Global Journal of Economic and Finance Research

e-ISSN: 3050-5348
p-ISSN: 3050-533X

Vol. 02(12): 1492-1502, December 2025

Home Page: https://gjefr.com/

How Behavioral Factors Affect Vietnamese Stock Investors' Decisions

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KEYWORDS: behavioral factors, making decisions, stock market, Vietnam investor

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Publication Date: 29 December-2025
DOI: 10.55677/GJEFR/17-2025-Vol02E12

ABSTRACT

The study examines the impact of behavioral psychological factors including rationality, overconfidence, optimism, pessimism and herding effect on investor decisions in the Vietnamese stock market. Using daily data of the VN30 index and its constituent stocks from January 1, 2020 to June 30, 2024, combining two research methods: diffusion index and Wavelet transformation. The results show that behavioral psychological factors and investor decisions in the stock market are highly connected and closely influence each other. Investor decisions are strongly influenced by pessimism and herding effect while rationality, optimism and overconfidence only have a significant impact during the period of rapid market growth, and have no significant impact in other periods. As the market becomes more volatile, the degree of interdependence between psychological factors and investor decisions increases.

1. INTRODUCTION

The stock market plays an extremely important role in the economic development of a country. It is a measure of the health of the economy, an important capital mobilization channel for businesses and also contributes to enriching investment channels for people, especially individual investors with limited capital, helping them to diversify their investment portfolio and minimize risks. In Vietnam, after more than 20 years of operation, the stock market has gradually become an indispensable part of the country's economic development. According to the State Securities Commission, as of July 2023, the market capitalization reached VND 7.69 trillion, accounting for 86.44% of GDP, of which HoSE capitalization was VND 4.46 trillion, equivalent to 51.23% of GDP. Fluctuations in the stock market have a direct and significant impact on the country's economic situation. From 2005 to early 2007, the Vietnamese stock market grew rapidly, leading to remarkable economic growth. However, in 2008, the stock market crisis and collapse also led to economic crisis and recession. The same scenario was repeated in the following periods. Recently, the rapid increase and collapse in the period of 2020 - 2022 caused a significant impact on economic growth.

The developments in the stock market come from the behavior of investors - those who buy and sell securities in the market, when the majority of investors in the market act similarly, they will affect the changes in trading volume and price fluctuations. However, traditional economic theories fail to explain some phenomena that occur in the stock market, such as: why is there excessive trading volume in the market? Why are stock price fluctuations sometimes not reflecting fundamental values? Why is there an overreaction to news? Why are there booms and busts in the market? Why do financial crises occur? A series of why questions are raised, and in order to explain those questions, studying and explaining investor behavior becomes extremely necessary.

Unlike developed markets such as Europe and the US where individual investors own less than 30% of shares and account for only 10-20% of transactions (according to Retail Investor Report 2023 - Public Investing), most securities transactions are conducted by professional institutional investors, in the Vietnamese stock market, individual investors play an extremely important role in leading the market as they account for an overwhelming proportion of the total trading volume of the entire market. According to data from the Vietnam Securities Depository (VSD), as of June 2023, the trading volume of individual investors accounted for nearly 90% of the total market volume, the large trading ratio accounted for more than 85% of the number of transactions, the number of accounts exceeded 7.25 million, equivalent to about 7.2% of the population, the trading value was more than 3.5 times higher than that of institutional investors, therefore, the price and performance of the Vietnamese stock market were strongly affected

and changed according to the actions of the group of individual investors. However, most individual investors are non-professional investors, they are limited in knowledge, information processing ability as well as lack of control, so they are prone to making mistakes when making decisions, resulting in investment failures. A 2009 National Futures Association (NFA) survey on MoneyShow.com found that "over 90% of retail accounts opened with $10,000 close within a year because the account holder has lost a significant portion of that money." Shefrin, Shleifer, and Tabeb believe that humans are incapable of rational action in the stock market. (Shefrin, 2007; Shleifer, 2000; Taleb, 2008), or Akerlof and Shiller assert that psychological factors play an important role in the stock market, which can lead to irrational decisions of investors (Akerlof & Shiller, 2010). If an individual investor makes psychological mistakes, it only affects their investment results, but if the majority of individual investors in the market make systematic psychological mistakes, this will affect the price signal and the efficiency of the stock market. With the overwhelming number of individual investors in the Vietnamese stock market today, finding out the behavioral factors that affect investment decisions is important and urgent not only in explaining market fluctuations but also helping investors recognize mistakes and the origins of those mistakes so that they can adjust, make more effective decisions, and improve investment results.

2. RELATED LITERATURE

Although the influence of psychology on individual behavior has been mentioned for a long time, such as John Maynard Keynes' famous 1936 comment on animal spirits in the stock market (Dow & Dow, 2011) or Markowitz's proposal that people focus on gains and losses relative to reference points (Markowitz, 1952), it has only recently attracted significant attention from economists.

According to Hirshleifer, due to cognitive limitations and decision-making time, people cannot analyze the data provided optimally, instead they are forced to use heuristics to guess, select and gather signals (Hirshleifer, 2001). Besides cognition, when making decisions, people are also influenced by emotions and self-control as well as social interactions . Behavioral factors are divided into: heuristic simplification, emotion, social interaction.

Investors always face risk and uncertainty when making decisions, risk is a subjective construct that is influenced by the interpretation of an event (Rottenstreich & Tversky, 1997; Tversky & Koehler, 1994; Weber, 2004), therefore, different people in different contexts will perceive risk differently (Diacon & Ennew, 2001). Objective assessment of probability has only a weak impact on the decision-making process (Capon, Fitzsimons, & Alan Prince, 1996), instead, investors will take into account other aspects when making decisions under uncertainty and therefore they are more influenced by subjective risk than objective risk (Diacon & Ennew, 2001).

According to Garling T. et al. risk acceptance is governed by risk perception (assessment of the level of risk) and risk propensity (i.e. assessment of risk as positive or negative and level of intention to accept risk) (Gärling, Kirchler, Lewis, & Van Raaij, 2009). In addition, risk acceptance is also influenced by other factors such as: demographic characteristics, personal personality traits or specific social context. Risk perception is influenced by fear, regret and optimism (Loewenstein & Weber, 2001) and cognitive biases (Slovic, 1987, 2001) are considered an irrational belief that affects the ability to make decisions (Simon, Houghton, & Aquino, 2000). Cognitive biases include: conservatism bias, confirmation bias, representativeness; anchoring and adjustment, availability, overconfidence (Fagerström, 2008).

In the stock market, investors tend to follow each other in buying and selling stocks, a phenomenon Sias calls herd behavior (Sias, 2004). According to Scharfstein & Stein, investors make choices that are consistent with the opinions of others to avoid damaging their own reputation when they fail, an unprofitable investment will be significantly less damaging to the decision maker when others also make similar investments, which forms a credible reason for investors to ignore private information and trade in herds (Scharfstein & Stein, 1990). According to Shiller, investors facing uncertainty can use many sources of information including information about the behavior of others (Shiller, 2000). These reasons are not mutually exclusive, and investors may act herd-like for multiple reasons at the same time.

Bouteska et al. showed that investor overconfidence is a dominant and persistent behavior in the stock market, high market returns will make investors overconfident and they trade more afterwards (Bouteska, Harasheh, & Abedin, 2023). Chang et al. suggested that herd mentality is always present in the market and the degree of herd effect will be stronger when the market is highly volatile (Chang, Cheng, & Khorana, 2000). Moreover, herd effect causes large fluctuations in the market regardless of market conditions and macroeconomic factors (Hwang & Salmon, 2004). Past information about stock returns and market volatility significantly influence the formation of herd tendency among investors (Vieito et al., 2023).

Rashid et al. showed that investors' trading volume in the stock market decreases when they are optimistic and increases when they are pessimistic, as investors' confidence level increases, trading volume increases, rational expectations and trading volume show signs of inverse relationship (Rashid, Tariq, & Rehman, 2021). Similar effects of optimism and pessimism on stock market volatility are found in the study of (Andleeb & Hassan, 2024).

Thus, it can be seen that behavioral factors significantly affect the liquidity of the stock market (Debata, Dash, & Mahakud, 2021). However, in Vietnam, studies on behavioral factors in the stock market are limited, very few studies assess the impact of these factors on investors' decisions. Therefore, this study will contribute to understanding the influence of behavioral factors on the decisions of Vietnamese investors as well as the Vietnamese stock market.

3. METHODOLOGY

3.1. Variables and measurement

Investors' decisions are influenced by both internal factors including factors related to investors' perception of risk and factors related to their risk-taking tendencies, and external factors such as the environment and surrounding context. Some factors that affect investment decisions are reflected in investment performance, while others are reflected through market fluctuations. This study measures the impact of behavioral factors that can influence market fluctuations, including: investor rationality, overconfidence, optimism, pessimism, and herding effect. These factors are shown in Figure 1 below:

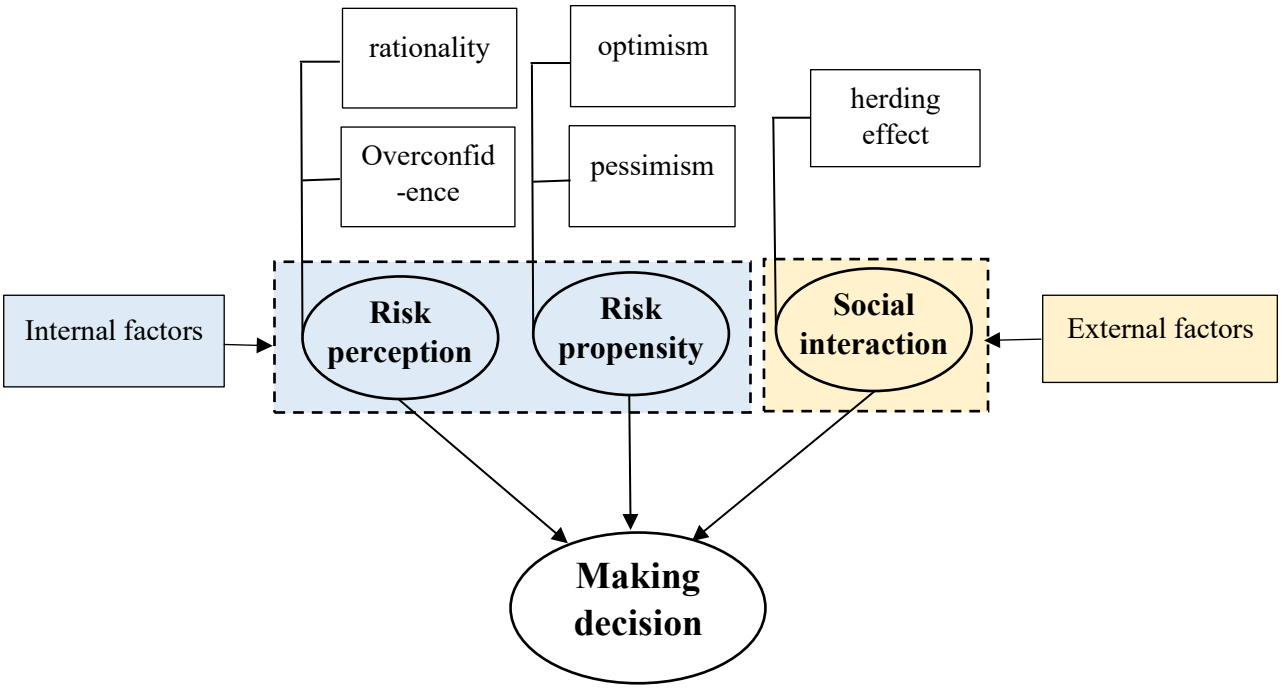


Figure 1: Diagram of behavioral factors affecting investment decisions and stock market fluctuations

Investor decision (ID): related to the choice of buying or selling securities, trading volume, this is an important factor determining market liquidity (Baker & Stein, 2004). Therefore, investor decision is measured by the following formula:

$ID_t = \ln(TV_t)$

Where TV_t is the trading volume of VN30 index at time t

Investor rationality (rat): represents through rational expectations (Muth, 1961), investors rely on rational analysis of market information to make the best predictions for the future, so there are no noisy investors in the market. Investor rationality is measured by the following formula:

$$rat_t = \frac{|closing\ price_t - opening\ price_t|}{high\ price_t - low\ price_t}$$

In which rat_t is the investor's rationality level, $closing\ price_t$, $opening\ price_t$, $low\ price_t$, $high\ price_t$, respectively are the closing price, opening price, lowest price and highest price of the VN30 index on day t. The value of rat_t fluctuates from $0 \leq rat_t \leq 1$, if rat_t is closer to 1, it shows that the investor is decisive with his decision, if rat_t is closer to 0, it shows that the investor is hesitant or there are many noisy investors in the market.

Overconfidence (over)*:* Past returns affect investor confidence (Rashid et al., 2021), a characteristic of overconfident investors is their overtrading behavior (Caballé & Sákovics, 2003), from which investors overconfidence is measured through the influence of past returns on their current trading volume, represented by the following formula:

$over_t = a_t$

with a_t calculated from the following equation: $Ln(TV_{i,t}) = f(R_{i,t-1}) = a_t . R_{i,t-1} + b_t$

In which: $TV_{i,t}$ is the trading volume at time t of component stock i in the VN30 index; $R_{i,t-1}$ is the profit achieved at time t-1 of component stock i in the VN30 index ($R_{i,t-1} = \ln(\frac{P_{i,t-1}}{P_{i,t-2}})$. The larger a_t is, the more overconfident the investor is.

Optimism (optim) and pessimism (pessim): investors will become optimistic when they achieve higher returns than the average return of the market during the study period, whereas if they achieve lower returns, they will become pessimistic (Rashid et al., 2021). Therefore, optimism and pessimism are measured by the following formula:

$$optim_t = \frac{1}{N}\sum_1^N (R_{i,t} |\ R_{i,t} > E[R_i]); \quad pessim_t = -\frac{1}{N}\sum_1^N (R_{i,t} |\ R_{i,t} < E[R_i]$$

$$E[R_i] = \sqrt[n-1]{\frac{P_i \text{ ending of period}}{P_i \text{ beginning of period}}} - 1$$

In which: N is the number of component stocks of the VN30 index, n is the number of days in the research period, $R_{i,t}$ is the profit of component stock i in the VN30 index on day t, $E[R_i]$ is the average profit of component stock i of the VN30 index in the research period.

Herding effect (herd): leads to mispricing that distorts the risk-return relationship (Hwang & Salmon, 2004). Herding effect is measured by the coefficient h_{mt} proposed by Hwang & Salmon (2004) in the equation below:

herd$_t$ =h_{mt} = 1 - exp(H_{mt})

$$\begin{cases} \text{Log}\left[\text{Std}_c\left(\beta^b_{imt}\right)\right] = \mu_m + H_{mt} + \vartheta_{mt}\ ,\ \vartheta_{mt} \sim \text{iid}(0, \sigma^2_{m\upsilon}) \\ H_{mt} = \phi_m H_{mt} - 1 + \eta_{mt}\ \ ,\ \ \eta_{mt} \sim \text{iid}(0, \sigma^2_{m\eta}) \end{cases}$$

In which: $\text{Std}_c(\beta^b_{imt})$ is the cross-sectional standard deviation of beta in the CAPM model of component stock i in the VN30 index at time t; h_{mt} is the parameter representing the herding effect at time t.

3.2. Data

Data: The study uses daily data of the VN30 index and the stocks used to calculate this index. The data is collected from https://www.investing.com/ in the period from January 1, 2020 to June 30, 2024, including 1,118 observations. This period of time represents relatively complete stages in a cycle of the Vietnamese stock market. Daily data is considered suitable for studying investor behavioral factors because investors' psychological behavior is very complex and often changes in a short period of time. Daily data can help to observe more specifically the psychological developments of investors over time.

3.3. Methodology

In our paper, we use both the spillover index and the wavelet coherence approaches. In this section, we briefly introduce the empirical methods used throughout the article.

The spillover index is built on the VAR model (Diebold & Yilmaz, 2012) used to measure the dynamic connection between behavioral psychological factors and the decisions of Vietnamese investors. The spillover index is calculated based on the variance decomposition results with the following formula:

$$S^{\delta}(H) = \frac{\sum_{i,j=1, j\neq 1}^{N} \tilde{\theta}^{\delta}_{ij}(H)}{\sum_{i,j=1}^{N} \tilde{\theta}^{\delta}_{ij}(H)} \times 100 = \frac{\sum_{i,j=1, j\neq 1}^{N} \tilde{\theta}^{\delta}_{ij}(H)}{N} \times 100$$

To determine the role of variables in the model as information transmitters or information receivers, the net spillover index is used with the following formula. If the net spillover index is positive, then i is information transmission and vice versa.

$$S^{\delta}_i(H) = S^{\delta}_{ij}(H) - S^{\delta}_{ji}(H) = \left(\frac{\sum_{i,j=1, i\neq j}^{N} \tilde{\theta}^{\delta}_{ij}(H)}{N} - \frac{\sum_{i,j=1, i\neq j}^{N} \tilde{\theta}^{\delta}_{ji}(H)}{N}\right) \times 100$$

The Wavelet Transform (WT) method was first used by Goupillaud and Morlet in 1984 to increase accuracy and overcome the disadvantages of the old model (Goupillaud, Grossmann, & Morlet, 1984). It can describe the correlation between variables in three dimensions: time, frequency and correlation strength, as well as analyze phase shift and determining the guiding variable (Bloomfield et al., 2004; Torrence & Webster, 1999).

To calculate the correlation coefficient between two time series x(t) and y(t) on the same time-frequency space, Torrence & Webster proposed the Wavelet Coherence technique which is described by the following formula:

$$R^2_n(u,s) = \frac{|S(s^{-1}W^{XY}_n(u,s)|^2}{S(s^{-1}|W_X(u,s)|^2)S(s^{-1}|W_Y(u,s)|^2)}$$

Where: S is the parameter used to smooth both time and frequency (smoothing parameter) representing the oscillation of two time series at a specific position.

$R^2_n(u,s)$ is a correlation coefficient that shows the interdependence between two variables, $R^2_n(u,s)$ with a range of 0 to 1 ($0 \leq R^2_n(u,s) \leq 1$). This correlation level is represented on the graph through a color spectrum, light blue represents a weak correlation level, dark red represents a strong correlation level.

To examine the dependence and causality between time series, Bloomfield et al. proposed the Wavelet phase-difference technique to analyze the phase shift and identify the driving variable (Bloomfield et al., 2004). The formula for calculating Wavelet phase-difference is as follows:

$$\varphi_{xy} = tan^{-1}\left(\frac{\Im\left\{S\left(s^{-1}W_{xy}(u,s)\right)\right\}}{\Re\left\{S\left(s^{-1}W_{xy}(u,s)\right)\right\}}\right)$$

In which: $\Im$ represents the imaginary image in the cross-wavelet transform (CWT); $\Re$ represents the real image in the cross-wavelet transform (CWT); φ_{xy} varies in the range $[-\pi, \pi]$.

4. EMPIRICAL RESULTS

4.1. Descriptive statistics

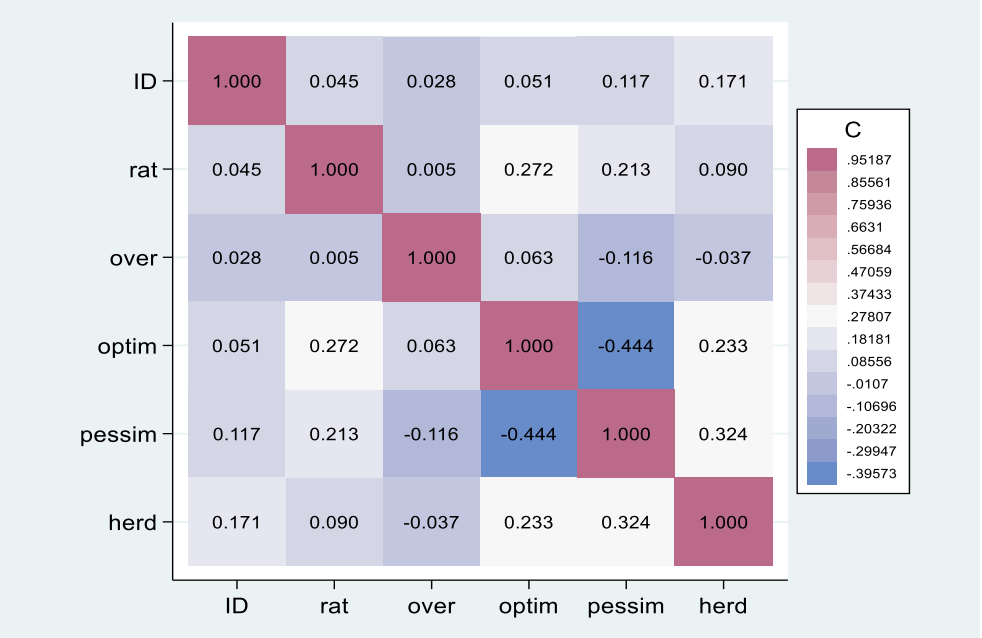
The results of descriptive statistical analysis of the research variables are presented in Table 1 below. In the research data, the two variables optim and pessim have relatively small mean values of 0.0079 for optim and 0.0074 for pessim, respectively, while the mean values of the variables ID and over are relatively large with values of 5.0714 and 4.8487, respectively. Based on the standard deviation coefficient, it can be seen that the variable over fluctuates the most and much more strongly than the remaining variables. The difference between the smallest and largest values of the variable over is quite large, from -82.7003 to 535.6645, the remaining variables fluctuate relatively stably. In general, the median values of the variables do not differ too much from their mean values, indicating that the data is not too skewed, which is also shown through the relatively small skewness coefficients of the variables. The two variables ID and rat have left-skewed distributions with negative skewness coefficients of -0.6078 and -0.0458, respectively, while the remaining variables have right-skewed distributions with positive skewness coefficients. The Jarque-Bera normal distribution residual test shows that the research variables do not have normal distributions when the Jarque-Bera test is statistically significant at the 1% level.

Table 1: Descriptive statistics of research variables

Variable	ID	rat	over	optimize	soccer	herd
Medium	5.0714	0.5108	4.8487	0.0079	0.0074	0.0680
Median	5.1218	0.5225	4.7266	0.0058	0.0040	0.0628
Maximum value	6.1445	1	535.6645	0.0566	0.0692	0.6338
Minimum value	3.4828	0.0012	-82.7003	0	0	0.0036
Standard deviation	0.4453	0.2959	32.4256	0.0077	0.0099	0.0315
Kurtosis	3.2951	1.8099	66.4655	10.8193	12.7999	96.7377
Skewness	-0.6078	-0.0458	3.9563	2.3066	2.8707	5.9801
Jarque-Bera	72.89	66.37	1.9e+05	3840	6009	4.2e+05
P-value	000	000	000	000	000	000
Number of observations	1118	1118	1118	1118	1118	1118

Source: Author's calculation

The linear correlation coefficients between the variables in the research model are shown in Figure 2. In general, the variables pessim and herd are more strongly correlated with the ID variable than with the other variables. The variables optim and pessim are strongly correlated with each other and this correlation is negative, which can be understood as the optimism and pessimism are two opposing states in the psychology of investors, the more optimistic they feel, the less pessimism will be and vice versa.



Source: Author's calculation

Figure 2: Correlation coefficient matrix between variables

4.2. Spillover analysis

The spillover index matrix of behavioral psychological factors and investors' decisions in the stock market is shown in Table 2. The total spillover index is 23.87%, which means that on average, 23.87% of the forecast variance of the variables is caused by other variables in the model. This relatively high number shows that the level of connection and mutual influence between behavioral psychological factors and investors' decisions in the stock market is quite tight.

Table 2: Matrix of spillover index of behavioral psychological factors and investment decisions

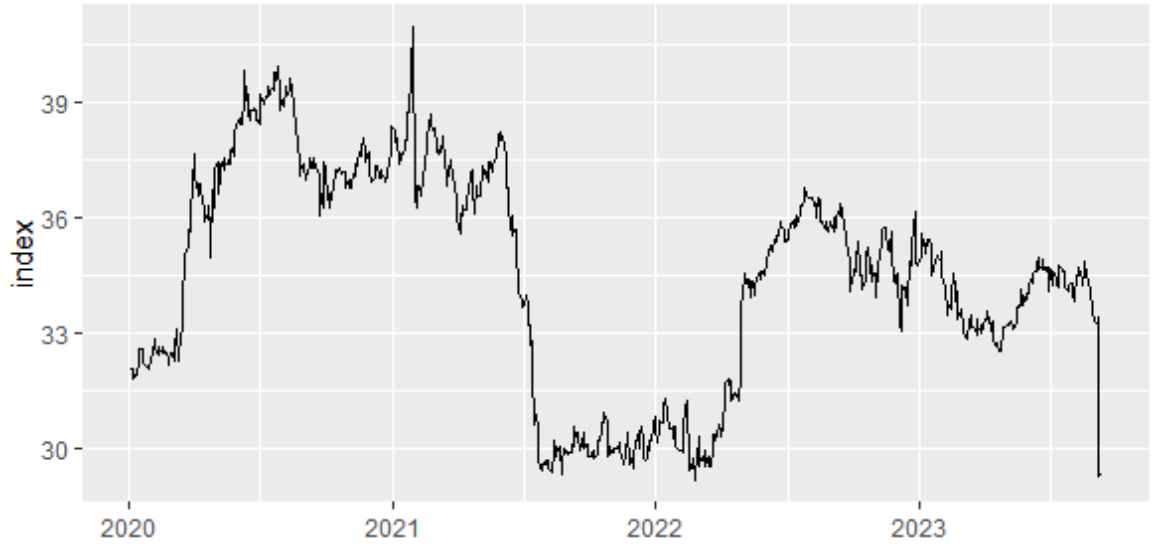
Variable	ID	rat	over	optim	pessim	herd	From others
ID	74.8	2.49	2.20	1.07	11.04	8.39	25.2
rat	1.56	86.39	0.21	7.22	3.89	0.73	13.61
over	0.29	0.91	96.01	1.27	1.39	0.14	3.99
optimize	0.54	5.11	4.91	65.85	19.78	3.81	34.15
soccer	11.64	2.26	3.41	22.05	54.78	5.86	45.22
herd	8.53	0.54	0.63	9.31	2.04	78.94	21.06
To others	22.57	11.31	11.35	40.92	38.15	18.93	**Total spillover**
Net spillover index	-2.63	-2.3	7.36	6.77	-7.07	-2.13	**index 23.87%**

Source: Author's calculation

From row 1, it can be seen that investors' decisions are strongly influenced by pessimism and herding effect when the spillover index to ID from pessim and herd has high values, respectively 11.04% and 8.39%. On the contrary, column 1 shows that investors' decisions are also strongly influenced by the formation of pessimism as well as their crowding behavior when the spillover index from ID to pessim and herd is high, respectively 11.64% and 8.53%. This shows that pessimism, herding effect and investors' decisions are closely related to each other. In addition, it can be seen that optimism and rationality have a close relationship with the spillover index of 7.22% and 5.11%, respectively. In addition, optimism also strongly influences the crowding behavior (herding effect) of investors with a spillover index of 9.31%. However, the herding effect does not strongly influence optimism but instead strongly influences pessimism with a spillover index of 5.86%. In addition, optimism is also greatly influenced by the level of confidence of investors with a spillover index of 4.91% , but optimism has little effect on the level of confidence. Pessimism and optimism have a high level of information transmission and reception, which is understandable because these are two opposite states in human psychology.

In the last row of Table 2, the net spillover index of overconfidence and optimism variables is positive, indicating that optimism and overconfidence play a stronger role in transmitting information, while rationality, pessimism, herding effect, and investment decision play a stronger role in receiving information.

In addition to calculating static spillover indices, time-varying spillover indices are calculated and shown in Figure 3. For appropriate and practical assessments, Figure 4 is used to describe the developments of the Vietnamese stock market during the research period.



Source: Author

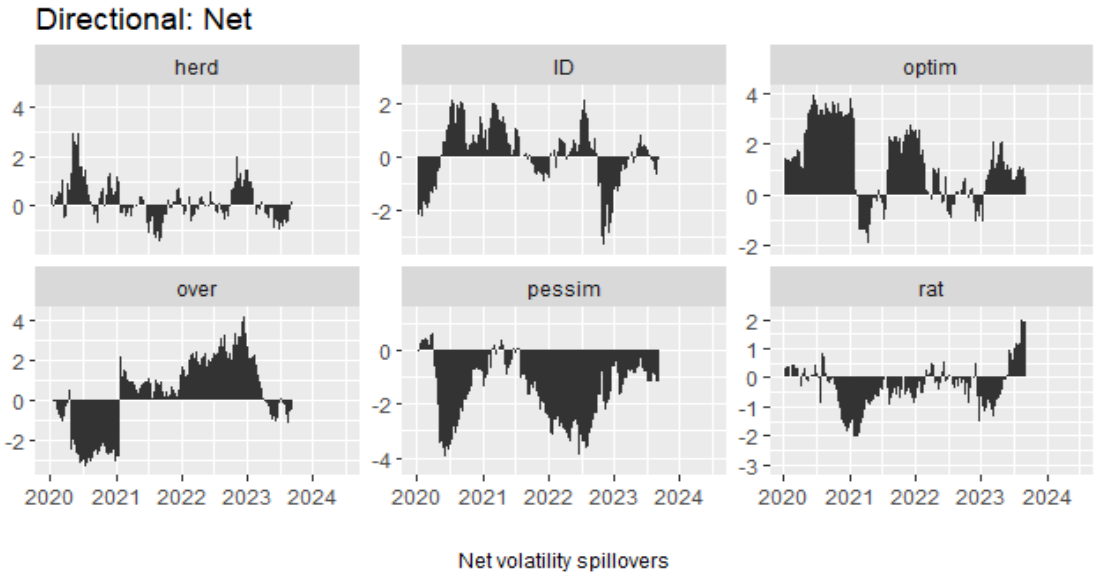
Figure 3: The total volatility spillover

Source: Vietstock.vn

Figure 4: Price and trading volume of VN30 index from 2020 to 2024

It can be seen that the total spillover index of the variables in the model has a clear change in different market periods. The spillover index will increase sharply in periods of strong market fluctuations, which means that the more volatile the market is, the more dependent the psychological and behavioral factors as well as the decisions of investors are on each other. This can be clearly seen on the chart, in the period from the beginning of 2020 to mid-2021, the Vietnamese stock market experienced a period of rapid and continuous growth, the spillover index during this period was very high, averaging about 37-38%, even at times over 40%. However, in the period of sideways market with little fluctuation from mid-2021 to the end of the first quarter of 2022, the spillover index decreased sharply. After that, when the market became more volatile from the second quarter of 2022 until now, the spillover index also increased again. However, the market volatility in this period was weaker than the previous period, so the spillover index was also lower, averaging at 34-35%.

To examine the role of variables in the model as information receivers or transmitters at different stages, the net spillover index of each variable over time is calculated as shown in Figure 5.



Source: Author

Figure 5: Net spillover index chart of variables

Figure 5 shows that pessimism and rationality of investors mainly receive information during the research period of the thesis, shown through the net spillover index of these two factors lying below the horizontal axis (with negative value), in which pessimism is the factor that receives strong information from other factors. On the contrary, optimism in most of the research period plays the role of transmitting information when the net spillover index lies above the horizontal axis (with positive value), especially the level of information transmission increases during the period of rapid market growth. On the other hand, overconfidence is the factor that receives information during the period of rapid market growth but becomes a strong factor of transmitting information in the remaining periods of the market. The remaining two variables, herd effect and investment decision, sometimes play the role of

transmitting information, sometimes play the role of receiving information when the net spillover index has alternating positive and negative values.

4.3. Wavelet analysis

Wavelet Coherence Transform is applied to explore the co-oscillation phenomenon for each pair of variables in turn in the same time and frequency domains, the results are shown in Figure 6.

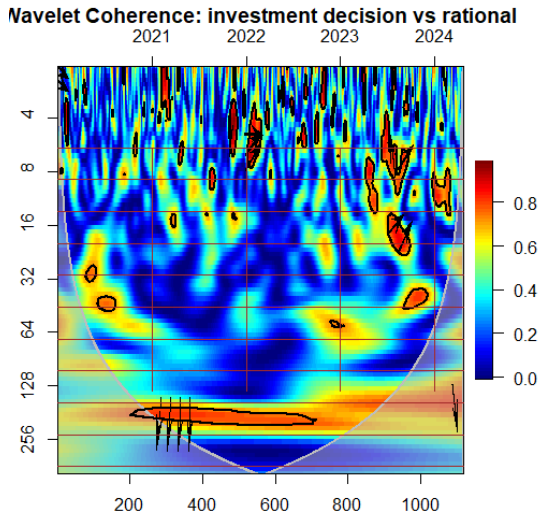


Figure 6.a

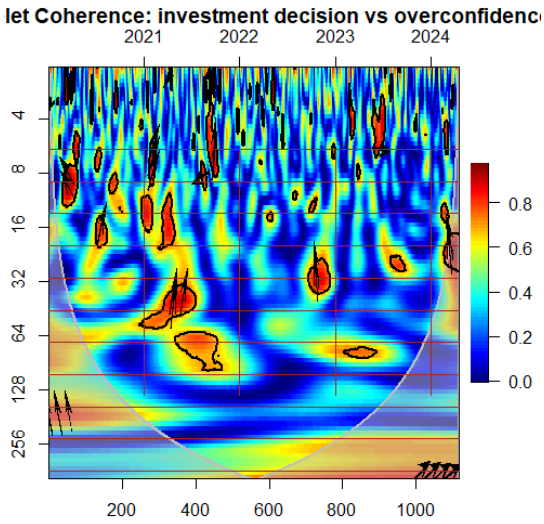


Figure 6.b

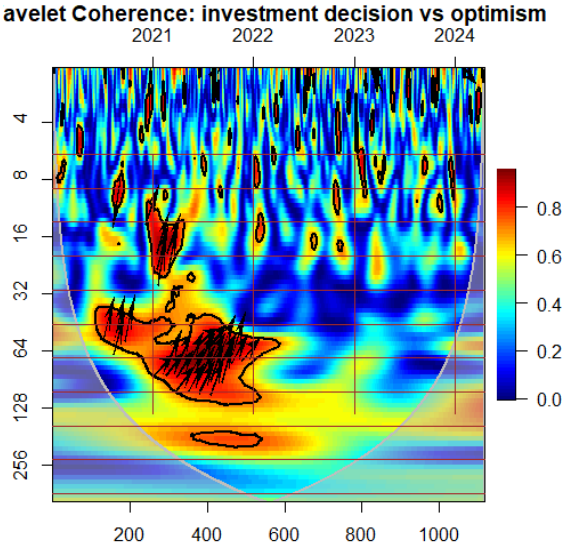


Figure 6.c

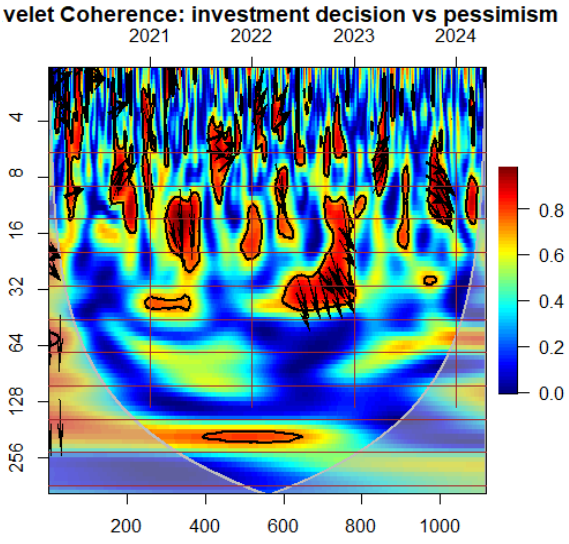


Figure 6.d

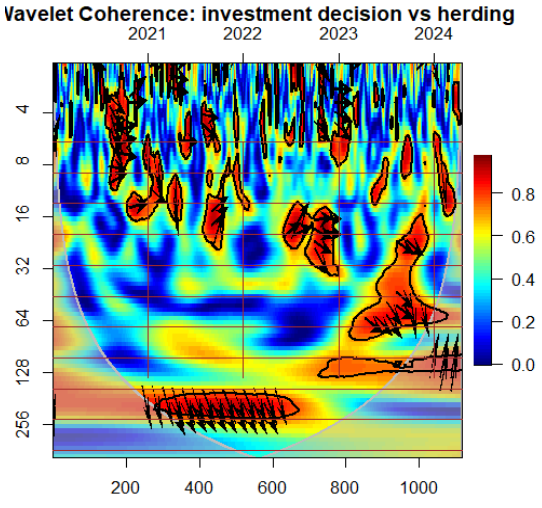


Figure 6.e

Source: Author

Figure 6: Wavelet Coherence between investor decisions and behavioral psychology factors

In general, investors' rationality has little influence on their trading decisions, as shown by the fact that there are few areas of strong correlation in Figure 6.a. This can be explained by the fact that the more rational investors are, the more their trading volume will be determined by the macro information they receive from the market. Depending on the signals from that macro information, investors will make trading decisions and trading volume. However, in periods of strong market fluctuations, investment decisions and rationality have a strong correlation in the long term. The arrow pointing down to the left shows that investors' trading decisions are likely to affect their rationality. The more investors trade or the larger the volume, the less rational they may become over time.

Figure 6.b shows that Vietnamese investors are less affected by overconfidence, which may come from the fact that most investors in this period are new entering investors and the proportion of young investors is quite high, so they do not feel too confident when trading in the market. The strong correlation zone appears more in the lower frequency zones, indicating that overconfidence and its impact on investment decisions only appear in the long term when investors have had a lot of time to invest in the stock market. During the period of rapid market growth, overconfidence is strongly correlated with investor decisions, however, this correlation is less present in other periods of the market. The arrow pointing up to the right shows that during the period of rapid market growth, the more investors trade, the more confident they feel in both the short and medium term.

Figure 6.c shows that during a bull market, there is a strong correlation between investment decisions and optimism, especially in the medium and long term. Optimism is formed, maintained and strengthened when the market has to maintain growth for a long period of time, and when optimism is strengthened, it will create a correlation with investor decisions. The arrow pointing up to the right shows that during a long and fast bull market, the more investors trade or the larger the volume over a longer period of time, the more optimistic they feel.

Figure 6.d shows that pessimism affects investment decisions in all market phases, including growth, decline, or sideways. Moreover, this correlation appears mainly in the short term, indicating that investors are easily influenced by pessimism. The graph shows many arrows pointing up to the right and down to the right, showing that the correlation between investment decisions and pessimism is bidirectional and positive. In the stages after the market has grown well, the sideways stage at the top or the adjusting stage after hitting a bottom, the more investors trade, the more pessimistic they feel. On the other hand, in the stage when the market is growing rapidly or declining rapidly, the more pessimistic investors will trade more. This result is similar to the research of Dhaoui & Khraief (2014), Barberis (2018), Rashid et al. (2021) (Barberis, 2018; Dhaoui & Khraief, 2014; Rashid et al., 2021)

Figure 6.e shows that Vietnamese investors are greatly affected by the herding effect. Since the Vietnamese stock market began a period of significant changes, the herding effect has also begun to appear and has affected investment decisions more clearly. The herding effect will increase over the length of time that the market grows, the longer the time, the stronger the herding effect. Not only that, the herding effect is also very strong in a sharp bear market because investors are overwhelmed by confusion and the best choice they can think of is to act according to the crowd. During the stable market period, the correlation between investment decisions and the herding effect mainly appears in the long term. This result is similar to the study of Hwang and Salmon (2004), Kyriazis, NA (2020), Yuzhu Xia, Ghulam Rasool Madni (2024) (Hwang & Salmon, 2004; Kyriazis, 2020; Xia & Madni, 2024).

5. CONCLUSION

The study investigates the impact of five behavioral factors on investor decision-making in the Vietnamese stock market, including rationality, overconfidence, optimism, pessimism and herding effect in the period after the Covid-19 pandemic, specifically from January 1, 2020 to June 30, 2024. This impact is assessed through two approaches: the spillover index method and the Wavelet transform method. Through the analysis of the total spillover index, it shows a high level of connection and mutual influence between behavioral psychological factors and investor decisions in the stock market. In particular, investor decisions are strongly influenced by pessimism and herding effect, conversely, investor decisions also strongly influence the formation of pessimism as well as herding effect. In addition, optimism and overconfidence play a stronger role in transmitting information, while rationality, pessimism, herding effect, and investment decisions play a stronger role in receiving information. It is worth noting that the more volatile the market is, the more interdependent the behavioral factors and investor decisions are.

Wavelet analysis results show that rationality and overconfidence have little impact on Vietnamese investors' decisions, while pessimism and herding effect have a strong and frequent impact on investors' decisions. Optimism only has a net impact on investment decisions during periods of rapid bull market and has no significant impact on other market states. More specifically, during periods of strong market volatility, the more investors trade or the larger the volume, the less rational they may become over time, and at the same time, they will become more confident in both the short and medium term, and not only that, they will feel more optimistic. In contrast, pessimism and herding effect affect investment decisions in all stages of the market, including growth, decline and sideways periods. In some periods, the more investors trade, the more pessimistic they become, but in other periods, the more pessimistic investors trade, and in others, the more pessimistic investors trade. On the other hand, the herding effect increases with the length of time the market has been growing, the longer the time the stronger the herding effect, and the herd effect also appears strongly in a sharp bear market.

The research results provide deeper insights into the complex developments of investors' behavioral factors as well as how they affect investment decisions in different market stages. From there, it can be seen that, in order to survive and invest long-term

in the stock market, investors must understand and apply the laws of behavioral psychology's impact on their decisions, thereby being able to build investment strategies and reasonable and effective disciplinary principles to seek profits in the market.

FUNDING
This research is funded by University of Finance - Marketing, Vietnam. The article will also be funded by the University of Finance - Marketing.

CONFLICTS OF INTEREST
The authors declare that there are no conflicts of interest related to the publication of this research.

AUTHOR CONTRIBUTIONS
Both authors contributed collaboratively to this research. Phan Ngoc Yen Xuan conceptualized the study, designed the framework, and handled data collection and analysis. Nguyen Thi Thanh Binh focused on methodology, literature review, and manuscript revisions. Both participated in drafting, interpreting results, and approving the final version for submission.

TRANSPARENCY
The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

ETHICAL STATEMENTS
This study uses publicly available financial market data, involving no human participants, personal data, or confidential information; hence, ethical approval was not required. The research complies with ethical standards in academic publishing and financial studies.

FEATURED APPLICATION
This study highlights how investor psychology impacts trading volume in Vietnam's stock market. It offers practical insights for investors, analysts, and policymakers to refine trading strategies, integrate sentiment-based indicators, and develop policies to mitigate sentiment-driven market instability.

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