceuticals
Tata Motors	Auto - LCVs & HCVs
Tata Motors (D)	Auto - LCVs & HCVs
Tata Steel	Steel - Large
TCS	Computers - Software
Wipro	Computers - Software
Yes Bank	Banks - Private Sector

Note. The mentioned time period has been preferred owing to the relatively low level of political instability in the nation.

Note. The duration of 3 years has been taken as it appears to be a sufficient enough span of time for a sound scrutiny of the desired data, as has also been conventionally endorsed by similar research in this regard.

Source: The primary source of data has been the official website of the Bombay Stock Exchange.

$$LOG(VOL) = C + X1.LOG(VOL)(-1) + X2.LOG(VOL)(-2) + X3.LOG(VOL)(-3) + X4.LOG(VOL)(-4) + X5.CUM.LOG(VOL)(5 \ TO \ 10) + X6.LOG(DR)(-1) + X7.LOG(DR)(-2) + X8.LOG(DR)(-3) + X9.LOG(DR)(-4) + X10.CUM.LOG(DR)(1 \ TO \ 5) + X11.LOG(DRI)(-1) + X12.LOG(DRI)(-2) + X13.LOG(DRI)(-3) + X14.LOG(DRI)(-4) + X15.CUM.LOG(DRI)(1 \ TO \ 5)$$

where,

LOG(VOL): It is the natural log of daily volume traded of a stock.

LOG(VOL)(-1): It is first lag of natural log of daily volume traded of a stock.

LOG(VOL)(-2): It is second lag of natural log of daily volume traded of a stock.

LOG(VOL)(-3): It is third lag of natural log of daily volume traded of a stock.

LOG(VOL)(-4): It is fourth lag of natural log of daily volume traded of a stock.

CUM.LOG(VOL)(5 TO 10): It is the natural log of the average volume from fifth to the tenth lag of a stock.

LOG(DR)(-1): It is the first lag of natural log of daily return of a stock.

LOG(DR)(-2): It is the second lag of natural log of daily return of a stock.

LOG(DR)(-3): It is the third lag of natural log of daily return of a stock.

LOG(DR)(-4): It is the fourth lag of natural log of daily return of a stock.

CUM.LOG(DR)(1 TO 5): It is the natural log of the cumulative daily return of a stock from the first to the fifth lag.

LOG(DRI)(-1): It is the first lag of natural log of daily return of the index.

LOG(DRI)(-2): It is the second lag of natural log of daily return of the index.

LOG(DRI)(-3): It is the third lag of natural log of daily return of the index.

LOG(DRI)(-4): It is the fourth lag of natural log of daily return of the index.

CUM.LOG(DRI)(1 TO 5): It is the natural log of the cumulative daily return of the index from the first to the fifth lag.

In cross-sectional distributions, the turnover series (volume traded, in our case), by definition, is restricted to non-negative values and thus, the skewness is right-tailed. Making use of the log transformation normalizes this along with correcting the non-stationarity in the data. The natural log of daily returns of the stock as well as that of the index have also been taken in order to smoothen the data. Additionally, as the percentage changes, it assists in the examination of the coefficient estimates and the resulting impulse response functions.

The above equation will show the dependency of the volume traded on its lags, lags of the daily return, and on the lags of the daily return of the index and will be interpreted as follows :

✤ **Overconfidence :** Since overconfidence occurs in the entire market and not in a particular stock, logic dictates that overconfidence will be present if and only if there is a significant positive relation between the lagged returns of the index and the volume of a stock so much so that the volume shows a trend which is similar to that observed in the lagged returns of the index.

✤ **Disposition Effect :** Since disposition effect occurs in a particular stock, logic dictates that it will be present if and only if there is a significant positive relation between the lagged returns of the stock and the volume of a stock so much so that the volume shows a trend which is similar to that observed in the lagged returns of the stock. Level of significance used is 0.05, which is commonly used in many studies.

(ii) Stationarity - A Necessary Aspect : A series is said to be stationary when its basic properties like mean, variance, etc., remain constant over a period of time.

One of the prerequisites for running an OLS regression is that the data has to be stationary. Without this, the regression results will be spurious and any significant relationship between the two variables will actually be artificial and will disappear when a proper regression is run. Hence, testing stationarity becomes important.

We use the Augmented Dickey-Fuller test to test stationarity of volume traded, daily return, and daily return of the index. If the p - value of the test statistic is less than 0.05 (our level of significance), we reject the null

Table 2. Empirical Results and Discussion

Company Name	Overconfidence	Disposition Effect
Adani Ports & SEZ	Yes (at all lags)	Yes (at cumulative lag)
Asian Paints	Yes (at lag 3)	Yes (at cumulative lag)
Axis Bank	Yes (at lag 4)	Yes (at cumulative lag)
Bajaj Auto	No	Yes (at cumulative lag)
Bharti Airtel	Yes (at lag 4)	No
Cipla	Yes (at lag 2)	Yes (at cumulative lag)
Coal India	Yes (at lags 2,3 and 4)	No
Dr. Reddy's Lab	No	No
HDFC Bank	No	Yes (at cumulative lag)
HDFC	Yes (at lag 3)	Yes (at cumulative lag)
Hero MotoCorp	No	No
Hindustan Unilever	No	Yes (at cumulative lag)
ICICI Bank	No	Yes (at lag 3)
Infosys	Yes (at lag 2)	No
ITC	Yes (at cumulative lag)	No
Kotak Bank	No	No
LT	No	Yes (at cumulative lag)
Lupin	Yes (at lags 2 and 4)	No
M&M	No	No
Maruti	No	Yes (at cumulative lag)
NTPC	Yes (at lags 2 and 4)	Yes (at cumulative lag)
ONGC	No	No
PowerGrid	No	Yes (at cumulative lag)
Reliance	Yes (at all lags)	Yes (at cumulative lag)
SBIN	Yes (at lag 1 and 3)	No
Sun Pharma	No	No
Tata Motors	Yes (at lags 2 and 4)	No
Tata Steel	Yes (at all lags)	Yes (at cumulative lag)
TataMtrDVR	No	Yes (at cumulative lag)
TCS	No	Yes (at lag 2)
WIPRO	Yes (at lags 1 and 2)	No

hypothesis that the data has a unit root, thereby proving it to be stationary.

In our tests, all the stock data has come out to be stationary except for that of SBI. This has been taken care of by taking the absolute values of variables in the data and testing stationarity, thus ensuring the validity of all the regression equations arrived at by using the above estimator.

The Table 2 shows that overconfidence is present in 16 out of 31 companies, while disposition effect is present in 17 out of 31 companies. Out of these, eight companies manifest both overconfidence and disposition effect. Hence, the H_{01} for overconfidence has been rejected in 16 out of 31 companies ; H_{02} for disposition effect has been rejected in 17 out of 31 companies ; while, eight companies show rejection of both H_{01} and H_{02}. Consequently, H_{A1}

is not rejected for 16 companies and H_{A2} is not rejected for 17 companies ; moreover, there are eight companies for which both H_{A1} and H_{A2} are not rejected. This goes on to show that these two effects have a huge bearing on the overall functioning of the Indian stock market.

The results obtained are in tandem with the ones obtained from analysis of French stock markets (Siwar, 2011), Chinese stock markets (Shumway & Wu, 2006), Indonesian markets (Dharma & Koesrindartoto, 2018), and Egyptian stock markets (Metwally & Darwish, 2015). This shows that India is no exception when it comes to such effects. We also observe that positive significant relationship between the daily returns and volume occurs at a cumulative level of data for 5 days. This shows that these effects take time to show their influence in the market ; hence, reiterating imperfect dissemination of knowledge in markets as against propounded by normative theory.

The presence of these biases explains the deviations found in the actual investor behaviour in the stock market. It suggests the need to formulate algorithms and trading strategies, which take into account the impact of these biases as well to enhance accuracy. The significant presence of these biases also explains the growing focus on technical analysis as against fundamental analysis in the stock markets.

However, a study conducted on the Tunisian stock market by Zaiane and Abaoub (2009) presented conclusions opposite to our study. It claimed that the Tunisian Stock Market was largely free of any such biases. One possible explanation of this could be the fact that taking monthly data wipes out all the fluctuations that would have been taken into account had they used daily data of returns and volume.

Research Implications

The research suggests that the market is able to recognize these biases only after some time has elapsed and not in advance, that is, these biases are a trailing measure of the irrationality. Hence, further research can be conducted to substantiate the same and make it more predictable via technical analysis. As has been explained by Chu, Im, and Jang (2012), overconfidence is a precursor to disposition effect as overconfident consumers are more prone to realize gains early and hold on to losing investments in the hope of beating the market. The effect of these biases has been aggravated by the presence of herd behavior in the market.

Conclusion

This paper concludes that there is a strong presence of disposition effect and overconfidence in the Indian stock market. Apart from the basic fundamental and technical analysis, an investor's decision is driven by heuristics and mental biases, which show that there is no mathematical formula to arrive at the investment decision. The results are in tandem with many other research studies, and India is no exception when it comes to biases.

There is a huge scope for further research. The causes and effects of these biases can be investigated along with the magnitude of the deviation they cause from the expected trajectory of prices of stocks. Similarly, recommendations can be developed to guide the government for the same. All in all, the paper shows the omnipresence of behavioural biases, which were discovered years ago.

Limitations of the Study and Scope for Further Research

The study has focused on a limited time frame which was replete with economic fluctuations like demonetization and GST. Increasing the time period will increase the accuracy and show a clearer picture after accommodating diversity. Moreover, only 31 companies of SENSEX were considered. Increasing the sample size will help in determining better results and adding more edge to the analysis.

Further research can be conducted sector-wise to gauge what investor types are more prone to these biases. In

order to be able to generalize investor types, research can be conducted across financial markets around the world which will also help in distinguishing the investor behavior in emerging and developed markets.

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About the Authors

Dr. Sushmita is Assistant Professor of Economics at Department of Management Studies, Shaheed Sukhdev College of Business Studies, University of Delhi. She is also an affiliate at Fellow Developing Countries Research Centre, University of Delhi. She has earned her doctorate in the field of infrastructural macroeconomics.

Rishabh Bhatia is a student of finance at Shaheed Sukhdev College of Business Studies, University of Delhi. He has experience working with the Ministry of External Affairs and his fields of interest include finance & behavioral economics.

Sanchit Sharma is a student of finance at Shaheed Sukhdev College of Business Studies, University of Delhi. He has won several national-level finance and case study competitions and has experience working on M&As in the financial services sector.