

**FACTORS AFFECTING DISPOSITION EFFECT IN EQUITY INVESTMENT: A
SOCIAL NETWORK ANALYSIS APPROACH**

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ABSTRACT

The study aims at identifying the factors influencing the disposition effect acting on equity investors and further identifying the relationship between the influencing factors. The study aims at conducting a complete analysis of the influencing factors along with measuring their impact on disposition effect using Social Network Analysis (SNA). The factors affecting disposition effect on investors were identified through the literature review. Experts' opinions were sought for determining the relationship among the factors and finally, the importance of those factors was analyzed using Social Network Analysis (SNA). It was found that social trust, investor emotion are the two most important factors affecting the other factors of disposition effect and consequently disposition effect finally. Besides, mental accounting; regret aversion, trading intensity, trading volume, and portfolio performance strongly influence the effect of disposition on investors because of their higher in-degree and out-degree. Therefore, the policymakers need to impart training to the investors to understand the mechanism of the stock market so that they can evaluate their standing in the stock market which, in the long run, will be reflected in their investment behavior.

Keywords: Disposition Effect, Equity Investment, Stock Market, Social Network Analysis.

INTRODUCTION

When an individual investor does want to avoid losses much more than they like making gains and in consequence, investors will hold onto stocks that have lost value and will be impatient to sell the stock in his portfolio that have risen in value and this phenomenon is called as 'disposition effect' (Singh, 2009). In all the available large databases of individual investor's trading activity, the disposition effect has been recorded and it has been related to the major pricing phenomena such as post-earnings announcement drift and stock-level momentum. The disposition effect adversely impacts the wealth of investors (Odean, 1998). Disposition bias, where investors show a higher tendency to realize their gains than their losses, was identified by Shefrin & Statman (1985). Disposition bias is known to be prevalent in equity markets worldwide (Shefrin & Statman, 1985; Odean, 1998; Barber & Odean, 1999; Brown, Chappel, Rosa & Walter, 2006; Visaltanachoti, Lu & Luo, 2007; Grinblatt & Keloharju, 2001). The disposition effect is a fundamental characteristic of trading and its cause remains unclear. Prospect theory (Kahneman & Tversky, 1979) and mental accounting (Thaler, 1985) were used by Shefrin & Statman (1985) to explain this effect.

Past researchers, mentioned above, have recognized a large number of factors that affect disposition effect in stock market such as risk aversion, prospect theory, social trust, mental accounting, preferences, experience, etc. However, the impact of the factors influencing the disposition effect is still not known. The present study tries to fill the gap of earlier research on disposition effect that seldom analyzes the relationship between different influencing factors. The objectives of the study are threefold. The first objective of the study is to identify the important factors influencing the disposition effect. The second objective is to identify the relationship between the influencing factors. And third is to conduct a complete analysis of the influencing factors and measure their impact on disposition effect using Social Network Analysis (SNA).

The remaining part of the paper is structured as follows: Section 2 presents the review of relevant literature on the factors influencing disposition effect; Section 3 describes the research

methodology used in the study; Section 4 presents the analysis and findings; Section 5 shows the discussion and Section 6 presents the conclusion and the policy implications.

LITERATURE REVIEW AND IDENTIFICATION OF FACTORS AFFECTING DISPOSITION EFFECT

Shefrin & Statman (1985) contradicts that in the actual market conditions the experimental theories are improper. They, hence, suggest a structure for signifying what decisions are actually taken in the real financial markets, and therefore, a thorough analysis of factors affecting the disposition effect was suggested. In the present study, the factors affecting disposition effect among the stock investors are identified through the literature review. The identified factors are as follows:

Prospect theory (PT): Kahneman & Tversky (1979) found that investors become risk averse when faced with the situation of sure gain and become risk taking when faced with the situation of sure loss. They further found that loss of equivalent amount gives pain and the pain is twice the pleasure of gaining equivalent amount and therefore, in order to avoid the pain the investors hold on to stock that have gone down in value. Because if the stock that has gone down in value is sold, losses will be realised and losses given pain.

Mental accounting (MA): Kahneman & Tversky (1981); Thaler (1985), Kahneman & Lovallo (1993) stated that investors create several compartments in their mind for the revenue they generates which is called as mental compartment and the process is termed as mental accounting. Thaler (1980) states that mental accounting has been used to account for economical phenomena including the disposition effect.

Regret Aversion (RA): Shefrin & Statman (1985) have worked extensively on the regret aversion. They also called it as 'fear of regret'. They stated that people hold on to the losers because investors do not want to regret their decision that they made a bad decision. So if they sell a losing stock, losses will be realised and they might regret their decision of making investment. But if they do not sell it, they can avoid the regret of making a bad investment decisions and therefore, they keep on holding a losing stock.

Seeking pride (SP): Shefrin & Statman (1985) observed a hidden pride in the mind of the investors when they are gaining and when they lose money this pride is lost. Investors always want to keep his pride high but once a losing stock is sold and losses are booked, this pride is lost and therefore, in order to keep this pride they do not sell the losing stock.

Stop losses (SL): When the investors are given the option of choosing the stop loss, the investors can postpone selling winners and also can avoid the unwillingness to hold losers, and eventually it will help to reduce the disposition effect (Shefrin & Statman, 1985).

December effect (DE): Shefrin & Statman (1985) explained that the December effect concentrated in December, which is related to the tax-loss selling because it would be beneficial to realize a tax loss in the year-end to avoid further tax obligations.

Overconfidence (O): Overconfidence of investors also add to the bias called disposition effect (Ben-David & Doukas 2006; Čekauskas, Liatukas, Verlaine, & Putniņš, 2011; Singh, 2011 and Parveen, Siddiqui & Malik, 2016).

Sign realization preference (SRP): The investors do not want to sell when the net result is zero, but when the market moves in the positive direction, the investors like to sell the winners and book profit and hold the losers which causes the disposition effect (Ben-David & Hirshleifer, 2012).

Entrapment research (ER): A situation of decision-making under uncertainty arises where the negative returns of the past decisions move investors into the dilemma of continuing with the decision. The same happens with the disposition effect when investors prefer to hold the losing investment (Zuchel, 2001).

Social trust (ST): The social trust has tremendous impact on the disposition effect. The proper coordination between the cognitive factors and social causes can give considerable insights into the framing of proper policies for investment performance (Zuchel, 2001).

Under-reaction (U): When the average return on the stock following good news is higher than the average return following bad news is defined as under reaction by Berberis et al., (1998) and Shleifer (2000). Frazzini (2006) obtains data from mutual fund holdings to show the relationship between under-reaction of stock prices to public news and this type of under-reaction is followed by the disposition effect of mutual fund managers.

Social networking (SN): Heimer (2016) presented the relationship between social contact and the disposition effect by utilizing an online social networking platform in the world of retail trading.

Trading Intensity (TI): Investors with aggressive investment strategies tend to exhibit a relatively high disposition effect (Weber & Welfens 2007). Talpsepp (2013) stated that trading intensity has a negative impact on the disposition effect.

Investor's sophistication (IS): Sophisticated investors are less resistant to realize a loss (Brown et al., 2006; Richards, Rutterford, Kodwani & Fenton-O'Creevy, 2017; Choe & Eom, 2006; Leal, Armada & Duque, 2008). Empirical evidence suggests that professional traders who trade on behalf of others are less susceptible to causing disposition effects (Shapira & Venezia, 2001; Dhar & Zhu, 2006).

Trading Experience (TE): Many researchers found that the strength of the disposition effect depends on investor's experience of past gains and losses and tend to reduce the disposition effect (Odean 1998; Shapira & Venezia's, 2001; Ackert & Church, 2001; Dhar & Zhu 2006; Brown et al., 2006; Choe & Eom 2006; Seru, Shumway & Stoffman, 2010; Da Costa, Goulart, Cupertino, Macedo & Da Silva, 2013). On the contrary Richards et al., (2017) said that experience increases disposition effect as the investors tend to be overconfident.

Peer effect (PE): When someone purchases an asset, his peers may also want to purchase it, both because they learn from his choice and because his possession of the asset directly affects others' utility of owning the same asset. Financial peer effect asymmetrically relates to gains and losses (Shefrin & Statman 1985; Singh, 2019).

House Money Effect (HME): House money effect is the propensity of investors and traders to take on greater risk when reinvesting the profit from securities. Thaler & Johnson (1990); Brown et al., (2006) state that investors are more risk-seeking following previous gains and have a stronger bias toward 'breaking even' after prior losses.

Tax-loss selling (TLS): Tax-loss selling is a strategy of investor for selling stock or other securities with the capital loss to lower the capital gain from other investors to reduce one's taxable income. Brown et al., (2006) observed that tax-loss selling give rise to investors to overcome their usual aversion to selling losers by identifying investors for whom tax is less relevant and it has a positive influence on the disposition effect.

Gender (G): Barber, Lee, Liu & Odean, (2009) states that men make a bit larger trades compared to women and also hold larger portfolios than women but they do not find differences in the performance based on gender (Feng & Seaholes, 2008). On the contrary to that Talpsepp (2013) provides evidence that the portfolios of female investors perform better than the portfolios of male investors. Richards et al., (2017) find evidence that men are more likely to hold losses longer because of that they are more willing to the disposition effect than women. Singh & Bhattacharjee (2010a) found that gender has a significant role to play in equity investing.

Age (A): The study conducted by Talpsepp (2013) found that older investors between both male and female investors perform much better than younger investors. Singh & Bhattacharjee (2010b) also found age as significant in influencing the equity investment.

Portfolio Return (PR): According to Talpsepp (2013) portfolio returns have a negative impact on the disposition effect.

Initial Public Offering (IPO): Brown et al., (2006) and Singh (2012) observed that the disposition effect exists for all class of investors in both IPO and index stocks.

Portfolio Performance (PP): Portfolio performance means, based on some standard how a particular managed investment portfolio has performed in the stock market. Talpsepp (2013) stated that less biased investors generally show better results as there is a negative correlation between the disposition effect and portfolio performance.

Holding Period (HP): Johnson & Thaler (1990) and Talpsepp (2013) found that when the strength of the investor's holding period increases, the strength of the disposition effect gradually diminishes.

Trading Volume (TV): Trading volume is the total number of shares exchanged on a particular day and it can provide further evidence of institutional buying or selling. Brown et al., (2006)

and Kaustia,(2004)identified that larger investments tend to be less affected or unaffected by the disposition effect.

Investors Emotions (IE): Emotions are a threat for the investor and it hurts the disposition effect. Richards et al., (2017) states that the emotions of an investor affect the presence of the disposition effect. The emotion of the investor leads to more biased decision making. For example, the shares of the company familiar to the investors are valued more than the shares of other companies (Singh & Bhowal, 2010a).

Income (I): According to Weber & Welfens (2007) the individual investors whose income is high, sell their winners more often, which causes the disposition effect.

Volatility (V): According to Goetzmann & Massa (2008) volatility factor hurts the disposition effect. Kumar (2009) observed that volatility is high when behavioral biases are stronger.

Bull (BL): It is a market in which share prices are rising and inspire buy off the share. In a bull market, the attainment of gains is easier and it is easily achieved, which leads to a stronger disposition effect. In a bull market, momentum strategy is followed by the investors (Leal et al., 2008).

Bear (BR): It is a market in which the share prices are falling and motivate selling of the share. In a bear market, the possibility of realizing losses is more, which leads to less disposition effect as compared to a bull market (Leal et al., 2008).

While going through the critical analysis of prior research, this study got tucked with lots of other previous research papers where they created the solemn invisible gap on disposition effect that seldom analyses the relationship between different influencing factors. This research paper tried to fill and cover this particular gap. The analysis of influencing factors has a great and immense role from the perspective of the investors. Several important factors influence decision making. This paper will blow away all those previous limitations and all the gaps in the previous research paper.

METHODOLOGY

The present study focuses on finding the relationships of different factors of disposition effect and tries to identify both their causes and effects. There are several methodologies to examine the relationship among factors. This study uses Social Network Analysis (SNA) to analyze the relationship. SNA was first introduced by Moreno (1934). SNA has been increasingly used in management science and business research (Giusti, Alberti & Belfanti, 2020). Additionally, SNA has been used in the majority of the past studies to identify the social structures and individual attributes (Lusher, Robin & Kremer, 2010). It is a set of methodological tools that focus on the relationships and implications among social entities and on the patterns (Wasserman & Faust 1994). It is a tool to study the performance and interconnections of teams and organizations (Bae, Nikolaev & Castner, 2015). The recent studies have proved that SNA can be used to study the subsistence and power of the relationship between any two factors (Huang, Baai, Wang, Du, Shao & Li, 2018; Hoffmann, Post, 2014; Soheipli, Khademi & Mansoori, 2014). There are very few studies that have calculated the strength of the relationship between the factors affecting

disposition effect. Therefore, the present study has used SNA methodology to examine the might of the relationship between the factors. There are several techniques of SNA; visualization of social networks is one such technique (Borgatti, 2002). General data analysis and some statistical analysis using UCINET and also statistical modelings are a few more techniques available in SNA. According to Huang et al., (2018) SNA can be used to measure the existence and strength of the relationship between any two factors. While using SNA, the study used different terminology and notation. These terminologies are described below:

- **Node:** The formation of a social network is based on two parts, one of these is nodes. Node is a point where multiple lines meet. In a social network, individual may be represented as nodes in a graph and the relation between them are represented as edges.
- **Degree centrality:** Degree centrality refers to how connected the node is. It helps to know about the distribution of nodes and how connected they are and the probability of being either highly or less highly connected.
- **In-degree:** In-degree means the numbers of edges that are coming into. It is denoted by $\text{deg}^+(v)$. The in-degree of a node is equal to the number of edges with that node as the target.
- **Out-degree:** Out-degree means the number of edges that are going out. It is denoted by $\text{deg}^-(v)$.
- **Centrality:** Centrality refers to a group of the matrix that aims to quantify the importance or influence of a particular node within a network. Examples of common methods of measuring centrality include betweenness centrality, closeness centrality, alpha centrality, etc.
- **Betweenness:** Betweenness centrality is a measure of how often a node is a bridge between the other nodes.
- **Network Cohesion:** Cohesion is a measure that defines the degree of inter-dependability within elements of a module. The greater the position the better is the program design. Cohesion is a measure of the functional strength of a module. In social network analysis, the term network cohesion refers to a measure of the connectedness and togetherness among factors within a network.
- **Network Density:** Network density is the proportion of ties that are connected out of all ties that could be connected. Higher density means the network is more connected.

Data Collection

To identify the influencing factors, the study reviews the past academic literature and to list out the reasonable influencing factors, the study uses the Delphi technique. Delphi technique is one of the most widely used methods that allow the use of collective human intelligence on the specific problem solution (Bleijlevens, Wagner, Capezuti, Hamers & International Physical Restraint Workgroup, 2016). The Delphi Method is based on the assumption that group judgments are more valid than individual judgments.

The survey was started in July 2020. The selection of respondents has always been one of the most important parts of the Delphi technique. There were three criteria for selecting experts for the study. Firstly, the person should have erudite knowledge about disposition effect; secondly, the person should be an academician and thirdly, the person should have experience of investing in the stock market for at least three years. Based on criteria eight experts were invited to join the survey. Total of thirty relevant factors were identified using literature review and survey. After the identification of factors, a questionnaire was prepared to explain the

background and purpose of the research study. The same questionnaire was sent to eight respondents by email. The questionnaire was designed using the Design structure system technique (Steward, 1981) to establish dependent-independent relations among the factors. Next, experts were asked to define the relationship between the given factors. After that, the responses were collected and the confirmation was done based on the majority of respondents. For a further comprehensive analysis, collected data were subsequently processed with the SNA method. The matrices were established in an Excel spreadsheet then transferred to one of the SNA software of UCINET (Borgatti, Everett & Freeman, 2002) for the analysis of social network data.

ANALYSIS AND FINDINGS

This study used the SNA model to spot the important factors affecting disposition effect and interrelations among them. After the identification of factors and their relationship, a network diagram can be developed. The study used the UCINET package to develop the network graph. The strong presentation of the UCINET package shows the efficient results and provides the numbers of analytical techniques such as cohesion, the centrality of multiple measures, etc. It has access to read and write a multitude of a differently formatted text files as well as Excel files and with the help of these files, it can draw graph social networks by labeling and coloring the nodes with one's recommendation. Based on the data of the questionnaire survey, a factors network was established by analyzing the matrix of relationships among different factors. The network diagram of degree centrality obtained by using the UCINET package is shown in figure 1.

The configuration of the network is based on the association of all factors indicating that the research process is complex. In the network diagram, influencing factors are shown with solid circle shape nodes and these nodes are of different sizes. The size of the nodes indicates the impact of given nodes. For instance, all the small nodes such as A, SN, and PE are represented with the small circle because these factors have minimum relations with other factors in the network.

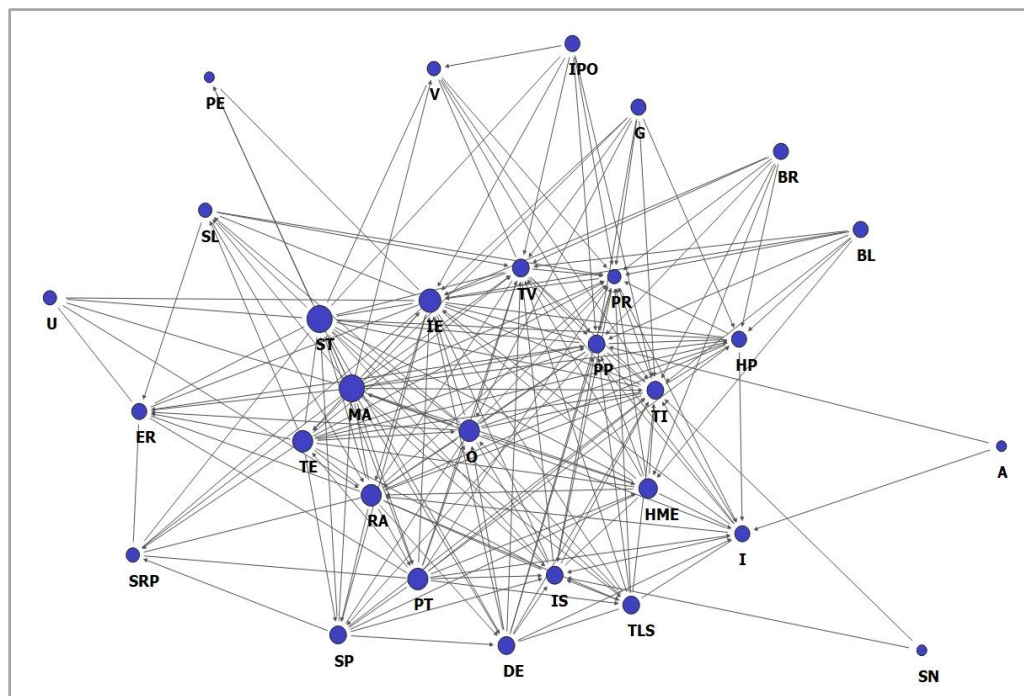


Figure 1. Degree Centrality of the factors influencing disposition effect

Source: Prepared by the authors

ST, MA, RA, and IE are represented with larger nodes because these factors have maximum in-degree and out-degree relations in the network. The links between the two nodes represent the relationship between the nodes. The connections among the factors are denoted by arrows and when there is no arrow between two nodes, there is no link between two nodes. The central part of the diagram represents the highly influencing factors. Here, highly influencing factors mean those factors which directly or indirectly impact most of the other factors.

In SNA analysis, three types of measures are used for network analysis, such as, network measures, node measures, and partition measures. These actions can be used to describe the structural display of the influencing factor network in the disposition effect. Network measures include density measure and cohesion measures that are usually used to describe the characteristics of an entire network. The network density of the present data set is 0.331 which means the network is not dense as compared to the density value. The network has 288 ties and their compactness showing the value of 0.575.

Table 1 represents in-degree and out-degree of the influencing factors. A node's or a factor's in-degree centrality refers to the number of ties it received and out-degree centrality refers to the number of ties it sends. These two indicators expressed the characteristics and effects of the influencing factor from different perspectives.

Table 1. Degree Centrality of the factors influencing disposition effect

| Factors | Out-degree | Factors | In-degree |
|----------------|-------------------|----------------|------------------|
| ST | 22.000 | IE | 25.000 |
| MA | 22.000 | TI | 22.000 |
| IE | 17.000 | ST | 22.000 |
| RA | 15.000 | PP | 20.000 |
| TE | 15.000 | TV | 19.000 |
| PT | 15.000 | PR | 18.000 |
| O | 14.000 | IS | 17.000 |
| HME | 12.000 | RA | 17.000 |
| TI | 11.000 | O | 16.000 |
| PP | 11.000 | HP | 12.000 |
| TV | 10.000 | HME | 11.000 |
| TLS | 10.000 | ER | 11.000 |
| SP | 10.000 | I | 9.000 |
| DE | 10.000 | MA | 9.000 |
| IS | 9.000 | SP | 9.000 |
| G | 8.000 | TE | 8.000 |
| HP | 8.000 | SRP | 8.000 |
| I | 8.000 | TLS | 7.000 |
| IPO | 7.000 | PT | 6.000 |
| BL | 7.000 | SL | 5.000 |
| BR | 7.000 | DE | 5.000 |
| ER | 7.000 | V | 4.000 |
| SL | 6.000 | U | 4.000 |
| SRP | 6.000 | PE | 3.000 |

| | | | |
|----|-------|-----|-------|
| U | 5.000 | IPO | 1.000 |
| V | 5.000 | G | 0.000 |
| PR | 5.000 | A | 0.000 |
| A | 2.000 | BL | 0.000 |
| SN | 2.000 | BR | 0.000 |
| PE | 2.000 | SN | 0.000 |

Source: Compiled by authors

To categorize the extent of the relationship between the factors, the out-degree, and in-degree centrality measures were divided into three parts. The highest value of out-degree was 22 and the lowest value was 2. The difference between highest and lowest, i.e., 20 was divided by 3 since our objective was to find out three levels of out-degree which comes out to be 6.67. So, the first-class interval of the out-degree value was between 2 (smallest value) to 8.67 (2+6.67). Similarly, adding 6.67 with subsequent value, the next higher range was obtained. Thus, the following interpretation table was framed as given in table 2.

Table 2. Interpretation of out-degree values

| Range of out-degree values | Interpretation |
|----------------------------|--------------------------------|
| 2 - 8.67 | Least influential factors |
| 8.67 – 15.34 | Moderately influential factors |
| 15.34 - 22 | Highly influential factors |

Source: Compiled by authors

Based on table 2, it can be interpreted that ST, MA, IE, RA, TE, and PT are highly influential in influencing other factors of the disposition effect. Overconfidence, HME, TI, PP, TV, TLS, SP, DE, and IS are moderately influencing the other factors of the disposition effect. Rests of the factors have a low impact on influencing other factors of the disposition effect.

Similarly, the in-degree centrality measures were also categorized into three categories. The highest value of the in-degree centrality measure was 25 and the lowest value was 0. The difference of highest and lowest was divided by three to ascertain their impact at three levels which comes out to be 8.33. So, the first-class interval of in-degree value was between 0 (smallest value) to 8.33 (0+8.33). Similarly, adding 8.33 with subsequent value, the next higher range was obtained. Thus, the following interpretation table was framed as given in table 3.

Table 3. Interpretation of out-degree values

| Range of in-degree values | Interpretation |
|---------------------------|-------------------------------|
| 0 - 8.33 | Least influenced factors |
| 8.33 – 16.66 | Moderately influenced factors |
| 16.66 - 25 | Highly influenced factors |

Source: Compiled by the authors

Based on table 3, it can be inferred that that IE, TI, ST, PP, TV, PR, IS, RA is highly influenced by other factors contributing to disposition effect Overconfidence, HP, HME, ER,

| | | | |
|-----|--------|-----|-------|
| TI | 28.179 | SL | 0.247 |
| TV | 20.211 | IPO | 0.107 |
| IS | 17.684 | V | 0.107 |
| O | 15.580 | A | 0.000 |
| PT | 8.742 | G | 0.000 |
| HME | 8.587 | SN | 0.000 |
| TE | 6.982 | BL | 0.000 |
| PR | 6.136 | U | 0.000 |
| ER | 6.082 | PE | 0.000 |
| SP | 5.975 | BR | 0.000 |

Source: Compiled by authors

Table 2 shows the betweenness centrality of factors. The factors have been ranked according to the betweenness centrality value. Table 4 shows that ST and IE have the highest betweenness centrality in the network which means they can control the impact of a maximum number of influencing factors. The same could be explained in Figure 2. The study has tried to categorize the factors into three levels of influence based on the betweenness centrality measure. The highest betweenness centrality measure was 131.321 and the lowest was 0. The difference between the highest and lowest value of betweenness centrality was divided by three to determine the three levels of betweenness centrality which came out to be 43.77. So, the first-class interval of betweenness centrality was ranged from 0 (smallest value) to 43.77 (0+43.77). Similarly, 43.77 was added with subsequent value, to obtain the next higher range. Thus, the following interpretation table was framed as given in table 5.

Table 5. Interpretation of betweenness centrality values

| Range of betweenness centrality values | Interpretation |
|--|--------------------------------|
| 0 – 43.77 | Least influential factors |
| 43.77 – 87.54 | Moderately influential factors |
| 87.54 – 131.321 | Highly influential factors |

Source: Compiled by the authors

Based on table 5, it can be interpreted that ST and IE are the only highly influential factors and they can control the impact of a maximum number of influencing factors. It is interesting to observe here that no factor lies in the range of moderately influential factors. Therefore, the remaining twenty-eight factors are categorized as the least influential factors that can control the impact of a minimum number of influential factors.

DISCUSSION

The parameter set by the 'disposition effect' has profoundly created a business-ethical ambiance sum up with the stock market. 'Disposition Effect' which creates predictability in stock return has been identified as an important bias from which the investment decision is affected. This study connects some critical factors influencing the disposition effect. A comparison of influencing factors from given figures and tables can explain the level of impact of the factors. The categorization of factors into highly influential, moderate influential and low influential was done on the basis the basis of degree centralities and betweenness centrality measures.

As expected, social trust found to be an important influencing factor in the social network as it has the highest out-degree, highest betweenness centrality, and high in-degree. Earlier researcher such as Li, Massa & Zhang, (2016) finds out that higher social trust is associated with higher flow performance sensitivity, and high trust induced flows mitigate the disposition effect. Social trust ultimately reduces the tendency to sell winners and hold into losers and it can influence investor trading habits. Investor's emotion was found to be the second most important factor in the network analysis with the in-degree of 25, out-degree of 17, and betweenness centrality of 89.68. The investor's emotion (IE) was also placed in the center position of the network diagrams along with Social Trust (ST). The findings are correlated with past researches where it was observed that emotions of an investor impact the occurrence of disposition effect (Richards et al. 2012; Singh, 2009). It has a powerful impact on investor's investment behavior and may influence the decision when the choices are complex and the subject matter is more uncertain. Psychic reality will often cause investors to ignore reason in decision making and make the choices based on the emotions (Singh, 2010).

Apart from social trust and investors' emotions, factors such as regret aversion, portfolio performance, mental accounting, trading intensity, trading volume and investors' sophistication can also be considered as highly influential since they show either high out-degree centrality or high in-degree centrality. Nevertheless, it is important to note here that the betweenness centrality of the remaining 28 factors falls under the category of low influencing factors. Thereupon, the major categorization of the influential factors is dependent on the degree of centralities.

Regret aversion showed high out-degree as well as high in-degree centrality and therefore strongly affects most of the influencing factors in the network. The influence of regret aversion is high because investor always tries to avoid regret and as a result have a greater tendency to sell winners than losers resulting disposition effect. Investors might feel regret when they realize a loss and conversely, feel pride when they realize a paper gain and that is why the disposition effect is positively related to regret aversion (Singh, 2009). Portfolio performance came out to be an important factor since it showed high in-degree centrality. The finding is correlated with the study conducted by Talpsepp (2013). According to him, portfolio performance negatively influences the disposition effect. Singh & Leepsa (2016) also found that portfolio performance has an impact on the investor's decided to remain invested in the stock.

The in-degree of mental accounting was lower than portfolio performance. However, mental accounting has the highest out-degree in the network. Mental accounting also occupied the center position in Figure 1 because of the highest level of out-degree. Therefore, the study regarded mental accounting as one of the most influential factors in a network having substantial influence and control on other influencing factors. Similarly, trading intensity, trading volume, and investors' sophistication were also categorized as a highly influential factors based on their high in-degree centrality and moderate out-degree centrality. The result can be supported by past studies i.e., high investment in the stock exchange may reduce the impact of the disposition effect (Singh & Bhowal, 2009). Effect of Investors' sophistication, which decreases the disposition effect (Shapira & Venezia, 2001; Choe & Eom, 2006; Dhar & Zhu, 2006; Leal et al., 2008; Richards et al., 2017) was also found to be influenced from many important factors in the network.

Overconfidence, house money effect, and seeking pride was classified as factors of moderate influence in the network since the in-degree and out-degree of these factors lie in the range of 8.33-16.66 and 8.67- 15.34 respectively. The moderate influence of overconfidence was

also found in the study conducted by Singh (2011). According to Singh (2011), overconfidence has higher chance of being influenced by other important factors. Pride seeking was also found to have a considerable impact on disposition effect in the analysis.

Influencing factors such as trading experience, prospect theory, portfolio return, entrapment research, holding period, tax-loss selling, December effect, and income were also classified as factors of moderate influence. Trading experience and prospect theory were ranked as factors of moderate influence because both showed high out-degree centrality but low in-degree centrality. The impact of trading experience shows that high trading experience of past gains and losses will reduce disposition effect in the future. Choudhury et al., (2016) were also of the view that experiencing a thing reduces many biases. The impact of prospect theory can be supported by the finding of the study conducted by Kahneman & Tversky (1979). Accordingly, analogy from prospect theory may have a significant impact on other influential factors as well.

Portfolio return reported high in-degree and thus regarded as a factor of moderate influence. It has also been observed that portfolio return is negatively related to the disposition effect. As per the analysis, holding period, entrapment research, and income reported a significantly higher tendency of being influenced by other factors in the network. According to Johnson & Thaler (1990) and Talpsepp (2013), an investor holds stocks for a longer period the strength of the disposition effect will diminish gradually. Similarly, the significant impact of income on disposition effect was correlated to the findings of the studies conducted by Weber & Welfens (2007) and Deb & Singh (2017) i.e., investors with high income may sell winner stock very often.

The in-degree the holding period was more than its out-degree which means that the holding period tends to be influenced by many influential factors in the network. The study suggests that holding on to losing stock for a long-time influences disposition effect. Tax-loss selling and December effect showed higher out-degree in the network. The significance of tax-loss selling is correlated to the study conducted by Brown et al., (2006). December's effect was also found to be highly related to tax-loss selling in past studies (Shefrin & Statman, 1985).

The study regarded stop loss, initial public offering, under-reaction, volatility, peer effect, social networking, sign realization preference, bull, bear, age, and gender as low influential factors based on their degree as well as betweenness centralities. Previous studies found that stop-loss has a significant impact on the disposition effect. It can also be an important tool to control the disposition effect because when investors are given an option to choose stop-loss, they eventually postpone selling winner stock (Shefrin & Statman, 1985). But the present study showed that stop-loss has low degree centrality as well as low betweenness centrality and thus, it is restricted to low influential factors.

In the previous studies, the disposition effect was found to exist for all class of investors (Brown et al., 2006), however as per the findings the effect of the initial public offering on disposition was significantly less (Singh, 2012). The under-reaction and peer effect showed zero betweenness centrality in the network. Zero betweenness connotes that under-reaction and peer effect cannot significantly influence the effect of disposition. In this study, social networking, bull market, bear market, age, and gender reported zero betweenness centrality and zero degree centralities. These factors failed to draw any significant impact on other important influential factors. The least influence of social networking contradicted the findings of Heimer (2016). Bull and Bearish markets were found to be the influencing factors in a study conducted by Leal et al., (2008). However, the present study regarded both the factors as low influential factors. Similarly, age and gender failed to establish a relationship with other factors and do not settle in a central

place in the network diagram. The study considered age and gender as the least significant factors.

CONCLUSION AND POLICY IMPLICATIONS

The present study concentrates on the factors that have an impact on the disposition effect and shows the most influencing factors and least influencing factors. The factors have been identified through the review of relevant literature on disposition effect and use of the Delphi technique in the study. The study has used the SNA technique to determine the relationship between the identified factors. To determine the impact of factors on the existence of disposition effect, degree centrality and betweenness centrality measures have been used in the study. The present study is unique as it has used the SNA technique in the concerned area for the first time.

Social trust and investor emotion have been regarded as the most important factors in the network analysis. These factors influence most of the other factors related to the disposition effect. Apart from these two, it was found that regret aversion, portfolio performance, mental accounting, trading intensity, trading volume, and investors' sophistication also strongly influence the effect of disposition. The study identified that factors such as overconfidence, prospect theory effect, house money effect, trading experience, portfolio return, entrapment research, pride seeking, holding pattern, tax-loss selling, December effect, and income have significantly moderate influence on investors towards disposition effect. While the factors such as assign realization preference, stop loss, initial public offering, volatility, under-reaction, peer effect, social networking, bull, bear, age, and gender were regarded as least influencing factors.

The factors regarded to be most influential in the study need high attention to minimize the disposition effect. Therefore, it is required to make the investor understand their standing in the market and then to understand the functioning of the market. This can be done by making the investors aware of the market (Bhattacharjee & Singh, 2017; Bordoloi, Singh, Bhattacharjee & Bezborah, 2020). Understanding the markets and the forces that drive the market trends can reduce the emotional impact (Seo & Barrett, 2007). Social trust was also found to be the important factor influencing the disposition effect and therefore, it is needed to build social trust among the investors. This can be done by creating small investor education associations (Singh & Bhowal, 2012). This small exercise of establishing investors association will increase the trust among the investors and consequently trading intensity is expected to increase. The investors who are employed somewhere are directly in the control of their employer and if the employer can take up an investors education program then it will not help the employee but also the employer because a satisfied employee can only give his/her full dedication to the work (Singh & Bhowal, 2010b) and once the investors are educated, the bias including disposition effect will be reduced significantly. Furthermore, the culture of equity investing has to be promoted among the investors and this requires the use of concepts of marketing (Singh & Bhowal, 2011). An increase in the investor's experience eventually decreases the disposition effect and therefore, the investors should be given some experience of investing in the equity shares. Opening of learning Investors' Club at different places can be a solution to this (Singh & Barman, 2011).

The study has presented some new findings for academicians. The categorization of the factors based on their influence has been done only in limited past research. Our approach to measuring the extent of the effect of the influential factors is new in the concerned area. No previous study was found dealing with possible differences between the influences of each of these factors. Apart from this, authors have found that social networking, bull, bear, age, and gender failed to show any significant impact on the other influential factors in the analysis.

Therefore, the study calls for more research to examine the impact of these factors using other possible methodologies.

The results of this study need to be confirmed with a more in-depth study. In this study, there are some prevailing research limitations. The first limitation is that the study is focused only on degree centrality and betweenness centrality measures. Closeness centrality and Q-measure are also important measures of social network analysis but the authors have not included these measures. Therefore, it should be included in future research. The second limitation is that, all the experts invited for the survey were academicians. The study has not involved any investors or stockbrokers in the panel of experts. This limitation may affect the accuracy of the results. Therefore, investors and stockbrokers should be approached in future research. Lastly, the study has identified the most influencing factors by SNA, but the path analysis factors and the level of influence in different factors are not clear. This limitation can impact the validity of future research. Therefore, the limitation will be taken into consideration in future research.

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APPENDIXES

Appendix A: Data Matrix of the opinion of the experts showing relationship among variables (1 denotes ‘relationship’; 0 denote ‘No relationship’)

| | G | A | U | S | S | O | T | P | I | T | P | P | I | H | H | T | T | I | I | V | B | B | P | M | R | S | D | S | E | S | |
|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | N | | I | R | S | E | P | E | P | O | E | | V | L | E | | L | R | T | A | A | P | E | R | R | T | |
| G | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| U | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | |
| S L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | |
| S | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

