

What make investors herd while investing in the Indian stock market? A hybrid approach

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Abstract

Purpose – In recent years, significant research has focused on the question of whether severe market periods are accompanied by herding behavior. As herding behavior is a considerable cause of the speculative bubble and leads to stock market deviations from their basic values it is necessary to examine the motivators which led to herding behavior among investors. The paper aims to discuss this issue.

Design/methodology/approach – In this study, the authors performed a two-phase analysis to address the research questions of the study. In the first phase, for text analysis NVivo software was used to identify the factors driving herding behavior among Indian stock investors. The analysis of a text was performed using word frequency analysis. While in the second phase, the Fuzzy-AHP analysis techniques were employed to examine the relative importance of all the factors determined and assign priorities to the factors extracted.

Findings – Results of the study depicted Investor Cognitive Psychology (ICP), Market Information (MI), Stock Characteristics (SC) as the top-ranked factors driving herding behavior, while Socio-Economic Factors (SEF) emerged as the least important factor driving herding behavior.

Research limitations/implications – The current study was undertaken among stock investors from North India only. Moreover, numerous factors are not part of the study but might significantly influence the investors' herding behaviors.

Practical implications – Comprehending the influences of the different factors discussed in the study would enable stock investors to be more aware of their investment choices and not resort to herd behavior. This research enables decision-makers to understand the reasons for herd activity and helps them act accordingly to improve the stock market's performance.

Originality/value – The current study will provide an inclusive overview of herding behavior motivators among Indian stock investors. This study's results can be extremely useful for both academics and policymakers to gain some insight into the functioning of the Indian stock market.

Keywords Herding, Investment, Behavioral finance, Fuzzy-AHP, Indian stock market

Paper type Research paper

1. Introduction

In the finance literature, the behavioral element has been a divisive issue for academicians, researchers, and financial experts (BenSaïda *et al.*, 2015; Chauhan *et al.*, 2020). The investment decision-making process of an investor is centered on a complex mixture of demographics (Özmen and Sümer, 2011; Maxfield *et al.*, 2010), personal characteristics (Chitra and Ramya Sreedevi, 2011; Young *et al.*, 2012), and market factors (Ferguson *et al.*, 2011). Like the Efficient market theory (Fama, 1970) and the theory of modern portfolio (Markowitz, 1952), several conventional financial theories have argued that investors are rational. Their decisions are driven by the information available in the market. These investors react rationally based on their own sets of information, irrespective of how other investors act.



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However, several researchers challenged these classical finance theories and posited psychological and behavioral factors as a major driver for investment decisions (Kourtidis *et al.*, 2011; Weller and Thulin, 2012). In the last few years, the research on investor decision-making has been shifted from the traditional approach to behavioral finance research (Zahera and Bansal, 2018; Bhatia *et al.*, 2020; Talwar *et al.*, 2021). Many behavioral finance studies have identified different behavioral biases and anomalies that influence the decision-making process of investors. Among all the behavioral biases, herding is one of the most commonly found biases that influence investor decision-making (Satish and Padmasree, 2018). Investors today generally imitate what other investors do and neglect their information (De Bondt *et al.*, 2008). This is called “Herd behavior.” Herd behavior has indeed been reported in many academic fields as an important human behavior element like psychology (Hoffer, 1955), financial markets (Hirshleifer and Hong Teoh, 2003), and online auctions and purchasing (Chen, 2008). Herd behavior outlines different social conditions under which people are influenced heavily by other people’s decisions (Asch, 1956). Both economists and practitioners are greatly interested in herding the behavior of investors in financial markets. For the economist, herding is of great relevance in examining stock prices, while for practitioners, herding is of great relevance in creating profitable trading prospects.

In emerging economies such as India, the liberalization of capital markets has resulted in a massive rise in investors’ practices. With increased international equity portfolio flows and a rising role of FIIs, domestic investors have become more likely to pursue the investment actions of foreign institutional investors (FIIs). Growing foreign portfolio investments in Indian stock markets have caused a rise in herding among domestic investors, raising moral hazard problems and negative selections. Moreover, the COVID-19 epidemic has ravaged global economies, disrupted stock market performance, and led to panic among stock market investors (Abd-Alla, 2020). Under ordinary situations, investors could have enough time for gathering sufficient knowledge, rational thinking, an analysis of the market, and informed decision making (Mertzanis and Allam, 2018). However, in times of market instability like in the current COVID situation, investors tend to adopt the crowd decision by suppressing private information.

In recent years, significant research has focused on the effects of herding behavior on stock market volatility (Bekiros *et al.*, 2017; Chauhan *et al.*, 2020). As herding behavior is a considerable cause of the speculative bubble and leads to stock market deviations from their basic values (Kanojia *et al.*, 2020), it is necessary to examine the motivators which led to herding behavior among investors. These undesirable consequences of herding highlight the need to identify herding behavior in financial markets. Thus, this paper aims to provide a brief review of the theoretical background of herding and empirical evidence on the highly prioritized motivators of herding behavior for investors in the Indian stock market. This will help to cover certain research gaps and to address various issues. First, most of the research done with respect to herding is related to secondary data i.e. data related to financial markets (Kumar, 2020). While the primary data-related studies are focused on examining the consequent effects of herding behavior (Cai *et al.*, 2019). There is a dearth of studies related to behavioral aspects i.e. identifying the factors which motivate investors to herd. Second, literature is silent about the prioritization of these motivators. We could not find any single study that has attempted to assign priority to the motivators behind choosing a herding behavior. The objective of this study is therefore to identify the key motivators of herding behavior and to determine the hierarchy of these motivations. Consequently, the current study attempts to provide answers to the following research questions.

RQ1. What are the factors that drive herding behavior among Indian stock investors?

The text analysis method comprising word frequency analysis (WFA) will be used on the data of financial experts to determine the factors driving herding behavior among Indian

stock investors. The word frequency analysis will depict the list of herding behavior's most influencing factors among Indian investors.

RQ2. How to rank these factors based on their significance in driving herding behavior?

Secondly, the current study employed the Fuzzy analytical hierarchy process (F-AHP), a multi-criteria decision-making technique to rank herding behavior's motivators among the Indian stock investors. The approach is the best-suited technique in assigning priorities (Liu *et al.*, 2020) which has already been applied in several scenarios like priorities of behavioral bias influencing investment decisions (Jain *et al.*, 2020) and priority of drivers of environmental responsibility (Garg *et al.*, 2021).

This study will be beneficial for various groups such as (1) companies, who seek to source equity capital during pandemic crises, (2) investors who evaluate investment opportunities in international stock markets, (3) national and supranational financial regulators and policymakers, who are tasked with designing optimal policies that aim to avert or mitigate financial crises.

The rest of the paper is structured as follows. The second section comprises the literature review covering the basic concept and the motivators discussed in the past studies. The third section deliberates about the methodology adopted and the technique used. The fourth section covers the discussion of the findings of the study. In the last, the implications, limitations, and the future scope of the studies are discussed.

2. Review of literature

Theoretically, many studies have focused on the concepts and classifications of herding (Bikhchandani and Sharma, 2000; Spyrou, 2013). Hirshleifer and Hong Teoh (2003) explained herding as behavior when others influence investors in stock markets. Herding can be defined as a convergence of behavior in which investors follow others' actions from security to security and from market to market (Choi, 2016). Devenow and Welch (1996) indicated that independent decision-making across market participants is a matter of fiction. Many influential market participants emphasized that the decisions of other market participants highly influenced their decisions. Therefore, herding appeared in the capital markets as the propensity of a group of investors to trade in certain stocks simultaneously compared to what would be expected if the investors were working independently (Lakonishok *et al.*, 1992).

One line of research focuses on the psychology of the investor who prefers conformity with the market consensus (Devenow and Welch, 1996). The other line of research suggested that others may have knowledge about returns on the particular investment, and their actions reveal this information (Chari and Kehoe, 2004; Avery and Zemsky, 1998).

Literature has classified herding into different categories. Some authors have classified the herding into indirect influence (also labeled clustering) and direct influence or imitation. The reason behind direct influence is reputational costs which are related to that choice deviating from a consensus threaten to damage investors' reputation (e.g. Scharfstein and Stein, 1990), or information cascades which are related to that actor which are independent of private information make the same choices based on observations of others (e.g. Smith and Sørensen, 2000). Herding may also be the result of indirect influence (Bikhchandani *et al.*, 1992), including common knowledge (Grinblatt *et al.*, 1995), fads (Sias, 2004), or common investment styles (Wermers, 2000). And now, it is a challenge for empirical studies to identify determinants of herding since the bases for investors' decision-making are rarely disclosed in actual stock markets.

The literature on herding behavior proposed a large number of definitions. These definitions distinguished two great forms of herding: Irrational herding and Rational Herding (Devenow and Welch, 1996; Rajan, 1994). Under the Irrational perspective, herding behavior is referred to as a scenario of collective actions taken by individuals in uncertain conditions.

The reason behind irrational herding is the investor's need to reduce the uncertainty (Devenow and Welch, 1996). According to Devenow and Welch (1996), the irrational view is likened to a focus on investor psychology, where investors follow others' actions blindly and pay no attention to their prior beliefs. Whereas Rational herding put the main emphasis on the principal-agent problem in which managers imitate others' actions and ignore their private information to maintain their reputational capital in the market (Scharfstein and Stein, 1990; Rajan, 1994). Bikhchandani *et al.* (1992) refer to this behavior as an informational cascade. Under this perspective, herding behavior is considered as a situation where the investors follow another manager who tends to have a source of more reliable information or the analysis competencies for taking more eminent decisions, so the investors ignore their analysis (Bikhchandani and Sharma, 2000).

2.1 Theoretical background

Bikhchandani and Sharma (2000) classified the herding into three theoretical models: herding based on the information, herding based on reputation, and herding based on the compensation. The first set of theoretical models of herding is herding based on the information which is proposed by Banerjee (1992) and Bikhchandani *et al.* (1992). According to this theory, in a framework of uncertainty on the individual signals, another investor or the group's imitation can improve personal information. The main idea is, the agents collect useful information by observing the previous agents' performance to the extent that they ignore their private information in an optimal manner. The second subset that is named the herding based on reputation depicts the idea that the investors and institutions when acting differently from the crowd then they are subjected to the risk of reputation, so they tend to ignore their information to act with herding. Scharfstein and Stein (1990) further added that in labour markets where there is the absence of perfect information, reputation concerns force managers to follow each other; in other words, concern for reputation may direct to rational herd behavior, which can act as insurance against underperformance (Rajan, 2006). In the same way, analysts tend to forecast earnings like those announced by previous analysts in order to follow their higher ability, protect reputation, or hide low ability (Trueman, 1994). This behavior can also be referred to as a "principal-agent relationship". The third subset of herding is known under the name of herding based on remuneration. The main focus under this perspective is that payment method becomes a reason for blind conformity behavior. The explicit clause written by the principals focuses on the relative performance of the administrators to limit the ineffectiveness's caused by the problems of "the moral hazard" and "the opposite selection" also becomes an additional motivation in the herding behavior (Swank and Visser, 2008).

2.2 Motivators of herding

There are miscellaneous reasons for herding behavior. For example, the reason behind analysts' herding is to protect reputation, whereas institutional investors may herd to protect remuneration, and investors may refer to the information from the actions of previous investors or react to the arrival of fundamental information.

From the literature review, it is found that information plays a significant role in the stock market (Wong, 2018; Chia *et al.*, 2018). Suppose an investor has the skill of better information accessibility and processing ability. In that case, he/she can make better investment decisions compared to those who lack these abilities, and this limited capability of investors is known as bounded rationality (Simon, 1972). Speculators with short horizons may herd to ascertain what other informed investors know (Froot *et al.*, 1992). It is argued that it may be most favorable for individuals to ignore their private information and follow individuals' visible actions before them, as they believe that previous investors possess important private information (Bikhchandani *et al.*, 1992). These informational cascades leave an impact on

rational individuals and lead to the creation of bubbles (Banerjee, 1992). Investors who mimic others do not know the quality of other investors' information, so trends in the financial market are thus based on the mood of investors and not on rational responses (Parker and Prechter, 2005). Investors cannot process the huge amount of information present in markets (Simon, 1972). Therefore, they are often uninformed of all the information signals and fail to analyze all the information they receive (Wäneryd, 2001).

People are also reluctant to uncertainty. So, they engage in herding as tactics aimed at reducing uncertainty, such as recognition of patterns, which serve an important motivational function (Raghubir and Das, 1999). Herding becomes appropriate when such behavior continues over time. Research on rational herding has traditionally focused on asymmetric information. Yet, according to Allen *et al.* (1993), common knowledge of actions contradicts asymmetric information in the sense that agents would have behaved in the same way without the private part of their information.

Individual investors are also influenced by a sociological force (Nair and Yermal, 2017; Wong, 2018; Risal and Khatiwada, 2019). Social influence plays a critical role in formulating an individual persons' insight about others, with respect to the target behavior and whether they expect one individual to perform that behavior or not (Ajzen, 1991). Sociological factors outline an individual's identity and influence an individual's preferences. These factors also have a close relationship with herding propensity. When an individual strongly correlates with group norms, this creates social pressure on him/her, and it will lead to a lack of faith in their own judgment and encourages herding propensity. Elster (1998) argued that "social emotion" may imitate herding and social influences. If an individual fails to conform to social norms, then a sense of negative emotion is created amongst them. Prechter and Parker (2007) explain the role of social factors on individual decision-making. It is found that individuals tend to react differently to uncertain social situations as compared to when they are working individually, which results in unconscious herding behavior. The market will fluctuate unpredictably because of herding and reflect the social mood, which causes instability in the financial market. Baddeley *et al.* (2007) and Baddeley (2010) also supported this argument through their experimental research that the interface between social and behavioral factors leads to herding biases.

Several researchers have tried to explain the origin of herding by exploring investor psychology (Chia *et al.*, 2018; Kabir and Shakur, 2018; Christoffersen and Stæhr, 2019; Gul and Khan, 2019). Investors who have less cognitive abilities and trading experience have a higher tendency to herd (Zhao, 2014). So, the cognitive capability of an individual plays a vital role in the herding behavior of investors in the stock market. As Taffler and Tuckett (2005) argue in their research, investors' financial behavior is thus contaminated by subjects' emotions. Whereas Oechssler *et al.* (2009) argue, it is still important to distinguish between individuals who are less and more affected by behavioral biases because market behavior may at times be extreme and seemingly irrational. Lux (1995) explains that the phenomenon of herding takes place as the contagion of feeling. In the study of Devenow and Welch (1996), it is indicated that the investor who prefers conformity with the market consensus and has the feeling of insecurity can also indulge in herding behavior. The aversion to regret, moderate self-confidence, and the other ways motivated the release of a herding behavior by the investors (Shiller, 2003).

In support of the above argument, some authors also revealed that investor sentiment may lead to investor overreaction and/or underreaction (Barberis *et al.*, 1998) or that investors who are overconfident suffer from self-attribution bias (Daniel *et al.*, 1998). Kashif *et al.* (2020) depicted in their study that investment decisions in extreme market conditions are influenced by investor sentiments such as fears, greed, and overreaction to bad news, which portrayed the Pakistan stock market as inefficient and indicating misleading asset prices. Garcia (2021) in their study contributes to the behavioral finance literature by establishing a link between firm-level investor sentiment and analyst herding. By better understanding the drivers of analyst herding via the consideration of investor sentiment, market participants are better

able to identify the situations that may lead analysts to herd, and the findings provide a deeper understanding of financial markets. The findings also shed light on the drivers of market instability as analyst herding induced by investor sentiment can have a destabilizing effect on stock prices and increase the probability of a stock market crash (Xu *et al.*, 2017).

Some authors refer to the stock and trade characteristics as a motivator for herding. They argue that this phenomenon drives the prices further from the fundamental values and causes destabilization (Bikhchandani and Sharma, 2000; Hsieh, 2013; Scharfstein and Stein, 1990; Spyrou, 2013). Other authors argue that the reason behind herding is the efficiency of the market because prices are adjusted faster to new information (Hirshleifer *et al.*, 1994; Hirshleifer and Hong Teoh, 2003). Tedeschi *et al.* (2012) show that when herding is profitable, market participants are motivated to imitate and develop a desire to be imitated, and in addition to it when herding is high, and noise traders populate the market, intelligent market participants cannot enter this market.

The tendency to herd is also motivated by certain socio-economic factors (Nair and Yermal, 2017). Age significantly impacts herding behavior as old investors have more information, experience, and expertise in stock markets so they can make better and rational decisions than young investors (Lin, 2012). Another idea suggests that investors become more confident with an increase in the age group as there is an increase in their knowledge and capabilities. As a result, they are less likely to listen or follow the crowd's actions (Ngoc, 2014). Higher levels of education also influence the tendency to herd. Stock investors with higher educational qualification levels are expected to be more knowledgeable and informed about the stock market. Therefore, the stock investors tend to be overconfident about their capabilities and knowledge, and they are less likely to follow the crowd (Bhandari and Deaves, 2006). Investors with higher levels of income tend to invest more in the stock market. Therefore, they are more likely to be risk-averse, and in order to avoid risk, they follow the actions of others and engage in herding (Ngoc, 2014).

3. Phases of the study

The authors performed a two-phase analysis to address the research questions of the study. In the first phase, for text analysis NVivo software was used to identify the factors driving herding behavior among Indian stock investors. The analysis of a text was performed using word frequency analysis. While in the second phase, the Fuzzy AHP analysis techniques were employed to examine the relative importance of all the factors determined and assign priorities to the factors extracted. Each phase employed a separate research methodology that has been explained in the subsequent sections.

3.1 Phase 1: text analysis using word frequency analysis

3.1.1 Methodology. Text analyzing techniques have always been used to analyze vast quantities of textual data, so that information, observations, valuable patterns, and trends are automatically extracted (Kuckartz, 2014). To extract the factors driving herding behavior, the data were collected from a sample of 50 financial experts having more than five years of experience investing in the Indian stock market. These financial experts comprise 25 Investment advisors and 25 stockbrokers. These experts were first made familiar with the study's objectives and were asked to list out the factors that, according to them, drive herding behavior among Indian stock investors. The word frequency analysis yielding word cloud was conducted on the data collected to determine the frequency of the factors extracted.

3.1.2 Analysis of results. All the factors as listed by the experts were listed in the excel file. In order to prevent duplication of factors, the factors with identical significances or synonyms (ex. uncertain information, uncertainty in information) have been translated into specific labels. For this, a panel discussion was conducted among five experts randomly selected from

the previous fifty experts. After thorough analysis, the twenty-two factors emerged from the experts' data set on which word frequency analysis was examined to determine the most common factors among all the experts. The word frequency analysis as presented in Table 1 gives a clear picture of the count and frequency (by percentage) of the factors listed most commonly by all the financial experts. The above results depict that Information Uncertainty (Count-50), Past Performance (Count-50), Anxiety (Count-48), Information Asymmetry (Count-48), Information Source (Count-48) to be the most repeatedly considered drivers of herding behavior among financial experts. On the contrary, Word of Mouth (Count-25), Bid-Ask Spread (Count-25), Industry Affiliation (Count-24), Want to be associated with a group (Count-23), Market Capitalization (Count-21), Transaction Volume (Count-20) are the least commonly considered drivers of herding behavior among financial experts. To examine the relative importance of all the factors determined and assign priorities to the factors extracted, the current phase results further proceeded toward the second phase of the study.

3.2 Phase 2: fuzzy analytical hierarchy process (fuzzy-AHP)

3.2.1 Methodology. According to Saaty (1990), the analytical hierarchy process (AHP) has been applied to solve decision-making problems. In the decision-making process, the traditional AHP is not effective while handling the vagueness (Büyükoçkan, 2004). The Fuzzy-AHP method has been developed to overcome the limitation of traditional AHP. In the year 1996, Zadeh has given the concept of Fuzzy-AHP. A fuzzy-AHP method is capable of handling vagueness.

$$\mu_{\tilde{A}(x)} = \begin{cases} 0, & x < l \\ \frac{(x-l)}{(m-l)}, & \text{if } l \leq x \leq m \\ \frac{(u-x)}{(u-m)}, & \text{if } m \leq x \leq u \\ 0, & x > u \end{cases} \quad (1)$$

Factors	Count	Weightage (%)
Information uncertainty	50	6.44
Past performance	50	6.44
Anxiety	48	6.18
Information asymmetry	48	6.18
Information source	48	6.18
Confidence	47	6.05
Emotions	47	6.05
Market sentiments	47	6.05
Risk tolerance	46	5.92
Good performance of other investors	40	5.15
Experience	38	4.89
Age	37	4.76
Education	33	4.24
Reputation and status of other investors	30	3.86
Stock price	30	3.86
Word of mouth	25	3.22
Bid-ask spread	25	3.22
Industry affiliation	24	3.08
Want to be associated with group	23	2.96
Market capitalization	21	2.70
Transaction volume	20	2.57

Table 1.
Word frequency
analysis of drivers of
herding behavior

According to [Kaufmann and Gupta \(1991\)](#), \tilde{A} = “ l ” represents lower value, “ u ” represents upper value, “ m ” represents mid-value, and [Eqn \(1\)](#) represents the membership function. For any two triangular fuzzy numbers ([Figure 1](#)), $\tilde{A}_1 = (l_1, m_1, u_1)$, $\tilde{A}_2 = (l_2, m_2, u_2)$, and the arithmetic operation of triangular fuzzy numbers are shown as below:

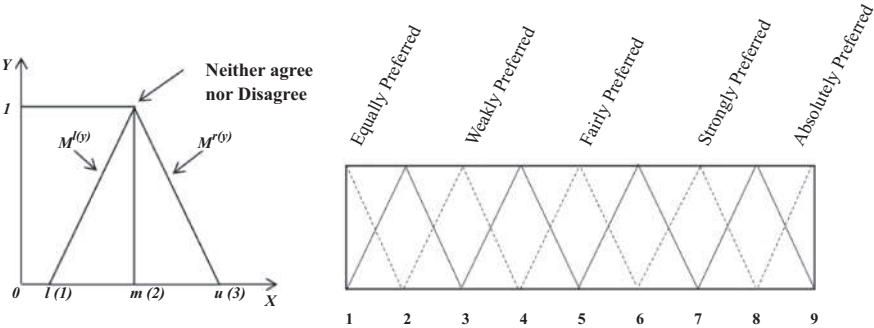
$$\begin{aligned}\tilde{A}_1 + \tilde{A}_2 &= (l_1 + l_2, m_1 + m_2, u_1 + u_2) \\ \tilde{A}_1 * \tilde{A}_2 &= (l_1 * l_2, m_1 * m_2, u_1 * u_2)\end{aligned}$$

The computational procedure of fuzzy-AHP: For calculating criteria and sub-criteria weights the following procedure has been adopted which was given by [Buckley \(1985\)](#) and [Hsieh et al. \(2004\)](#).

3.2.1.1 Step 1: creating a pairwise comparison matrix. The pairwise comparison matrix [Eqn \(2\)](#) has been created based on linguistic terms ([Table 2](#)). The triangular fuzzy numbers signify for making a pairwise comparison matrix in linguistic terms, i.e. “equally preferred”, “weakly preferred”, “fairly preferred”, “strongly preferred”, and “absolutely preferred”.

$$A^k = \begin{bmatrix} a_{11}^k & a_{12}^k & \cdots & a_{1n}^k \\ a_{21}^k & a_{22}^k & a_{23}^k & a_{2n}^k \\ \vdots & a_{32}^k & \ddots & \vdots \\ a_{m1}^k & a_{m2}^k & \cdots & a_{mn}^k \end{bmatrix} \quad (2)$$

Figure 1.
Fuzzy triangular membership function



Classification	Reciprocal of Fuzzy number	Scale	Triangular fuzzy scale (l, m, u)
Equally preferred	(1,1,1)	1	(1,1,1)
Weakly preferred	(1/4,1/3,1/2)	3	(2,3,4)
Fairly preferred	(1/6,1/5,1/4)	5	(4,5,6)
Strongly preferred	(1/8,1/7,1/6)	7	(6,7,8)
Absolutely preferred	(1/9,1/9,1/9)	9	(9,9,9)
The intermittent values between two adjacent scales	(1/3,1/2,1)	2	(1,2,3)
	(1/5,1/4,1/3)	4	(3,4,5)
	(1/7,1/6,1/5)	6	(5,6,7)
	(1/9,1/8,1/7)	8	(7,8,9)

Table 2.
Fuzzy linguistic scale **Source(s):** [Gupta et al. \(2020\)](#)

Eqn (3) has been applied to evaluate the opinion of the respondent and construct the matrix as shown in Eqn (4).

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herding
behavior

$$\tilde{a}_{ij} = \left(\tilde{a}_{ij}^1 * \tilde{a}_{ij}^2 \dots * \tilde{a}_{ij}^{10} \right) \quad (3)$$

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & a_{23} & a_{2n} \\ \vdots & a_{32} & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \quad (4)$$

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3.2.1.2 Step 2: Calculate the geometric mean and fuzzy weight of each criterion and sub-criteria. For group decisions, a fuzzy matrix has been created while applying the geometric mean method. The fuzzy weight and the geometric mean value of each criterion and sub-criteria have been calculated with the help of Eqns (5) and (6).

$$\tilde{r}_i = \left(\tilde{a}_{i1} * \tilde{a}_{i2} * \tilde{a}_{i3} * \dots * \tilde{a}_{in} \right)^{1/n} \quad (5)$$

where, $l_{ij} = \left(\prod_{m=1}^M l_{ij}^m \right)^{1/M}$, $m_{ij} = \left(\prod_{m=1}^M m_{ij}^m \right)^{1/M}$, $u_{ij} = \left(\prod_{m=1}^M u_{ij}^m \right)^{1/M}$

$$\tilde{w}_i = \tilde{r}_i * \left(\tilde{r}_1 + \tilde{r}_2 + \tilde{r}_3 + \dots + \tilde{r}_n \right)^{-1} \quad (6)$$

where $\tilde{r}_k = (l_k, m_k, u_k)$ and $(\tilde{r}_k)^{-1} = \left(1/u_k, 1/m_k, 1/l_k \right)$

3.2.1.3 Step 3: Defuzzify the fuzzy weight of each criterion and sub-criteria. The center of the area i.e. the COA method has been applied to defuzzify the fuzzy weight to crisp number Eqn (7).

$$Df_{ij} = [(U_{ij} - L_{ij}) + (M_{ij} - L_{ij})]/3 + L_{ij} \quad (7)$$

3.2.1.4 Step 4: normalised the non-fuzzy weight. The normalization process has been applied after step 3 with the help of equation 8.

$$NW_i = \frac{Df_{ij}}{\sum (Df_{ij})} \quad (8)$$

3.2.2 Criteria and sub-criteria selection and model development. In the current study, the aim is to rank the factors driving herding behavior among Indian stock investors. The twenty-two factors extracted during word frequency analysis were put under panel discussion and were divided into six categories based on their description and nature. The identified herding motivators correspond to the variables established in previous studies (Kumari et al., 2020; Agrawal et al., 2016). These six categories were labeled as Investor Cognitive Psychology, Market Information, Social Factors, Stock Characteristics, Trade Characteristics, Socio-Economic Factors. All factors and sub-factors have been assessed by pilot tests among five independent experts. These experts comprise three investment advisors and two stockbrokers. These experts were first acquainted with the study's objectives and were asked to respond on a Fuzzy language scale (Table 2). In order to prevent inconsistencies in the pairwise comparison matrix, Saaty (1990) suggested testing the consistency ratio for reliability. The consistency ratio must be below 0.10 to achieve reliability (Saaty, 1990). The pilot test results demonstrated a consistency ratio below the cut-off points, which showed good reliability. Thus, the three-level hierarchal model was developed incorporating the

ultimate goals, i.e. drivers of herding behavior as Level 1, the main factors (Criteria) as Level 2, and the 22 sub-factors (Sub-criteria) as Level 3 (Figure 2).

3.2.3 *Sample design and data collection.* In order to analyze the relative significance of the drivers of herding among Indian stock investors, the pair-wise comparison study was conceived based on the proposed hierarchical model. The Fuzzy-AHP questionnaire format based on the 9-point rating was applied to indicate each criterion's relative importance (or sub-criterion) in the hierarchy. The current study employed the snowball sampling technique to collect the data from the 380 Indian stock investors from North India, taking into account the minimum AHP sample requirements (Dias and Ioannou, 1996; Lee and Ross, 2012). Prior to collecting responses, the study's aim, the meaning of the criteria/sub-criteria, and how the response should be given were briefly made clear to all the respondents. Of the 380 responses received, 176 were males, while the rest were females. The respondents were between 20 and 60 years of age.

3.2.4 *Analysis of results.* Following the hierarchical decision model's finalization, a comparative matrix was designed using the scale mentioned above. The local and global weights shown in Table 4 were extracted. The local weights (LW) indicate the importance of the sub-criteria within a particular category, while the importance of sub-criteria across all sub-criteria overall is specified by global weight (GW). Based on the findings, the ultimate

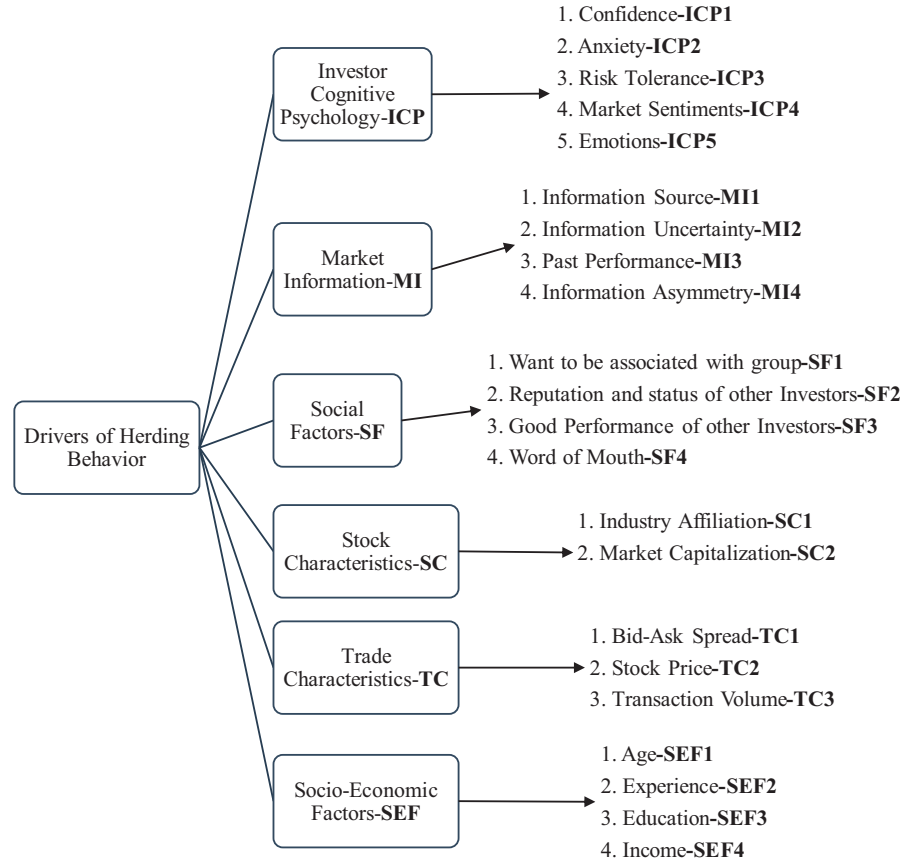


Figure 2.
Comprehensive model
for the occurrence of
herding behavior

ranking of all the factors (Criteria) turns out to be is ICP > MI > SC > SF > TC > SEF (The “>” symbol means ‘More significant’). ICP (Investor Cognitive Psychology; Weight: 0.326) has emerged as the top-ranked driver of herding behavior (Table 3) followed by MI (Market information; Weight: 0.252), SC (Stock characteristics; Weight: 0.154), SF (Social Factors; Weight: 0.148), TC (Trade characteristics; Weight: 0.072), and SEF (Social-economic factors; Weight: 0.047). In the case of the relative significance of sub-factors of ICP (Investor Cognitive Psychology), the highest rank was given to ICP3 (Risk tolerance; Weight: 0.291), and the lowest rank was given to ICP2 (Anxiety; Weight: 0.136). Amongst the various sub-criteria of second-ranked factors, i.e. MI (Market Information), the highest rank was given to MI3 (Past Performance; Weight: 0.369), and the lowest rank was given to MI4 (Information asymmetry; Weight: 0.129). The local weight evaluations of SC (Stock characteristics) criteria revealed that the investor gave the highest rank to SC2 (Market Capitalization; Weight: 0.525), and the lowest rank was given to SC1 (Industry Affiliation; Weight: 0.475). In the case of the relative

Table 3.
Weight and ranking of
each criterion of
herding behavior

Criterion	Normalized non-fuzzy weight	Ranking
Investor cognitive Psychology-ICP	0.326	1
Market Information-MI	0.252	2
Social Factors-SF	0.148	4
Stock Characteristics-SC	0.154	3
Trade Characteristics-TC	0.072	5
Socio-economic Factors-SEF	0.047	6

Table 4.
Fuzzy weight of entire
criteria and sub-criteria
for herding behavior

Major criteria	Fuzzy weight	Sub-criteria	Fuzzy weight	Global ranking
ICP-investor cognitive psychology	(0.06, 0.37, 2.29)	Confidence	(0.02, 0.12, 1.81)	9
		Anxiety	(0.01, 0.17, 1.65)	10
		Risk tolerance	(0.01, 0.29, 3.62)	1
		Market sentiments	(0.03, 0.32, 3.38)	3
		Emotions	(0.01, 0.10, 1.93)	7
MI-market information	(0.02, 0.21, 1.87)	Information source	(0.08, 0.34, 2.80)	4
		Information uncertainty	(0.01, 0.10, 1.50)	12
		Past performance	(0.01, 0.44, 3.10)	2
		Information asymmetry	(0.01, 0.12, 1.11)	15
		Want to be associated with group	(0.01, 0.12, 1.68)	18
SF-social factors	(0.02, 0.14, 1.08)	Reputation and status of other investors	(0.01, 0.23, 4.22)	11
		Good performance of other investors	(0.03, 0.50, 4.35)	8
		Word of mouth	(0.01, 0.16, 3.84)	13
		Industry affiliation	(0.07, 0.55, 3.22)	6
		Market capitalization	(0.08, 0.45, 3.71)	5
TC-trade characteristics	(0.01, 0.07, 0.52)	Bid-ask spread	(0.03, 0.09, 0.85)	21
		Stock price	(0.09, 0.28, 2.41)	16
		Transaction volume	(0.04, 0.62, 3.16)	14
		Age	(0.02, 0.15, 1.43)	20
SEF-socio-economic factors	(0.02, 0.05, 0.33)	Experience	(0.08, 0.42, 2.85)	17
		Education	(0.03, 0.21, 1.43)	19
		Income	(0.02, 0.22, 1.16)	22

significance of sub-factors of SF (Social Factors), the highest rank was given to SF3 (Good Performance of other Investors; Weight: 0.322), and the lowest rank was given to SF1 (Want to be associated with the group; Weight: 0.119). Amongst the various sub-criteria of fifth-ranked factors, i.e. TC (Trade Characteristics), the highest rank was given to TC3 (Transaction Volume; Weight: 0.504), and the lowest rank was given to TC1 (Bid-Ask Spread; Weight: 0.129). The local weight evaluations of SEF (Socio-economic factors) criteria revealed that the investor gave the highest rank to SEF2 (Experience; Weight: 0.418), and the lowest rank was given to SEF4 (Income; Weight: 0.175).

Once all the criteria and sub-criteria local weights within their particular category have been calculated, the next step was to evaluate the global weights of the sub-criteria. By multiplying the local weight of each subfactor with the weight of each corresponding factor (Criteria), global weight was extracted (Tables 3 and 4, and Figure 3). Based on the results of the global weights of all the 22 sub-criteria driving herding behavior, the ranking of the top five significant factors came out to be is ICP3(Risk Tolerance; Weight:0.095) > MI3 (Past Performance; Weight:0.093) > ICP4(Market Sentiments; Weight:0.090) > MI1(Information Source; Weight:0.084) > SC2(Market Capitalization; Weight:0.081). On the contrary the least five rankings of the sub-factors came out to be is SEF4 (Income; Weight:0.008) < TC1 (Bid-Ask Spread; Weight: 0.0093) < SEF1 (Age; Weight: 0.0094) < SEF3 (Education; Weight: 0.0098) < SF1 (Want to be associated with group; Weight: 0.018) (The sign “<” indicates less significant). The global weights result depicts that the top five ranked criteria cover more than 44% of the total weightage, while the least five criteria cover only 5% of the total weight.

4. Discussion and implications

To make appropriate decisions, analyzing investors' herding behavior in the fastest growing market, such as the Indian stock market, is essential to financial policymakers, investors, and wealth managers. Market volatility based on this behavior will considerably affect market movement, cause assets to be mispriced, and contribute to market inefficiency. Thus, the current study attempted to examine the drivers of herding behavior among Indian stock investors by employing a two-phase study. In the first phase, the factors driving the herding behavior were explored using text analysis (Word frequency analysis), a qualitative analysis technique. A total of 22 factors were extracted from the word frequency analysis, which was carried forward for further analysis. In phase 2, the current study employed the fuzzy

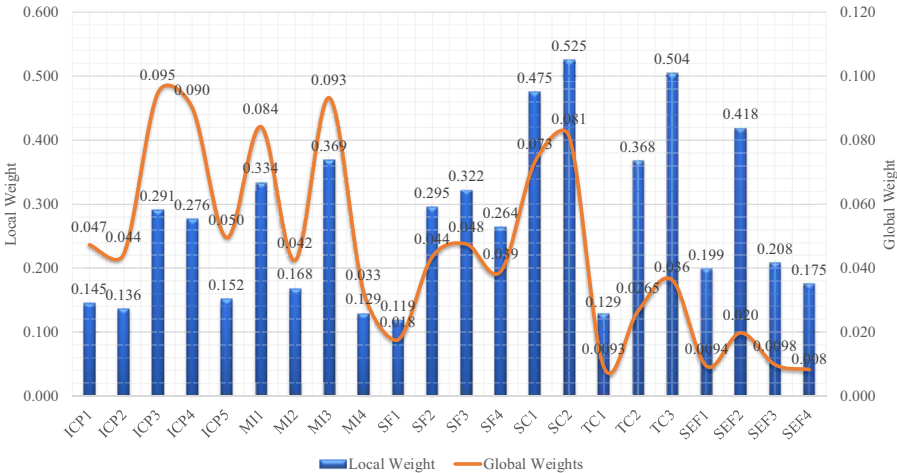


Figure 3.
Local and global
weights of sub-criteria
of herding behaviour

analytical hierarchy process (F-AHP) technique to examine the relative significance of all the factors and the sub-factors and rank them on the basis of their pair-wise comparison. The results of the study in case of factors indicated Investor cognitive psychology as the top-ranked driver of herding behavior among Indian stock investors. These results are in line with results of the previous studies which also reported the cognitive aspects as the significant driver of herding behavior among stock investors (Xu *et al.*, 2017; Chia *et al.*, 2018; Kabir and Shakur, 2018; Christoffersen and Stæhr, 2019; Gul and Khan, 2019; Garcia, 2021). Cognitive psychology thus acts as the main contributor to our study as well as in influencing investment decisions because human beings are emotional by nature; therefore their moods and emotions often become the cause for taking a particular action in all life situations, including investing. When an investor is in a bad mood, he is more prone to a pessimistic view of the future, while those who are in a good mood, on the other hand, are optimistic, that is, they are more likely to see positive market developments and expect favorable events. The extent of optimism and pessimism changes over time as when the market is bullish investors think optimistically and when it is bearish they are more inclined towards pessimism (Pandey and Sehgal, 2019). When an investor is optimistic, he will be more vulnerable to take risks when investing as compared to being in a bad mood. Investors cannot fully abandon themselves from emotions, even if they want to make decisions based on models of technical analysis, they still have to make certain assumptions to establish a specific value (Bouteska, 2019; Ren *et al.*, 2018). Investment sentiments such as fears, greed, and overreaction to bad news also play a major role in influencing investment decisions in extreme market conditions (Kashif *et al.*, 2020). Thus by better understanding the drivers of herding via the consideration of investor sentiment, market participants are better able to identify the situations that result in herding, and the findings provide a deeper understanding of financial markets (Garcia, 2021). Aversion to uncertainty also acts as a contributor towards herding propensity (Raghubir and Das, 1999). This feeling of uncertainty is a characteristic of each individual, as it depends on each individual's attitudes, their risk propensity, their more or less intuitive character, their excess or lack of confidence, and their degree of tolerance for ambiguity. All of these variables, which are interconnected, make up the investor's cognitive profile, which determines how the individual obtain and infers the different information stimuli to emerge from their environment.

Market information and the stock characteristics emerged out to be the top second and third-ranked factors of herding behavior. These findings confirm the findings of several previous studies which also found these two to be the significant drivers of herding behavior (Wong, 2018; Chia *et al.*, 2018). These findings portray that the investor's psychology, the informational aspects, and the stock characteristics play a crucial role in influencing the herd behavior among investors.

On the contrary, the individual's socio-economic factors came out to be the least ranked driver of herding behavior, followed by trade characteristics and social factors. These findings are in line with the assertions of Komalasari *et al.* (2021), who in their study conducted an extensive review of the literature regarding herding and found socio-economic factors as least influential towards herding. Contrary, these results contradict several previous studies that posited socioeconomic factors as the significant driver of herd behavior (Nair and Yermal, 2017; Wong, 2018; Risal and Khatiwada, 2019).

In the case of a pairwise comparison of sub-factors, the global ranking results indicated that Risk Tolerance, Market Sentiments, Information Source, Past Performance, Market Capitalization are the highest-ranked drivers of herding behavior among Indian stock investors. These findings validated the findings of several previous studies, which also reported these factors to be the significant driver of the herding behavior of the stock investors (Christoffersen and Stæhr, 2019; Litimi, 2017; Jlassi and Naoui, 2015; Chia *et al.*, 2018; Wong, 2018).

The results of this study provide significant theoretical and practical implications. As previously stated, most of the earlier research has explored and modeled the drivers of herding behavior. The present study enhances the limited literature by outlining the motivating factors for investors to herd. This creates finance researchers the opportunity to study the modeled relationships, by taking these factors into account. The current studies also fill the gap by applying a multi-criteria decision-making technique that helps scholars consider various other factors that might have great importance in the conduct of herding. The study gives a realistic perspective of the factors which drive herd behavior and a comprehensive framework to elucidate herding intentions. The present study will also direct researchers to implement the same approach to other behavioral dimensions of the stock investors.

The study also delivers several practical implications. As for the practitioners, herding creates profitable investment opportunities to buy and sell stocks as it drives asset prices away from the fundamental values. On the other hand, economists can analyze the consequences of expectations regarding the future risk and profitability of an asset-pricing model by understanding the herding behavior. Lastly, understanding herding behavior also is one of the major concerns for policymakers because of its ability to increase volatility, destabilize financial markets, and leading to a financial crisis. Comprehending the influences of the different factors discussed in the study would also enable stock investors to be more aware of their investment choices and not resort to herd behavior. Thus, this research enables decision-makers to understand the reasons for herd activity and helps them act accordingly to improve the stock market's performance. Some investor education programs can be initiated to educate investors in order to minimize the effects of herding behavior. It should be noted to investors that independent decision-making would contribute to financial independence and increase investor confidence.

5. Limitations and directions for future research

Like many other studies, there are limitations that give potential research opportunities. First, the current study was undertaken among stock investors from North India only. Future studies should be conducted in different regions to validate the findings of the study. Second, there are numerous factors that are not part of the study but might significantly influence the investors' herding behaviors. The future study should explore and take into account such factors also.

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