



Has financial attitude impacted the trading activity of retail investors during the COVID-19 pandemic?

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ARTICLE INFO

Keywords:

Artificial neural network
COVID-19
Financial behavior
Financial attitude
Financial anxiety
Pandemic

ABSTRACT

Financial attitude influences the financial behavior of retail investors. Although the extant research has acknowledged and examined this relationship, the measures of financial attitude and behavior still vary widely and are generally posed as a series of questions rather than statements. In addition to this, there is insufficient knowledge regarding retail investors' behavior in the face of a health crisis, such as the current COVID-19 pandemic. This study addresses these gaps in the prior literature by examining the relative influence of six dimensions of financial attitude, namely, financial anxiety, optimism, financial security, deliberative thinking, interest in financial issues, and needs for precautionary savings, on the trading activity of retail investors during the pandemic. Data were collected from 404 respondents and analyzed using the artificial neural network (ANN) method. The results revealed that all six dimensions had a positive influence on trading activity, with interest in financial issues exerting the strongest influence, followed by deliberative thinking. The study thus contributes important inferences for researchers and managers.

1. Introduction

Retail investors differ from institutional investors by way of their investment size, resources, access to research, and professional advice (Bhattacharya et al., 2012). Moreover, retail investors are influenced by several rational and irrational factors while making decisions related to where and when to invest (Seth et al., 2020). Apart from this, these investors also tend to have a different approach toward managing their finances. For example, some investors tend to save more than others or be more deliberative in their analyses before making finance-related decisions, while others are more instinctually driven when making investments (Fünfgeld and Wang, 2009). Scholars have thus recognized that psychological factors play a key role in shaping individuals' financial behavior and have emphasized the importance of examining these factors extensively (Strömbäck et al., 2017). In this context, financial attitude represents an expression of the individuals' underlying

knowledge of finance and their ability to manage decisions related to financial dealings (Shim et al., 2009). Accordingly, insights related to financial attitude can serve as a metric of individuals' financial knowledge, which can then be improved through education. It is critical to examine the attitude of retail investors since their financial attitude (Grable and Lytton, 1998), along with their financial behavior and knowledge (Joo and Grable, 2004) can influence their financial well-being and satisfaction (Falahati et al., 2012).

This understanding of financial attitude becomes even more important during black swan events like the COVID-19 pandemic, which has created extensive uncertainty and panic worldwide. Examining retail investors' COVID-19-related investment behavior is especially vital because no documented epidemic or viral infection outbreak has yet had this same level of impact on the financial markets (Baker et al., 2020). The swift and unprecedented spread of the COVID-19 outbreak has made the financial markets extremely volatile, leaving investors with

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<https://doi.org/10.1016/j.jretconser.2020.102341>

Received 12 August 2020; Received in revised form 28 September 2020; Accepted 28 September 2020

Available online 9 October 2020

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huge losses in a short timeframe (Zhang et al., 2020). The impact of the pandemic control measures has also been severe in terms of the curtailed economic activity, contraction in output, and extensive repercussions like job loss for many individuals (Pastor and Vorsatz, 2020). To estimate the nearly unfathomable commercial impact of the COVID-19 pandemic, we must first consider that the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, which was confined mainly to a single country (i.e., China), cost the global economy between 30 to 100 billion USD (Smith, 2006). In comparison, COVID-19, the so-called “once-in-a-century pathogen” (Gates, 2020), has hit more than 200 countries and can be expected to have a far greater and far more long-lasting global economic cost for many years to come. The fears that have arisen during this time have negatively impacted market returns and liquidity, throwing the financial markets worldwide into complete disarray. The turmoil has been further heightened by an increasing number of positive COVID-19 cases (Al-Awadhi et al., 2020) and aggravated by the fast diffusion of pandemic-related news and the resultant economic uncertainty across the digitally connected world. The combination of these factors has caused an unprecedented reaction in the financial markets (Baker et al., 2020).

Despite such volatility, retail investors may not stay away from the markets, since they still need different financial products and services to utilize their investible surplus gainfully (Garber and Koyama, 2016). In addition, we believe that easy access to stock markets may also attract retail investors to invest in different financial instruments, particularly while they are confined to their homes during the COVID-19 lockdown restrictions with an abundance of spare time on their hands. Information technology-enabled financial services support stock trading through an online interface (Oertzen, 2019), making this easy access possible. In fact, online stock trading has increased individuals' stock market participation by providing ubiquity of access and speeding up trading with benefits like lower cost and higher volumes (Khan et al., 2017, 2020). However, investing in such volatile markets, as seen during the COVID-19 pandemic, can be risky and leaves the investors vulnerable to higher losses. Indeed, many financial instruments can amplify the risks associated with investing under such world-changing circumstances (Corbet et al., 2020). The decision not to invest may thus seem a safer and more attractive option than parking money in ill-advised instruments (Barrafrem et al., 2020). Based on the preceding discussion, we argue that retail investors may need to be protected from their own erroneous decision-making while trading during such extraordinary events, which are beyond the comprehension of even the most well-informed institutional investors. Thus, we posit that there is an exigent need to understand the psychological factors influencing retail investors' financial decisions during the COVID-19 pandemic.

We believe that the pandemic provides a unique opportunity to obtain revelatory insights about the behavior of retail investors in the face of extrinsic stressors. Given the current backdrop of uncertainty in the economic environment and the extreme vulnerability of retail investors, we contend that an analysis of investors' psychological make-up, as measured through their financial attitude, will generate key insights into how this health crisis has affected their financial behavior. These insights can then help in formulating policies to protect retail investors and better educate them about the risks involved in making financial decisions during such extraordinary events. To our knowledge, no prior studies have examined the impact of the psychological dimensions of financial attitude on retail investors' financial behavior during previous health crises. Thus, there is an immediate need for a contemporaneous examination of investors' behavior in general and the psychological dimensions of their financial attitude in particular during the COVID-19 pandemic.

Additionally, an extensive review of the literature has revealed that even in the context of a normal situation (e.g., one without any extraordinary stressors), there is limited research on retail investors' financial attitude and the dimensions that may affect their financial behavior. In fact, the extant literature has largely focused on cognitive

aspects instead, such as financial literacy and numeric skills, when it comes to financial decisions in normal situations (Fernandes et al., 2014). In comparison, the influence of factors, such as deliberative thinking and optimism, on financial behavior has remained critically under-explored (Strömbäck et al., 2017). Notably, only a select number of studies have examined the effect of financial attitude on retail investors' behavior (Yong et al., 2018), despite its importance in influencing financial goals (Yulianti and Silvy, 2013). Thus, significant research gaps exist regarding (a) the influence of financial attitude on retail investors' behavior during an extrinsic event such as the COVID-19 pandemic, and (b) the influence of financial attitude on retail investors' behavior in general.

The present study proposes to address these gaps by examining the influence of retail investors' financial attitude on their behavior during the COVID-19 pandemic. We have measured financial attitude through six dimensions drawn from the extant literature: (a) financial anxiety, interest in financial issues, and needs for precautionary savings (derived from Fünfgeld and Wang, 2009), and (b) financial security, optimism, and deliberate thinking (Stromback et al., 2017). Next, in consonance with past studies (e.g., Lewis and Mackenzie, 2000), we have measured the financial behavior of retail investors according to their trading activity. The choice to measure financial behavior using trading activity and financial attitude using the above-mentioned six dimensions is also based on the suggestions of a panel of five professors from the area of finance and four professionals experienced in advising retail investors. Accordingly, our research objective is to assess the impact of financial attitude, measured by financial anxiety, optimism, financial security, deliberative thinking, interest in financial issues, and needs for precautionary savings, on retail investors' financial behavior, proxied by trading activity, during the COVID-19 pandemic. Specifically, we address two research questions: **RQ1:** Have the various dimensions of financial attitude influenced the trading activity of retail investors during the COVID-19 pandemic? **RQ2:** What is the relative strength of the influence of these dimensions of financial attitude on the trading activity of retail investors during the COVID-19 pandemic? To test the proposed relationships, we analyzed data collected from 404 retail investors who have traded in stock markets during the COVID-19 pandemic. The data were analyzed using the artificial neural network (ANN) approach to measure the relative influence of the various financial attitude dimensions.

The novelty of this study comes from the following: (a) it is the first study to examine the impact of financial attitude on the trading activity of retail investors during a health crisis. The global COVID-19 pandemic has caused unimaginable volatility in the financial markets, a disruption on a scale never before witnessed in a health crisis, including the Spanish flu. As such, our findings will help demystify the psychology of retail investors in the face of panic and unforeseen circumstances. (b) This study has applied the ANN approach to identify the key influencers of the trading activity of retail investors during the COVID-19 pandemic, thereby adding methodological rigor to the prior literature in this area. The extant empirical models related to the psychology of retail investors, including attitudes, biases, and behaviors, have not been analyzed, maintaining the possibility of non-linear associations among the variables examined.

2. Financial attitude

Irrationality causes retail investors to deviate from the rational behavior expected of them based on the *homo economicus* model (Barberis, 2003). Behavioral finance acknowledges such breaches of rationality regarding financial decisions by incorporating the learnings from psychology to provide a more realistic view of financial behavior (Camerer and Loewenstein, 2004). The extant literature on behavioral finance has largely focused on certain anomalies and cognitive biases such as herding that influence individuals' financial decisions (e.g., Baker et al., 2018). In comparison, the influence of financial attitude on

decisions such as buying insurance policy has been less examined, though some studies have investigated attitudes and behavior in this context (e.g., Fünfgeld and Wang, 2009; Skagerlund et al., 2018).

Financial attitude can be described as a psychological inclination, which manifests when individuals evaluate the well-established practices of financial management with varying degrees of acceptance or non-acceptance (Parrotta and Johnson, 1998). Furthermore, it can be classified as a view, state of mind, or judgment (Pankow, 2012). Extant studies in this area have examined various aspects of individuals' financial attitudes that may contribute to irrational decisions. For instance, Stromback et al. (2017) emphasized the effect of psychological characteristics, such as self-control and optimism, in influencing individuals' financial behavior (e.g., saving) and resultant well-being. Further emphasizing the importance of psychological factors, Park and Sela (2017) noted that individuals tend to avoid the finance-related decisions that are incompatible (or believed to be) with their affective style of decision-making. Scholars have also highlighted the psychological aspects of investor behavior and used the term 'ostrich-effect' to explain investors' tendency to avoid information about their portfolios in a falling stock market (Olafsson and Pagel, 2017).

In another study, Fünfgeld and Wang (2009) used financial attitudes to classify individuals into different segments and determine their need for professional advice. They assessed financial attitude in terms of needs for precautionary savings, decision styles, spending tendency, interest in financial issues, and anxiety. Similarly, the Organisation for Economic Co-operation and Development (OECD) proposed an instrument to measure the financial attitude of investors based on the extent of their belief in planning and their propensity to save and spend (Paluri and Mehra, 2016). In comparison, Tsui-Yii and Sheng-Chen (2014) used achievement, prestige, power, and respect as the key determinants of financial attitude. Drawing upon these studies and our discussion with the expert panel, we interpret financial attitude as an expression of investors' financial anxiety, their optimism, the extent of their financial security, their degree of deliberative thinking, the depth of their interest in financial issues, and their needs for precautionary savings.

Accordingly, we used these six dimensions as measures of financial attitude.

3. Research model

The present study proposes six dimensions of financial attitude as antecedents of retail investors' financial behavior, which, in turn, is measured through their trading activity during the COVID-19 pandemic (Fig. 1). Based on a comprehensive review of the literature, which has posited that financial attitude determines financial behavior (Kadoya and Khan, 2017) and that this behavior can be represented by trading activity (Lewis and Mackenzie, 2000), we selected our dependent and independent variables. Furthermore, our proposed model is consistent with Parrotta and Johnson's (1998) financial management framework adapted from the Deacon and Firebaugh Family Resource Management Model. According to Parrotta and Johnson (1998), financial management behavior is the outcome of financial attitude and literacy. Their model further suggests that financial management behavior influences the financial satisfaction of individuals. Additionally, the Theory of Planned Behavior (TPB; Ajzen, 1991) also supports our proposition that attitudes influence behaviors. In this regard, scholars have argued that attitudes' predictive power is higher in situations where behavior is captured through specific actions (Ajzen and Fishbein, 1980). On the whole, the TPB suggests that attitude, subjective norms, and perceived behavioral control function as antecedents of behavioral intentions (Ajzen, 1985). This theory thus provides a reliable theoretical backdrop for our study since it has been validated empirically in multiple contexts (Armitage and Conner, 2001).

3.1. Financial attitude and trading activity of retail investors

The effect of anxiety on financial decisions is not a new phenomenon in the literature. Gambetti and Giusberti (2012), for instance, noted that investment avoidance behavior might be motivated by financial anxiety. In addition, anxiety can influence individuals risk-taking tendencies as

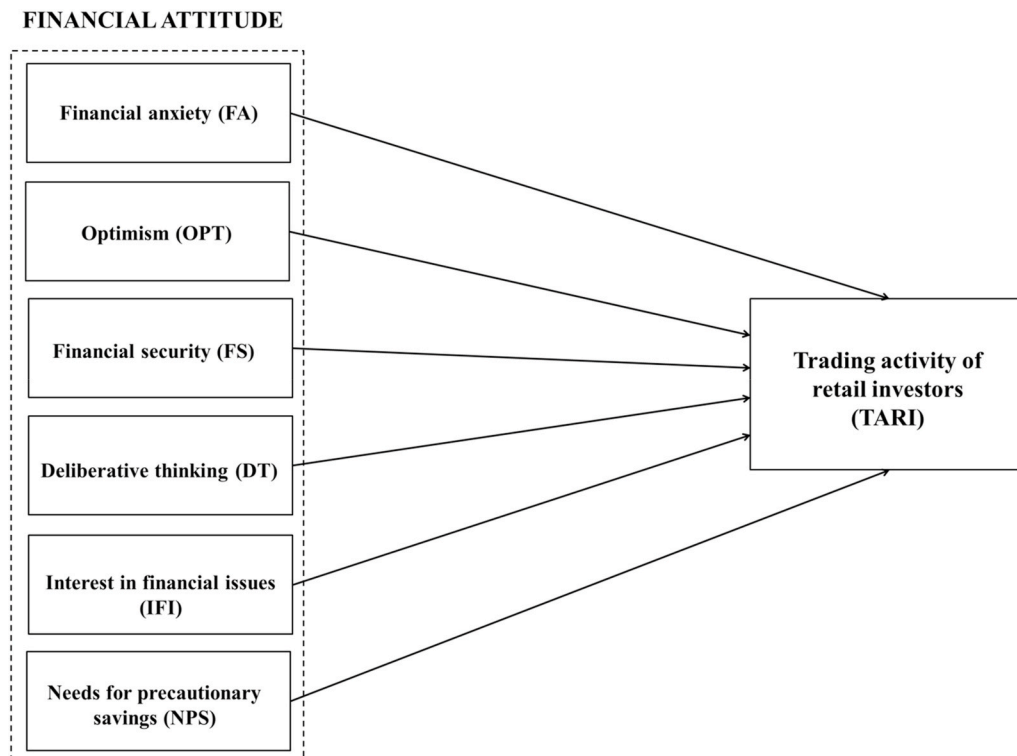


Fig. 1. Research model.

well as their degree of self-assurance in assessing investment avenues (Kuhnen and Knutson, 2011). Lim et al. (2013) found that women tend to exhibit more anxiety about financial issues than their male counterparts. Given that anxiety is associated with low predictability of stock price trends, scholars have contended that anxiety, therefore, causes individuals to make conservative investment decisions (Paluri and Mehra, 2016). We believe that anxiety, as an attitude, can influence the trading decisions of retail investors, particularly when there is a plethora of negative information regarding the turmoil in the financial markets and the impact of the COVID-19 outbreak (Al-Awadhi et al., 2020; Zhang et al., 2020).

Furthermore, past research has revealed that optimism is another influencing factor for financial behavior. For instance, Stromback et al. (2017) argued that less optimistic individuals are more likely to work longer and harder and to save more money. In comparison, their more optimistic counterparts may exhibit less conservative financial behavior (Puri and Robinson, 2007). Researchers have also associated optimism with financial well-being. In fact, prior studies have observed a higher pessimism bias in individuals who are depressed than in those who are not (Strunk et al., 2006). We, therefore, contend that retail investors with an optimistic attitude may perceive the COVID-19 stock market crash (Baker et al., 2020) as an opportunity to make more money and increase their trading activity in the stock market.

Additionally, our review of the literature has revealed that financial security has not yet been examined as an antecedent of financial behavior. However, previous studies have examined financial security in connection with financial well-being (Stromback et al., 2017), which, in turn, is related to financial behavior (Falahati et al., 2012). Accordingly, we believe that the sense of security related to one's finances can influence one's attitude toward financial behavior, particularly in the decision to trade in the stock market. This supposition is further supported by the literature, which argues that emotional states have an impact on an individual's risk-taking ability (Kuhnen and Knutson, 2011). For instance, feelings of fear increase risk-averse choices, while anger promotes the opposite behavior (Lerner and Keltner, 2001). As such, we expect that financial security may cause retail investors to be less fearful and thus more active in trading activities. This prediction is in line with the age-old market adage of "buy on fear, sell on greed", which underscores the impact of this dimension on investment decisions (Griffith et al., 2019).

The next dimension is deliberative thinking, which represents a structured approach toward planning and problem solving. It has previously been examined in connection with cognitive biases. For instance, scholars found that individuals who have more faith in intuitive rather than deliberative thinking use more heuristics-based judgments (Klaczynski et al., 1997). In contrast, financial traders engaging in professional trading tend to use more deliberative thinking, thereby using fewer heuristics while making decisions (Thoma et al., 2015). In addition, intuitive behaviors, as opposed to deliberative thinking, may lower the risk-adjusted performance of individuals, even the ones who are better informed financially (Glaser and Walther, 2014). As such, we believe that deliberative thinking by retail investors will reduce their reliance on heuristics and cause them to make their trading decisions during the COVID-19 pandemic accordingly.

Interest in financial issues represents a keen knowledge and understanding of financial products and information. Past research has found that knowledge of finance, as represented by financial literacy and education, influences the net worth and savings of individuals (Bernheim and Garrett, 2003), as well as their investment intentions (Lim et al., 2013). Scholars have also noted that women tend to possess a lower level of financial knowledge compared with their male counterparts (Bucher-Koenen et al., 2016), which can be attributed to their typically lower interest in such information. We believe that high interest in financial issues can cause retail investors to have a positive financial attitude while making financial decisions, especially since they are likely to have some amount of knowledge in this area (Fünfgeld and Wang,

2009). Similarly, we anticipate that this interest will cause retail investors to have a positive attitude toward trading during the COVID-19 pandemic. Investors with a high interest in financial issues may believe that the lower valuations resulting from the COVID-19 stock market crash present an excellent opportunity to make money through equity trading.

Needs for precautionary savings is the final dimension of attitude covered in this study. Savings are related to individuals' thought processes in deferring current consumption to save for the future. They are guided by the uncertainty associated with wealth accumulation (Guiso et al., 1992) and represent a sense of control over one's life (Zaleskiwicz et al., 2013). Scholars have also used individuals' attitude toward saving money as a basis to segment clients in the finance domain (e.g., Phan et al., 2019). Furthermore, Fünfgeld & Wang (2017) argued that there is a positive linkage between risk aversion and individuals' needs for precautionary saving. Based on these studies, we believe that this dimension of attitude may affect the risk aversion of retail investors. Retail investors with a financial attitude of savings may thus be more cautious while trading in volatile markets, as witnessed during the COVID-19 pandemic (Vishnoi and Mookerjee, 2020; Zhang et al., 2020).

Admittedly, the literature is limited regarding the relationships being examined in this study, but the evidence is robust enough to anticipate the proposed influences. Prior studies have not yet explored these six dimensions of financial attitude in the context of retail investors' trading activity. However, these dimensions have been examined and proven relevant for financial behavior, as proxied by savings and other finance-related decisions. Therefore, we believe that it would be particularly insightful to explore these psychological dimensions and their influence on the financial behavior of retail investors during the COVID-19 pandemic.

4. Data and methods

4.1. Data collection

We used a primary survey to collect cross-sectional data from retail investors. The survey respondents were selected from among Indian retail investors who have been active in the stock markets since the COVID-19 outbreak. India was selected as the geography for collecting the data based on the rise in retail trading in Indian markets during the global pandemic. Specifically, a large number of retail investors in India, particularly young investors, have begun trading for the first time during the pandemic to benefit from the crash and to utilize the time available due to the lockdown (Dubey, 2020). Low rates on deposits paid by banks have also caused new investors to turn to stock markets where the valuations look more attractive (Gilchrist, 2020).

We developed our survey questionnaire by adapting pre-validated scales used by scholars in behavioral finance. The measurement items for financial anxiety, interest in financial issues, and needs for precautionary savings have been drawn from Fünfgeld and Wang (2009), while the items for financial security, optimism, and deliberate thinking have been taken from Stromback et al. (2017). The trading activity of retail investors has been adapted from Barber and Odean (2000), as well as Milgrom and Stokey (1982). Financial anxiety was measured using 4-items, financial security, optimism, and trading activity were measured with 3-items each, and deliberate thinking, interest in financial issues, and needs for precautionary savings were each measured using 2-items. All questionnaire statements utilized a five-point Likert scale.

The survey measures' content validity was ascertained using feedback from three professors in the area of finance and one professional with experience in advising retail investors. After incorporating their suggested changes, we piloted the survey measures with 15 respondents from the target segment to ensure face validity and to pre-test the questionnaire. Subsequently, we made several minor revisions before finalizing our questionnaire.

We conducted the survey in June 2020 to capture responses during the peak of the COVID-19 pandemic. Respondents were identified using the snowball sampling technique, in which respondents were first recruited with the help of financial advisers and then requested to suggest other participants who could complete the survey. We included two screening questions to ensure that the respondents had traded in the stock market during the pandemic and that they were between 25 to 40 years in age. Of the 849 individuals contacted, 404 filled in the online survey. The respondents were assured of their anonymity during this process, and, as recommended by Saunders et al. (2009), they were not explicitly informed that their financial attitudes were being measured to control for self-response bias. The profile of the respondents is presented in Table 1.

4.2. Methods

The majority of recent studies have utilized the structural equation modeling (SEM) approach for data analysis since it helps analyze multiple relationships between the identified antecedents and outcomes (Talwar et al., 2020c; Tandon et al., 2020). Both variants of SEM, namely, covariance-based SEM (CB-SEM) and variance-based SEM (VB-SEM), have been applied by scholars to test their proposed hypotheses, including Talwar et al. (2020a), who utilized the former in their study, and Laato et al. (2020), who used the latter. However, both these methods have certain data-related restrictions. CB-SEM, for example, is best suited for testing theory-based models. However, it requires a large sample size, an absence of outliers, and conformance to the multivariate assumptions of normality, multicollinearity, linearity, and homoscedasticity (Henseler et al., 2009; Hair et al., 2016). In comparison, VB-SEM is more lenient regarding sample size and other data-related requirements and is best suited for theory-building. However, if the data has underlying relationships that are both linear and non-linear, and the objective of the analysis is to gauge the influence of antecedents on the outcome variables, then the artificial neural network (ANN) approach is more suitable for data analysis (Hew et al., 2019). Furthermore, ANN is robust against data-related issues such as outliers, noise, and small samples (Leong et al., 2020).

ANN uses three different kinds of neurons (i.e., input, hidden, and output) that are distributed in multiple layers to run the computations (Höglund, 2012). The method is based on a multi-fold cross-validation process, wherein the data is divided into training and test sets (Kuhn and Johnson, 2013). The network of neurons learns new information through a training process based on the two-way flow of information that then fine-tunes the outcome through forward iterations and backward propagation (Taneja and Arora, 2019). In the feed-forward-backward-propagation algorithm of ANN, inputs are fed in the forward direction, and the errors propagate in the backward

direction (Taneja and Arora, 2019). Several rounds of the learning process ensure the minimization of errors. The information learned through the process is then stored as synaptic weights in the model. The activation function (sigmoid in the present study) is used to adjust these weights, along with the backward propagation of errors. Together, these decrease the deviation between the actual and desired outputs through multiple iterations to result in minimum bias (EL Idrissi et al., 2019). The analysis was carried out in the present study using sklearn and multilayer perceptron (MLP) in Python and SPSS.

The present study used six input, two hidden, and one output neuron to generate alternative models. Moreover, 70% of the data was used as training data to avoid over-fitting. As recommended by Hew et al. (2019), the predictive accuracy of various models generated by ANN was evaluated based on the Root Mean Square Error (RMSE) value of each model. Furthermore, the normalized relative importance of each antecedent was obtained from the multilayer perceptrons of the ANN algorithm, in consonance with prior studies (e.g., Leong et al., 2020).

5. Results

5.1. Testing of multivariate assumptions

The present study used the Kolmogorov-Smirnov (K-S) test to check the nature of the data distribution (Simard & L'Ecuyer, 2011). Since the asymptotic significance (2-tailed) of the test statistic was less than 0.05, the null of normality was rejected. Thus, the data in this study did not follow the Gaussian distribution, lending support for the use of ANN for analysis.

Next, we examined multicollinearity by generating values of tolerance and variance inflation factor (VIF), as used by recent studies (e.g., Talwar et al., 2019; Talwar et al., 2020c). The computed values of tolerances were greater than 0.1, and VIFs were less than the recommended cut-off of 5 (Hair et al., 2011), implying that there was no multicollinearity issue in the data collected. These values are presented in Table 2. The value of the inter-construct correlations was less than 0.80, which further supported the absence of multicollinearity (Kaur et al., 2020a,b) (Table 3).

In congruence with recent studies (e.g., Hew et al., 2019; Leong et al., 2020), we utilized ANOVA to detect the relationship (linear/non-linear) between the variables. The test results indicated that the dependent variable, retail investors' trading activity, had a non-linear relationship with four of the independent variables, namely, financial security, deliberate thinking, interest in financial issues, and needs for precautionary savings. The existence of non-linear relationships, therefore, further supports the suitability of ANN for data analysis in the present study.

We also tested the data for the fourth multivariate assumption, i.e., homoscedasticity by plotting the scatter plot of standardized regression residuals and the dependent variable (Fig. 2). The data were confirmed as homoscedastic since the residuals were evenly distributed along the fitted line.

5.2. Common method bias (CMB)

As we collected the data for all variables through the same self-reporting instrument, there is a possibility that the data might suffer from common method bias. Although we tried to avoid this issue by following the procedural remedy of anonymity and questionnaire design, we still used Harman's single factor test after data collection to completely rule out the possibility of CMB in consonance with recent studies (e.g., Talwar et al., 2020b). The test results indicated that a single factor explained 34.53% of the total variance, which is below the recommended cut-off of 50%.

Table 1
Respondent profile.

Gender	%
Female	30.69
Male	69.31
Age group	
25-30 years	20.79
31-35 years	33.17
36-40 years	46.04
Income level	
Less than half a million INR	0.00
Half million to Million	18.32
More than Million to 1.5 Million	28.46
More than 1.5 Million to 2 Million	26.98
More than 2 million	26.24
Educational background	
Completed schooling	2.48
Graduate (pursuing/completed)	13.12
Post-graduate (pursuing/completed)	74.25
Ph.D. or equivalent (pursuing/completed)	10.15

Table 2
Multicollinearity diagnostics.

Model	Unstandardized Coefficients		Standardized Coefficients β	t	p	Collinearity Statistics	
	B	Std. Error				Tolerance	VIF
(Constant)	1.494	.252		5.919	.000		
FA	-.059	.070	-.048	-.846	.398	.535	1.869
OPT	.029	.072	.023	.399	.690	.532	1.879
FS	.136	.041	.180	3.299	.001	.571	1.753
DT	.128	.048	.173	2.645	.008	.397	2.516
IFI	.151	.078	.167	1.928	.055	.226	4.419
NPS	.122	.057	.147	2.139	.033	.361	2.770

FA = Financial anxiety; OPT = Optimism; FS = Financial security; DT = Deliberative thinking; IFI = Interest in financial issues; NPS = Needs for precautionary savings.

Table 3
Correlations, Cronbach's alpha, reliability values, and convergent validity statistics.

	α	CR	AVE	FA	OPT	FS	DT	IF	NPS	TARI
FA	0.83	0.82	0.55	0.74						
OPT	0.73	0.80	0.60	0.68	0.78					
FS	0.90	0.91	0.77	0.11	0.14	0.88				
DT	0.93	0.93	0.87	0.12	0.12	0.59	0.93			
IFI	0.75	0.75	0.61	0.08	0.07	0.62	0.75	0.78		
NPS	0.87	0.87	0.77	0.09	0.08	0.54	0.57	0.79	0.88	
TARI	0.71	0.77	0.56	0.04	0.06	0.46	0.49	0.52	0.47	0.75

α = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted; FA = Financial anxiety; OPT = Optimism; FS = Financial security; DT = Deliberative thinking; IFI = Interest in financial issues; NPS = Needs for precautionary savings.

Note: The off-diagonal values represent correlations and the diagonal values represent the square roots of AVE.

All correlations are significant ($p < 0.05$).

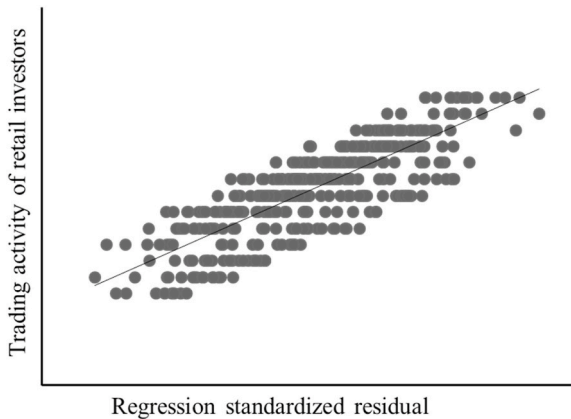


Fig. 2. Scatter plot of residuals.

5.3. Validity and reliability

We computed the prescribed validity and reliability measures and compared them against the recommended cut-offs proposed by Lowry and Gaskin (2014) to judge the robustness of the instrument and the efficacy of the underlying items. First, we calculated Cronbach's alpha and the composite reliability (CR). We found that both parameters for each construct in the study were equal to or higher than the cut-off value of 0.70, thereby confirming the instrument reliability (Table 3). We then examined convergent validity through the average variance extracted (AVE). The values obtained for all constructs exceeded the requisite cut-off of 0.5, confirming their convergent validity. Finally, we validated the instrument's discriminant validity by confirming that the square roots of the AVEs were higher than their respective correlations (Table 3). In summary, all the prescribed validity and reliability measures were examined and found to conform to the recommended cut-off values.

5.4. Results of ANN

We generated multiple ANN models using six input neurons, two hidden neurons, and one output neuron (Fig. 3). Following prior studies (e.g., Hew et al., 2019; Leong et al., 2020), we utilized the RMSE values to assess the predictive accuracy of alternative models. As presented in Table 4, these values show that the models had a high accuracy of prediction, with the training data's mean RMSE value at 0.2300 and the testing data's mean RMSE value at 0.2595.

5.5. Sensitivity analysis

We undertook sensitivity analysis to assess the strength of the influence of the six financial attitude dimensions (i.e., the input neurons) on the trading activity of retail investors (i.e., the output neuron). This

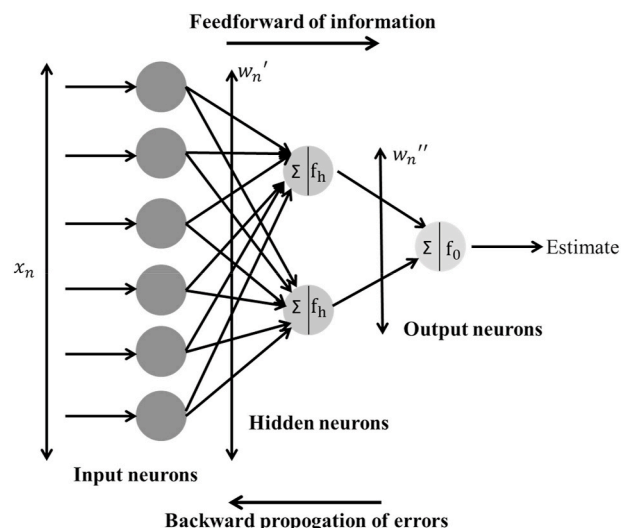


Fig. 3. ANN model.

Table 4
RMSE values.

Models	Random_state	Training (N)	RSME	Testing (N)	RSME
1	281	282	0.2298	122	0.2601
2	24	282	0.2303	122	0.2606
3	270	282	0.2298	122	0.2598
4	58	282	0.2307	122	0.2580
5	201	282	0.2298	122	0.2592
6	90	282	0.2298	122	0.2589
7	185	282	0.2302	122	0.2597
8	291	282	0.2288	122	0.2596
9	25	282	0.2307	122	0.2616
10	239	282	0.2301	122	0.2578
Mean			0.2300		0.2595
SD			0.0006		0.0011

RMSE = Root mean square error.

step helped us determine the normalized relative importance of these dimensions, which were expressed as a percentage of the maximum relative importance. As presented in Table 5, interest in financial issues had the maximum influence, followed by deliberative thinking, needs for precautionary savings, financial security, optimism, and financial anxiety.

6. Discussion

In response to RQ1, all six dimensions of financial attitude identified by the study were found to exist among retail investors (Table 6). In response to RQ2, the ANN results revealed that interest in financial issues had a maximum relative influence on the trading activity of retail investors, while financial anxiety had the least. The implication of these antecedents' relationship with the outcome variable (e.g., the trading activity of retail investors) is discussed below.

Interest in financial issues was the most important dimension in predicting retail investors' trading activity. This dimension had a normalized relative importance score equal to 100%. Furthermore, the relationship between the two was positive and non-linear, as confirmed by the test for linearity and the positive value of correlation (Table 6). This implies that retail investors who take an interest in financial news and participate in discussions related to finance can be expected to exhibit higher trading activity in terms of the buying and selling of their portfolio components when faced with an outlier event such as the COVID-19 pandemic. Although this relationship has not been investigated directly in the past in any context, the association between interest in financial information and financial behavior has already been previously supported (e.g., Lim et al., 2013). An obvious reason behind this finding could be that those who take an interest in financial news and talk to others about varied financial developments may recognize that the COVID-19 stock market crash presents an opportunity to buy good

Table 5
Normalized relative importance of independent variables.

Models	FA	OPT	FS	DT	IFI	NPS
1	0.0390	0.0573	0.1718	0.2209	0.3127	0.2058
2	0.0177	0.0444	0.1681	0.2044	0.4196	0.1409
3	0.0238	0.0391	0.1664	0.2153	0.3317	0.2220
4	0.0211	0.0221	0.1909	0.2110	0.3386	0.2172
5	0.0181	0.0354	0.1838	0.2164	0.2809	0.2551
6	0.0235	0.0369	0.1333	0.2002	0.3339	0.2646
7	0.0196	0.0546	0.1885	0.2159	0.3150	0.2026
8	0.0085	0.0313	0.1804	0.2297	0.3303	0.2122
9	0.0132	0.0417	0.1209	0.1728	0.4964	0.1411
10	0.0225	0.0374	0.2018	0.2278	0.2670	0.2467
Mean	0.0207	0.0400	0.1706	0.2115	0.3426	0.2108
Normalized	6.04%	11.68%	49.79%	61.72%	100.00%	61.53%

FA = Financial anxiety; OPT = Optimism; FS = Financial security; DT = Deliberative thinking; IFI = Interest in financial issues; NPS = Needs for precautionary savings.

Table 6
Summary of findings.

Financial Attitude	Normalized relative importance (%)	Correlation	Linear/non-linear
Interest in Financial Issues	100.00%	0.52	Non-linear
Deliberative Thinking	61.72%	0.49	Non-linear
Needs for Precautionary Savings	61.53%	0.47	Non-linear
Financial Security	49.79%	0.46	Non-linear
Optimism	11.68%	0.06	Linear
Financial Anxiety	6.04%	0.04	Linear

stocks at attractive valuations. The risk here is twofold: the retail investors may lack the required skills to correctly interpret the financial information they come across or the individuals that they discuss such information with may have different interpretations of the news. Consequently, this may lead investors to make poor trading decisions that result in financial losses. Such increased activity can also cause investors to churn their holdings more often, compounding the volatility of an already fragile market (Shantha, 2018, 2019).

Deliberative thinking was the second most influential dimension, with the relative importance of 61.72%. Its relationship with trading activity was non-linear and had a positive correlation (Table 6), indicating that retail investors who prefer outlining clear plans and analyzing problems systematically may trade more when faced with an extrinsic event, such as the COVID pandemic. The role of deliberative thinking in influencing financial behavior has been discussed from different perspectives in past research (e.g., Glaser and Walther, 2014; Thoma et al., 2015). While such tendencies to plan and have a structured approach toward problem-solving is generally very useful, there is still a risk of retail investors over-planning and potentially over-reacting by buying and selling stocks that may not be good for their overall portfolio returns. For instance, investors who think deliberatively may indulge in heuristic simplification and process the available information erroneously due to limits on their processing capacity (Montier, 2002).

Needs for precautionary savings is the third dimension of financial attitude that influences retail investors' trading activity. It had the relative importance of 61.53%, as well as a non-linear relationship and positive correlation with the outcome variable (Table 6). This implies that retail investors with a strong inclination to keep aside some money for future exigencies and who are very particular about their future may indulge in trading activity during a crisis, thereby causing the markets to move with even greater volatility. This is a confounding finding because rationally, individuals who feel the need to amass savings to reduce future uncertainty and thus have more control over their lives (Guiso et al., 1992; Zaleskiewicz et al., 2013) should want to avoid fluctuating markets. One would expect that individuals with an attitude to reduce uncertainty would not trade in volatile markets, especially under the influence of extraordinary events like the COVID-19 pandemic. However, one explanation for this finding could be that retail investors may be attracted to trade in the market if they believe that the stocks available at comparatively lower valuation during the COVID-19 crisis offer an excellent opportunity to build up wealth in the long-term. Given the unpredictable movement in the market during this extenuating period, these investors may also trade in the hope of making money by buying low and selling high in the short-term. This argument notwithstanding, we suggest that the relationship between these two variables be tested further, using a larger sample and considering the possible influence of intervening variables.

Financial security, the fourth dimension, had a relative importance value of 49.79%. Furthermore, the relationship of this antecedent with trading activity was non-linear and positive (Table 6), suggesting that retail investors, who feel secure in their existing financial situation, are assured about their future in the financial context. Given these investors'

confidence about their financial independence post-retirement, they may thus be likely to buy and sell stocks in the financial market during challenging situations like the one presented by the COVID-19 pandemic. Although the effect of financial security on financial behavior, as represented by trading activity, has not yet been tested, the relationship is plausible, given that past studies have explored this construct in the context of well-being and its impact on financial behavior (Falahati et al., 2012; Stromback et al., 2017). This is also explicable rationally because feelings of security can be expected to reduce risk aversion, as argued by prior studies (e.g., Kuhnen and Knutson, 2011; Lerner and Keltner, 2001). These may also motivate retail investors to increase their wealth by trading stocks during the COVID-19 pandemic, which has resulted in the prices of many sought after stocks becoming considerably less than their pre-pandemic levels.

The dimensions with the least amount of relative influence on retail investors' trading activity were optimism (11.68%) and financial anxiety (6.04%). The relationships were linear and positive, as witnessed from the values of the correlations (Table 6). The effect of these dimensions on individuals' financial behavior, in general, has been revealed by past studies (Paluri and Mehra, 2016; Stromback et al., 2017). In the case of optimism, this result implies that retail investors who are positive about the future and expect the best outcomes in uncertain times are likely to trade more in the face of massive disruptors, such as the COVID-19 pandemic. While such an attitude can be expected to help investors make a profit in the market, there is still a risk of complacency and overconfidence that might cause them to over- or under-react to market movements (Daniel et al., 1998) and thus erode their returns (Wulfmeyer, 2016). In fact, in the context of a tail-risk event, such as the COVID-19 pandemic, the spill-over effect, as well as panicked buying and selling, could come at a greater pace, making it risky to be complacent about short-term outcomes (Beck, 2020).

Regarding financial anxiety, individuals who are anxious about their financial decisions and who tend to postpone making such decisions due to their lack of finance-related knowledge may be likely to trade more during outlier events, such as the COVID-19 pandemic. This is another confounding result from our study as one would expect anxious retail investors to avoid volatile markets (Vishnoi and Mookerjee, 2020; Zhang et al., 2020). However, before drawing any firm conclusions, we recommend that this relationship be tested with a larger sample in multiple contexts. Of particular interest could be an examination of how financial anxiety impacts risk aversion during an extraordinary event like the COVID-19 crisis. If risk aversion of financially anxious individuals is found to decrease under the impact of such an event, these individuals can then be expected to trade more in the hope of benefiting from the perceived cheaper valuations.

8. Conclusion, implications, limitations, and future research areas

The panic that spread in the wake of the COVID-19 outbreak caused most financial markets to fall drastically, ranging from 10-20% in a single day (Vishnoi and Mookerjee, 2020; Zhang et al., 2020). However, after some initial nervousness, the stock market crash was perceived by retail investors as an opportunity, wherein markets in most countries witnessed increased retail participation as a result (Dubey, 2020). This development is exciting from the perspective of policymakers and firms who have been trying to encourage retail investors to participate in the stock markets. However, retail investors may contribute to making the markets even more unstable through their biases and psychologically driven responses (Seth et al., 2020). Due to this, there is an exigent need to elucidate the factors driving retail investors' trading activity during such a crisis.

Accordingly, the present study attempted to explicate the key influences on trading activity of retail investors in the context of the COVID-19 pandemic. To this end, we assessed how financial attitude, as measured in terms of financial anxiety, optimism, financial security,

deliberative thinking, interest in financial issues, and needs for precautionary savings, influenced the trading activity of retail investors in a global pandemic setting. We tested the influence of financial attitude by analyzing the data collected from 404 retail investors in India, who were active in the stock market during this period. Since the multivariate data diagnostics tests revealed the existence of non-linear relationships between some antecedents and the outcome variable, we applied the artificial neural network method (ANN) to analyze the data and confirm the relative importance of the influencers.

The findings suggested that interest in financial issues had a maximum relative influence on the trading activity of retail investors, followed by deliberative thinking and needs for precautionary savings, which had nearly identical influences. Following these were financial security, optimism, and financial anxiety. All influences were positive, as confirmed by the correlations. The study thus offers several interesting theory and practice-based insights.

7.1. Theoretical implications

This study makes three main theoretical contributions: first, we have curated a multidimensional scale for the measurement of financial attitude by identifying variables representing this construct from prior studies (e.g., Zottel et al., 2013). Notably, most of these studies have used a limited set of questions to measure financial attitude (Garber and Koyama, 2016) or used psychological constructs such as non-impulsiveness and achievement orientation only (Yong et al., 2018). By incorporating these existing views and drawing upon the extant finance literature (Fünfgeld and Wang, 2009; Stromback et al., 2017; Talwar, 2016) to formulate our understanding, we have identified some of the key dimensions of financial attitude that have relevance in the context of financial behavior. Future researchers can use this scale to measure financial attitude and subsequently extend it by incorporating other measures. For instance, they can include psychological aspects like risk tolerance (Grable and Lytton, 1999) and self-control (Stromback et al., 2017) to better explain the financial behavior of retail investors in terms of savings, paying bills, investing in bonds, taking loans, and using credit cards.

Second, this study is the first empirical effort to propose and test the influence of financial anxiety, optimism, financial security, deliberative thinking, interest in financial issues, and needs for precautionary savings on the trading activity of retail investors. The proposal of novel relationships between antecedents and outcome variables has been noted as a very important theoretical contribution by scholars (Whetten, 1989). Furthermore, information about such relationships has useful practical implications, which further increases these contributions' significance (e.g., Corley and Gioia, 2011).

Third, the study improves the theoretical understanding of financial attitude and behavior in three contexts simultaneously, all of which enrich the extant findings in the area (e.g., Kadoya and Khan, 2017; Stromback et al., 2017). These contexts are (a) *Trading activity during a health crisis*: The study examined psychological variables' impact on the trading activity of retail investors during a health crisis, i.e., the COVID-19 pandemic. It captured the behavior in real-time as the data was collected at the height of the outbreak. (b) *Emerging market data*: The underlying relationships have been tested with data collected from India, an emerging market economy. Given that many global firms are investing in India, insights into the financial attitude and behavior of Indians can thus be quite useful. (c) *Retail investors*: The study focuses on retail investors whose financial behavior is largely driven by irrationality and is likely to deviate from expected financial models. As such, these investors are less predictable and can potentially impact the volatility in the markets. These insights can serve as a basis for researchers to investigate these investors' motivations to provide actionable recommendations for practice.

7.2. Practical implications

Furthermore, our study makes four practical contributions. First, it reveals the impact of six different dimensions of financial attitude on retail investors' trading activity. The findings suggest that if retail investors improve their financial attitude, their trading decisions may be positively impacted, such that they may be able to construct and maintain a profitable portfolio. At the same time, it will enable them to make more informed decisions, resulting in less erratic trading activity and a more stable financial market. Previous studies have also confirmed that improvement in financial attitude can also alter financial behavior (Bir, 2016; Hayhoe et al., 2005). Given that financial knowledge reflects financial attitude (Batty et al., 2015), these can, therefore, be enhanced through financial education (Bruhn et al., 2013). Based on our findings, we recommend that policymakers target not only financial literacy through financial education programs, but also include investment education as this may impact not just numeracy but also the psychological dimensions of retail investors. Such programs can be valuable in increasing retail investors' ability to handle complex products that are a part of the evolving financial markets and can help them better navigate the financial world (Lusardi and Mitchell, 2014). Thus, our findings can contribute at a practical level by using the available information and knowledge, which are considered important for the design and efficacy of interventional education programs, to improve financial behavior in a more targeted and effective way (Lind et al., 2020).

Second, our study reveals that retail investors represent a complicated mix of financial anxiety, optimism, financial security, deliberative thinking, interest in financial issues, and needs for precautionary savings. All of these dimensions influence retail investors' trading activity in stock markets, confirming the finding by Grunnarsson and Wahlund (1997) that retail investors are impacted by various psychological factors. This information emphasizes the key focus areas for financial service and advisory firms that operate in very competitive conditions. A deeper knowledge of the financial attitude of retail investors and the impact it has on their trading behavior can help such firms optimize their relationships with existing customers and better strategize to attract new ones (Harrison and Ansell, 2002).

Third, we have presented findings related to India, which is a geography of interest for global financial service, investment, and advisory firms. Since financial decision-making is tied to individuals' geographic location (Stolper and Walter, 2017), the findings of our study can help regulators and firms develop a better understanding of Indian investors. In addition, our findings augment the current understanding of Indian retail investors' financial attitude, which can, in turn, serve as the basis for segmenting them. Such segmentation can help effectively predict these individuals' behavior toward financial services, as argued by Paluri and Mehra (2016).

Finally, since our study has contended that the ease of access to the stock market through online trading could also influence the trading activity of retail investors who have been confined to their homes while the pandemic control measures were in force (Fang et al., 2020), we suggest that regulators put this online interface to good use by making it mandatory for the system to warn retail investors. For example, the software can have a built-in feature alerting investors if they place too many orders together to buy or sell stocks, or if they place orders related to stocks that have moved with greater volatility during the preceding few trading sessions. This can serve as a way of protecting retail investors against their own irrational and psychologically-driven decisions.

7.3. Limitations and future research

Although we conducted the study following all procedural guidelines, there are certain limitations in our study that must be acknowledged to put our findings in the right perspective. Our research design, though popularly used by researchers (Talwar et al., 2020a, 2020b),

comes with certain caveats related to social desirability bias and the generalizability of findings. This is due to the fact that we collected data through a self-report questionnaire in a single geography. However, we sought to control for respondent bias by not revealing that attitude was being measured in our study. Future researchers can address the issue of generalizability by testing our model in diverse settings and then comparing the results. Second, although scholars have noted the impact of socio-demographic profile on financial behavior (Bucher-Koenen et al., 2016; Lim et al., 2013), we did not consider the effect of such variables. As our study is the first to empirically test the influence of various dimensions of financial attitude on the trading activity of retail investors, we did not want to confound the analysis by including too many variables. Future researchers can, therefore, incorporate various socio-demographic factors in the model to uncover their effect on the relationships examined by us. Third, other variables, such as spending freely or financial literacy (Skagerlund et al., 2018), can also be used to measure financial attitude. We did not include these variables to avoid increasing the scope of our study too much. We recommend that future researchers expand our proposed measure of financial attitude by including these and other factors to examine their impact on different manifestations of financial behavior. Furthermore, our model can also be expanded theoretically by drawing upon popular seminal theories, such as the TPB (Ajzen, 1991).

In addition, future researchers can add further methodological rigor by using the two-staged SEM-ANN approach to analyze data, instead of just ANN, as used in our study. Such a combination of methods can be very useful since SEM would support hypothesis testing, which cannot be performed through ANN, and ANN could capture the non-linear relationships that SEM cannot. However, researchers have to ascertain that the data meets all the data-related requirements of SEM before applying it. Finally, future researchers can examine the role of information technology-enabled financial services that support stock trading through an online interface in increasing the trading activity during the COVID-19 pandemic. In other words, they can examine whether ease of access, ubiquity, and lower cost also play a role, along with financial attitude, in influencing the trading activity of retail investors.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jretconser.2020.102341>.

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