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What Influenced Stock Investment Decision During the COVID-19 Pandemic? Environment, Expectations, and Biases: A Systematic Review

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Abstract

Diverse decisions and behavior of investors in stock markets under unforeseeable situations of the COVID-19 pandemic were influenced by environmental and psychological factors. This study aimed to identify the factors affecting individual investor decisions through a systematic review with a narrative synthesis. Scopus and ScienceDirect were academic databases used as sources of searched studies. The five included studies were correlational studies conducted through archival and survey data, and had a variety of study objectives. The risk of bias in the included studies assessment was presented through traffic light and summary plots. The analysis revealed that the COVID-19 cases, time spent on stock markets, expectations, and investor biases were the factors collaborating in influencing stock investment decisions in the ambiguous situations. The findings were interpretable that the four key factors had a role in perceiving, evaluating, and judging choices of stock investment. Implications of the findings will be shared with appropriate investment authorities in Thailand so as to reduce a degree of stock market volatility through issuing guidelines on investing in stocks under uncertainties and to researchers having the purpose of conducting the future study regarding investor decisions under the post-COVID-19 circumstances.

Keywords: equity market, decision-making, investment behavior, coronavirus, narrative synthesis
JEL Classifications: G4, G41

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1. Introduction

The outbreak of the COVID-19 caused serious loss of life (World Health Organization, 2023) as it had never been detected previously (Baylor College of Medicine, 2023) and effective vaccines against the COVID-19 had not been available. The breakthrough in vaccine development was announced on the 9th of November 2020 (Gallagher, 2020), and the vaccine was officially approved on the 23rd of August 2021 (U.S. Food and Drug Administration, 2021). In order to restrict the severity of the outbreak, social and physical distancing, forcing people, including investors in stock markets, to stay at their places, were used as non-pharmaceutical interventions (World Health Organization Regional Office for the Western Pacific, 2022). Due to these impacts of the pandemic, the investors decided to invest differently. A group of investors optimistically interpreted the impact of these measures as their opportunity to build their wealth through trading stocks so that they actively invested in stocks (Chiah et al., 2022; Priem, 2021). However, another group of the investors pessimistically interpreted the measures as a cause of economic loss due to a part of business closures; accordingly, they were likely to hesitate to invest in stock markets (Deng et al., 2022; Ftiti et al., 2021; Hunjra et al., 2021).

To observe investor decisions on stock trading, stock market performances, returns and volatility were employed as proxies for the decisions (Aggarwal et al., 2021; Chundakkadan & Nedumparambil, 2022; Gurbaxani & Gupte, 2021). Nevertheless, stock market returns and volatility were not consequences of not only investor decisions but also of artificial intelligence (AI). As facts and figures of the COVID-19 pandemic were not abundant, the investors could not predict the outcomes of their investment options so that they used artificial intelligence in order to solve their investment problems (Almehmadi, 2021; Sharma et al., 2020) in lieu of their reasoning. In unpredictable circumstances, investors decided to invest in stocks with diverse styles, including decreasing, increasing, temporary increasing, and shorter-term investments; consequently, numerous factors of these decisions were examined through economic and finance studies employing an infinite diversity of stock market indices around the world. Those factors were confirmed to have effects on stock market indices; however, which factors were in fact influential to investor decisions and behavior?

This study, therefore, aimed to identify factors affecting the decision-making process of stock investment behavior during the COVID-19 pandemic. The pandemic was impacting investors in many countries; also, the accessibility of these investors was unachievable. In place of an in-person survey, a systematic review is considered to be a method of examining a large number of studies conducted in those countries. Additionally, the systematic review is scientifically organized (Petticrew & Roberts, 2006, pp. 5) and so that it could produce accurate results, which achieved this study objective. Thus, the systematic review was designed for examining academic studies regarding the decisions and behavior of investors in stock markets under the pandemic circumstances. Since investor decisions were stimulated through their present surroundings and current state of mind, the identified factors were categorized into environmental and psychological ones. In regard to this study, the environmental factors were the things that investors perceived during the pandemic. These environmental factors collaborated with the psychological factors – covert actions of the cognitive process – to generate investor decisions and behavior.

This study was organized as follows: First, decisions and behavior were clarified in Section 2. The process of the systematic review was outlined in Section 3, and thus,

the results of the review were described in Section 4. After that, the results were discussed in Section 5 in terms of interpretation, limitations, implications, and contributions. Finally, the conclusion of this study was drawn in Section 6.

2. Decisions and Behavior

Bradley (2016) developed decision theory and stated that decisions, in general, were made according to particular conditions affecting decision-makers and their cognition. According to the academic work of Bradley (2016), the conditions contained some degree of uncertainties, which were dependent upon the quantity and quality of information that the decision-makers received; and thus, an environment having inadequacy of information was defined as a "severe uncertainty" or "ambiguity." Bradley (2016), moreover, explained that the decision-maker environment was a set of data which they perceived differently and afterwards, variously evaluated the consequences of available options. So as to judge which option to be exercised, Bradley (2016) determined that the decision-makers relied on "subjective expected utility" (formed by their personal belief) under uncertain environment that the decision-makers did not exactly acknowledge consequences of their options because of limitations of received information, time, and computational ability; nonetheless, decision-makers relied on "pragmatic dogmatism" (formed by their strong belief in their real world, or by aggregating personal and social opinion) under ambiguous environment that the decision-makers encountered unfamiliarity so that they could not evaluate possibilities of the consequences. In brief, decisions depended upon features of the decision-maker environment and their aspects of perception, evaluation, and judgement. This part of the decision theory harmonized with the field theory of Kurt Lewin. The field theory was summarized that human behavior was a result of their current interdependence of environment and psychological state (Burnes & Cooke, 2013; Pratkanis & Turner', 2021). The environment was defined as "external stimuli" that humans could perceive, and it had a role in influencing humans to adapt their minds to their existing environment, such as home or working environment (Burnes & Cooke, 2012).

3. Methods of the Review

The method of systematic review in this study was organized mainly according to the method section of PRISMA 2020 item checklist because PRISMA 2020 was the recently developed guidance on reporting systematic reviews; also, it was allowed to apply to appraise social interventions (Page et al., 2021). This guidance, moreover, had the quality of transparency, completion, and accuracy, as it exhibited a complete and straightforward procedure of reporting the review that gave rise to accurate results (Page et al., 2021).

3.1 Eligibility

The interest of this study was the factors influencing decisions and behavior of investors during the COVID-19 outbreak. The included studies should be absolutely related to actions of investors in stock markets in the context of the COVID-19 pandemic. These studies must contain a factor of economics and finance, psychology, anthropology, or sociology. While the excluded studies were conducted through stock market indices as returns, volatility, and liquidity. Their titles and abstracts were screened through the facts that: a) they did not have potential factors; b) they did not concentrate only on stock markets; c) they did not have attention to whole stock markets but just a sector in the

markets; d) they studied in other financial markets; e) they had interest in macroeconomics; f) they had interest in business management; g) they were not related to any types of investment; and h) their full articles were inaccessible.

3.2 Information sources

As an increasing number of related studies was a matter of concern (Petticrew & Roberts, 2006, p.7-8), this study relied only on a couple of accessible academic databases, namely Scopus and ScienceDirect. These databases contained an abundance of prime studies in a wide range of subject areas (Burnham, 2006; Harnegie, 2013), and thus, they were supportive of the eligibility for the included studies.

3.3 Search strategy

Since the systematic literature review is a research method used to identify, appraise, and synthesize the bulk of retrieved studies. Shah et al. (2021) applied this method to find and document behavioral finance impacting financial decision-making by widely defining search terms and recording all frequencies of each set of search terms. Nevertheless, this research employed the review with search term modification and empirical probability.

According to the study objective, the keywords of searching were 'decision-making process,' 'stock investment behaviour' and 'COVID-19 pandemic.' These keywords could be modified to be minor forms, such as decision-making, decision, stock investment, and COVID-19, as well as resemble forms such as stock market and coronavirus. Referencing the advanced search tips of Scopus and ScienceDirect, both databases had similar Boolean operators. Thus, the AND operator was employed to connect the search terms; however, the means of finding specific search terms were dissimilar. Scopus had braces ({}) that function word specification while ScienceDirect has quotation masks ("") doing so. In order to settle the same sets of search terms and reduce some errors, the hyphen (-) in the middle of the words decision and making was removed. Hence, the search term 'decision making' was used instead of 'decision-making.' As a result, sets of search strings were generated to be 27 sets for each database. So as to select the most practicable sets of the strings, relative frequency or empirical probability (Salvatore & Reagle, 2011) of the relevance was computed by the fraction of the number of relevant studies.

The search began by visiting the database and going to 'Advanced Search.' The sets of search terms were filled after that time span; language and document types were identified as 2020-2022, English, and article (research article), respectively. Finding the studies as per the search terms, the reached studies were screened through relevant subject areas, namely economics, econometrics and finance, psychology, and social sciences. The sets of search terms, having the highest empirical probabilities, of Scopus and ScienceDirect were {decision making} AND {stock investment} AND coronavirus; and decision AND "stock market" AND "covid-19 pandemic," respectively.

3.4 Selection process

Applying the selected sets of search terms, the sum of total searches was 940. After scoping by the subject areas, the number of studies waiting for screening by the exclusion criteria was 651. There were 611 excluded studies at the screening stage. After that, independent and dependent variables of the 40 retrieved studies were tabulated in order to distinguish between real behavior of investors and stock index performances. There were 7 eligible studies; however, two of them were not suitable for this research objective. The reasons were that Huber et al. (2021) experimented on finance professionals and students, not investors; in addition, Priem (2021) confirmed differences

in trading activities between before and during the COVID-19 pandemic, in which age and gender also had a role in making those differences. Therefore, the remains of the retrieved studies were 5 included studies. Also, the full flow of selecting the included studies was shown in Figure1.

3.5 Data collection process

The data of the included studies were collected manually. In order to address the reliability of this process, the use of several reviewers was required, and thus a number of the reviewers was suggested to be two or three (Petticrew & Roberts, 2006, pp. 155; Tawfik et al., 2019). Nonetheless, the number of the reviewers was determined to be three because one reviewer could be a moderator in the case that another two reviewers had disagreements. Accordingly, three reviewers had a group discussion on data extraction, and then the reviewers worked independently. After extracting the data individually, three sets of extractions were compared.

3.6 Data items

The extracted data was tabulated study by study, as shown in Table 1, and then examined differences in their research designs, including data collection, data analysis, and studied variables.

The studies excluded through their titles were classified as studies having interest in a) general effects of the pandemic; b) studied effects on not only stock markets but also commodity and cryptocurrency markets; c) agricultural, banking, biopharmaceutical, energy, real estate, service, tourism, and transportation sectors; d) bonds, commodities, currency, cryptocurrency, and derivatives markets; e) consumption and government economic policies; f) firm performance, business operation, and supply chain; and g) other topics except investment.

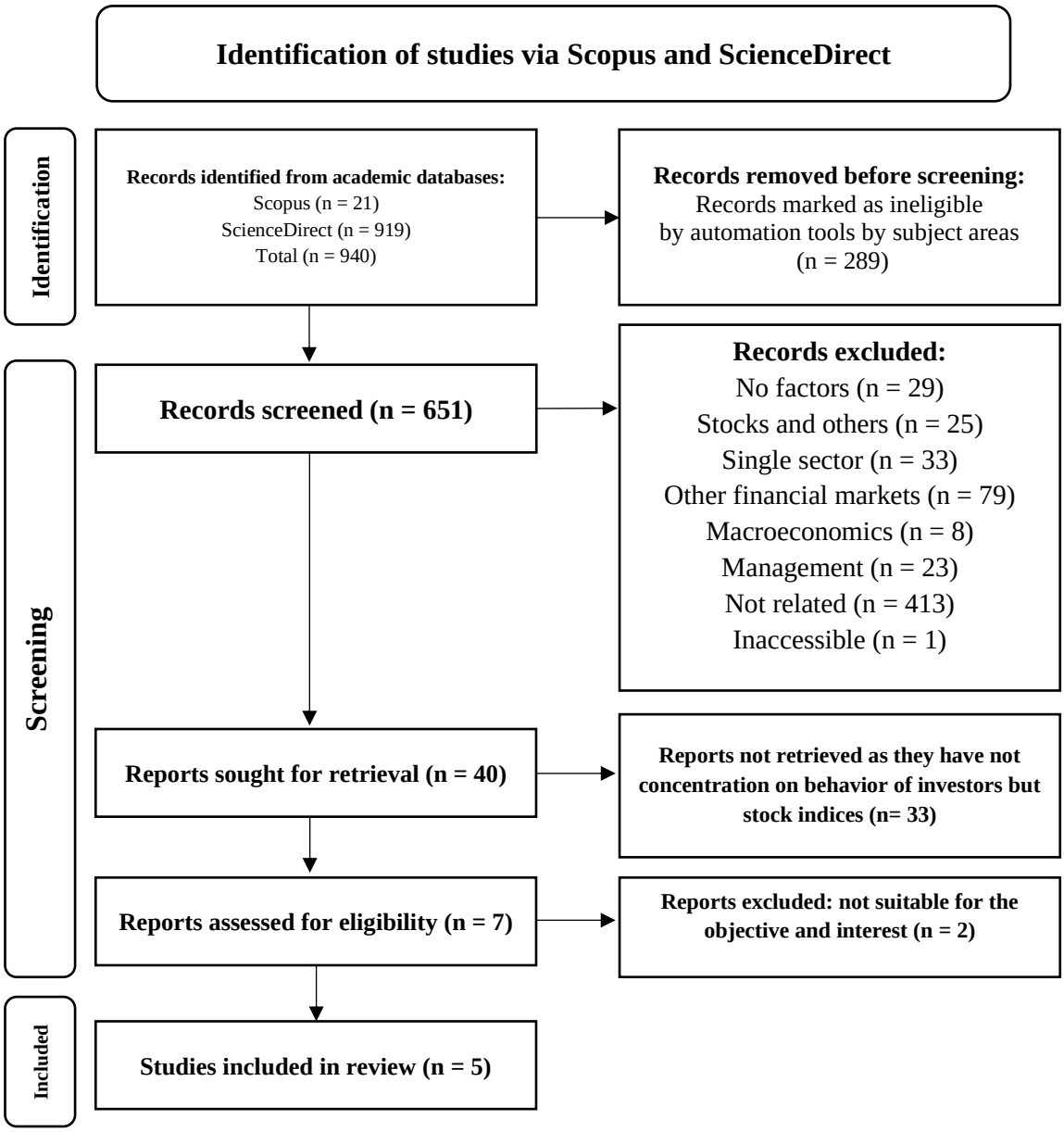
3.7 Synthesis methods

Having a variety of study objectives, narrative synthesis was applied in this study. The narrative synthesis is a synthesizing method using written words of the included studies to finalize a conclusion (Popay et al., 2006, pp. 5). This synthesis comprises organization of literatures, within literature analysis, and cross literature synthesis (Petticrew & Roberts, 2006, pp. 170-181). The included studies were organized, analyzed, and synthesized as the following sub-sections, thus.

3.7.1) Organization of studies

Concentrating on the factors influencing stock investment decision, the included studies were categorized through their types of independent variables. Environmental factors included impact of the COVID-19 (Himanshu et al., 2020; Sha et al.,2022) and perceived impact of the COVD-19 (Kathpal et al., 2021). Psychological factors included expectations of pandemic risk (Abdeldayem & Aldulaimi, 2020) and behavioral biases (Talwar et al., 2021).

Figure1: Flow of Included Studies for Systematic Review (PRISMA 2020).



Source: Authors' Compilation

Table1: Descriptive Table of the Included Study Research Context, Design, and Results.

Authors	Year	Research context			Research design				Research results	
		The COVID-19 situations		Research population	Sampling technique/ Duration	Number of samples	Research instrument	Data analysis	Independent variable	Dependent variable
		Real-life	Stock markets							
Sha et al.	2022	Changes in commuting, a great number of news and discussion, and overwhelming panic	Intensified stock market volatilities	Chinese individual investors living in different cities having different infection rate (the number of infected cases per day)	Archival data/ from January to December 2020	29,687	2020 China individual investor behavior database including age, gender, marital status, education level, occupation, financial knowledge, investment year, and wealth level.	Regression	The COVID-19 cases and time spent on stock market	Diversifications of stock investment
Abdeldayem & Aldulaimi	2020	A serious increasing rate of infection but no restrictions relieving monetary impact	Capital outflow and stock market crashes	Investors living in 5 GCC countries (Bahrain, Saudi Arabia, UAE, Kuwait, Oman)	Convenience sampling/ from January to March 2020	318	An online questionnaire survey consisting of 14 items to assess the two subscales (6 items to measure expectations of pandemic risk and 8 items to measure herding behavior)	Structural Equation Model	Expectations of pandemic risk	Herd investment behavior
Himanshu et al.	2020	Lockdowns, adverse impacts on economic activities, and changes in lifestyle	High uncertainties	Indian investors residing in Delhi and Mumbai	Snowball sampling/ from May to July 2020	184	Questionnaire asking to compare preference for investment avenues before COVID-19 and during COVID-19	Analytic Hierarchy Process (AHP)	Disposition effect, snake-bite effect, and status quo bias	Decisions on portfolio holding

Authors	Year	Research context			Research design				Research results	
		The COVID-19 situations		Research population	Sampling technique/ Duration	Number of samples	Research instrument	Data analysis	Independent variable	Dependent variable
		Real-life	Stock markets							
Kathpal et al.	2021	Collapse of business and investment activities	High uncertainties	Indian retail investor residing in Delhi region and invest in Bombay Stock Exchange	Convenience sampling by phone and personal visits/ from June to November 2020	290	A self-administered questionnaire containing demography, Covid-19 perception, and heuristic biases (five-point Likert scale)	Structural Equation Model	Anchoring, availability, and representativeness	Errors in investment judgement
Talwar et al.	2021	Lockdowns, closure of commercial activities, but delayed economic supportive plans	Stock market crashes	Male Finnish investors being born between 1981 and 1996	Convenience sampling by sharing the survey link on What's app and Facebook / in May 2020	351	Online questionnaire surveying heuristic biases, self-deception biases, and social interaction	Artificial Neural Network (ANN) analysis	Anchoring, herding, hindsight, overconfidence and self-attribution, and representativeness	Trading activities during the pandemic

Source: Authors' Compilation

3.7.2) Within literature analysis

Examining the details of the included studies, they were fully reviewed. It was found that Himanshu et al. (2020) detected biases of investors which directly affected their decisions. Moreover, Kathpal et al. (2021) suggested that investors actually made false decisions due to heuristic biases. Therefore, the actual factors having effects on decisions and behavior of investors were the biases which were psychological factors. As a result, the environmental factor was only the impact of the COVID-19 (Sha et al.,2022); also, the psychological factors were the expectations of pandemic risk (Abdeldayem & Aldulaimi, 2020) and various types of biases (Himanshu et al., 2020; Kathpal et al., 2021; Talwar et al., 2021).

3.7.3) Cross-literature synthesis

Observing heterogeneity; the included studies were extracted and tabulated as research context, research design, and research results (Petticrew and Roberts, 2006, p. 215-216). The context could be divided into situations and populations (Denyer & Tranfield, 2009) – the COVID-19 situations and research populations. The design was separated into sample technique, number of samples, research instrument, and data analysis. The results were categorized into independent and dependent variables. The details of each section were shown in table1.

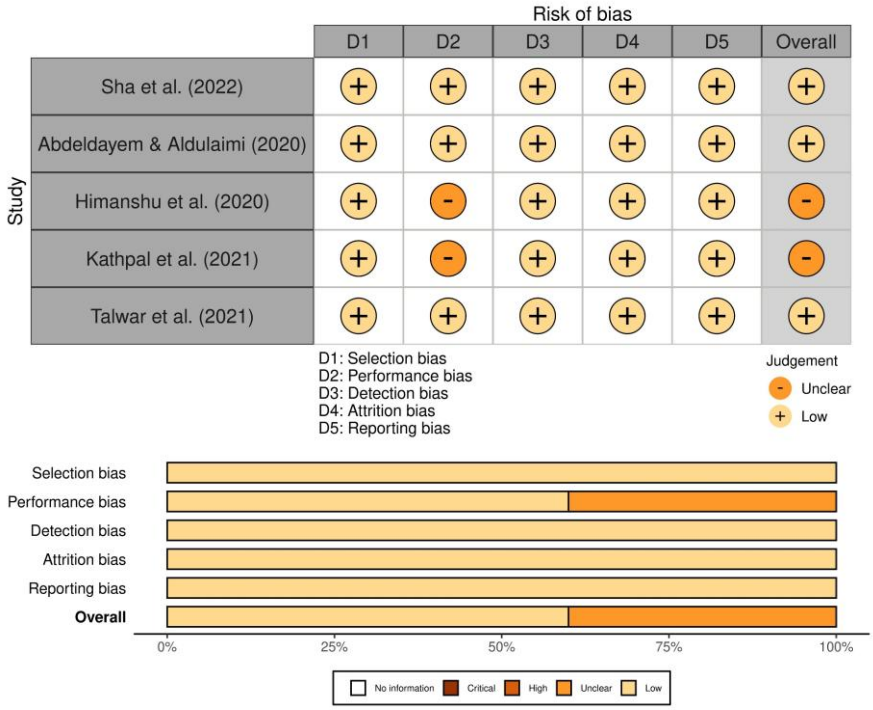
3.8 Reporting risk of bias assessment

The risk of bias assessment of this study originated from Cochrane risk of bias tool (RoB 2); which has five domains of bias including selection bias, performance bias, detection bias, attrition bias, and reporting bias (Higgins et al., 2022; Higgins & Green, 2011). The RoB 2 criteria of the domains are relevant to experimental studies, however, the included studies are nonexperimental ones – no manipulation of an independent variable and no randomizing participants to an assignment (Price et al., 2015, Chapter 7). To specify, the included studies are correlational studies – collecting data from respondents being in a study context and through a self-report questionnaire (Price et al., 2015, Chapter 7). Hence, the criteria of the domains of bias were adjusted. Moreover, the overall risk of bias judgment was in accordance with Higgins et al. (2022) criteria of overall risk of bias.

The included studies were judged to have low risk of bias in the case that 1) the respondents in the interested setting were selected by chance; 2) the respondents were unaware of the aim of the questionnaire; 3) the questionnaire was the proper measurement of studied variables; 4) the number of incomplete responses was not influential in reducing the quality of a statistical analysis; and 5) the results were reported depending upon the statistical analysis. In addition, the included studies were judged to be unclear because there were no details or insufficient details of a domain of bias. The studies having low risk of bias were interpreted that the bias was improbable to affect the alteration of the study results; and the studies having no clarity of a domain of bias were interpreted that there was a fair distortion of the study results (Higgins et al., 2011).

The risk of bias was reported through a traffic light plot and a summary plot shown in Figure 2. The plots were created via a generic assessment tool in robvis, which was an online application designed for visualizing risk of bias assessment (McGuinness & Higgins, 2020). The plots demonstrated that there were three included studies having low risk of bias, and two included studies having performance bias because the details of closing the purpose of the questionnaire while collecting the data were not found in the published articles.

Figure 2: Risk of Bias Traffic Light and Summary Plots



Source: Authors' Compilation

4. Narrative Synthesis Results

The results of the narrative synthesis were the summary of the dependent variables as shown in Table 1. The dependent variables were indicated to be identified factors having effects on stock investment decisions and behavior during the COVID-19 pandemic. The identified factors were examined under different research populations and methodologies. Additionally, the methodologies were considered to have unequal qualities as shown in Figure 2. Therefore, this section exhibited heterogeneity of the study contexts and designs which led to heterogeneity of the identified factors, the quality of the identified factors, and the effects of the identified factors.

4.1 Heterogeneity in the included studies

According to Table 1, there were differences in the included studies; this section presented heterogeneity of study context, designs, and identified factors.

4.1.1) Heterogeneity of study context

Every included study was conducted in the most ambiguous period of the pandemic, as there were no COVID-19 vaccinations, so investors were encountering unfamiliarity with life and uncertainties in stock markets. However, research populations of the included studies were investors residing in single countries – India, Finland, and China (where the investors faced the first outbreak) – and those residing in the grouped countries – Gulf Cooperation Council countries.

4.1.2) Heterogeneity of study designs

All the included studies were correlational studies. The studies were categorized into one archival study and four survey studies. The archival data was recorded from January to December 2020 and analyzed via ordinary least square regression (Sha et al., 2022). The four sets of survey data were collected through questionnaires from January to November 2020; furthermore, half of the studies were analyzed via structural equation model (SEM) (Abdeldayem & Aldulaimi, 2020; Talwar et al., 2021), and another half of them were analyzed via artificial neural networks (ANN) (Kathpal et al., 2021) as well as analytic hierarchy process (AHP) (Himanshu et al., 2020).

4.1.3) Heterogeneity of identified factors

The Covid-19 cases, time spent on stock markets (Sha et al., 2022), expectations of pandemic risk (Abdeldayem & Aldulaimi, 2020), and behavioral biases – anchoring, herding, hindsight, overconfidence and self-attribution, and representativeness (Talwar et al., 2021) – were statistically proved to be independent variables having influence on decisions and behavior of investors. Dissimilarly, the disposition effect, snake-bite effect, and status quo were not explicitly examined by statistical models; they were still indicated to be the reasons for investment decisions (Himanshu et al., 2020). Also, heuristic biases – anchoring, availability, and representativeness – were confirmed to be dependent variables affected by the impacts of COVID-19 which investors perceived, and thus, these biases in essence were suggested to be a cause of suboptimal investment decisions (Kathpal et al., 2021). At this stage, the identified factors affecting investor decisions during the COVID-19 outbreak were the COVID-19 cases, time spent on stock markets, expectations of pandemic risk, and nine types of investor biases. These factors were categorized by their types and arranged by their frequencies in Table 2.

The most recognizable psychological factors were heuristics, namely anchoring and representativeness. Moreover, the factor variation of the identified factors approximated 0.32. Although the dispersion of overall factors was not remarkable, the psychological factors were scattered about biases of the investors.

Table2: Descriptive Statistics of the Identified Factors.

Items	Factors	Frequencies
Environmental		
1	The COVID-19 cases	1
2	Time spent on stock markets	1
Psychological		
1	Anchoring	2
2	Representativeness	2
3	Herding	1
4	Hindsight	1
5	Overconfidence and self-attribution	1
6	Availability	1
7	Disposition effect	1
8	Snake-bite effect	1
9	Status quo bias	1
10	Expectations of pandemic risk	1
Total frequency		14
Mean		1.17
Standard deviation		0.37
Coefficient of variation		0.32

Source: Authors' Calculation

4.2 The quality of the identified factors

After assessing methodological quality (risk of bias) as shown in Figure 2, the included studies were categorized into low and unclear risk of bias ones. The studies of Abdeldayem & Aldulaimi (2020), Sha et al. (2022), and Talwar et al. (2021) were considered to have low risk of bias, therefore; the Covid-19 cases, time spent on stock markets, expectations of pandemic risk, anchoring, herding, hindsight, overconfidence and self-attribution, and representativeness had strong tendencies to affect decisions and behavior of investors in stock markets. Moreover, the studies of Himanshu et al. (2020), and Kathpal et al. (2021) were considered to have unclear risk of bias; as a result, availability bias, disposition effect, snake-bite effect, and status quo bias were possibly likely to affect the investor decisions and behavior. To summarize, the environmental and psychological factors tending to be influential were the COVID-19 cases, time spent on stock markets, expectations of pandemic risk, as well as five types of investor biases, namely anchoring, representativeness, herding, hindsight, and overconfidence and self-attribution.

4.3 Effects of the identified factors

During the COVID-19 pandemic, there was a wide diversity of investment styles, such as diversification, allocation, and trading stocks with fallacious reasoning, which were from the result of the environmental and psychological factors.

4.3.1) Effects of environmental factors

The COVID-19 cases and time spent on stock markets were reported by Sha et al. (2022) that the number of the cases was perceived as a risky signal of investment losses, and the time was perceived as a chance to gain more investment knowledge and advice by interacting with persons in the financial industry; as a result, investors were opportune to diversify their portfolios in order to mitigate investment risks during the health crisis. Moreover, Sha et al. (2022) proved that the strength of the number of cases depended upon the demographics of investors, namely age, investable asset, and work stability.

4.3.2) Effects of psychological factors

The psychological factors activated by the perceived information in each investor environment were encouraging investors to anticipate their investment options and to reason which option they ought to perform.

Effects of expectations of pandemic risk. The expectations of pandemic risk were reported by Abdeldayem & Aldulaimi (2020) that the expectations stimulated investors to have investment constructs about the COVID-19 contagion, future returns of companies listed in stock markets, and possible investment losses, and thus, these equivocal thoughts about the future shattered the confidence of investors so that their investment decisions were likely to be impacted by decisions and actions of other investors in stock markets.

Effects of biases of investors in stock markets. Investor biases were reported by Talwar et al. (2021) that the biases were the reasons why investors decided and behaved dissimilarly. Talwar et al. (2021) explained that a part of investors decided to adjust their stock holdings through imitating trading activities of other investors because of herding bias; another part of investors decided to increase their investment due to their belief in a sense of predictability, their past success, and their past experience in stock market recovery – these were so-called hindsight, overconfidence and self-attribution, and representativeness biases, respectively; however, some of the investors did nothing with their portfolios because they adhered to the past historical data – this was so-called anchoring bias.

5. Discussion

This section contained the interpretation, limitations, implications, and contributions of this study's results in the following subsections.

5.1 Interpretation

Similarly, the results were to the decision theory developed by Bradley (Bradley, 2016, pp. xiii), and to field theory (Rosca, 2020). Factors affecting investment decisions of investors in stock markets were both an existing environment and current psychological factors.

Environment

The environment for investing in stock markets over a span of the COVID-19 pandemic was illustrated with the COVID-19 cases and an extra time spent on stock markets. This environment was a conflicting condition because the COVID-19 cases were perceived as the severity of the pandemic, but the extra time was perceived as the opportunity of protecting or even accumulating wealth. This accounted for hesitation in making stock investment decisions – whether or not investors should continue or discontinue investing.

Expectations

The investors had the responsibility to evaluate their available options by anticipating forthcoming consequences of the options based on the pandemic risk. This psychological state was named expectations of the pandemic risk, with which the pandemic risk could be the degree of the severity of the pandemic and the volatility of stock returns in the future.

Biases

Biases were tendencies (American Psychological Association, 2022) which investors judged the options in accordance with their belief (Kelly, 2022, pp. 171-172). Investors, essentially, believed in financial analyses, others, and themselves.

Having belief in financial analyses – fundamental, technical, and quantitative analyses. Investors tended to have representativeness and anchoring biases. Investors believing in the fundamental analysis (the analysis applying macroeconomics and microeconomics such as firm performances during the Spanish flu in 1918 and 1919) seemed to have representativeness bias because they were likely to judge the options owing to familiar economic events in the past (Pompian, 2021, pp. 55-56). In contrast, investors believing in the technical analysis (the analysis applying historical data as closed, high, and low prices of stocks to compute stock indicators such as moving average and stochastics) and those who believed in the quantitative analysis (the analysis applying historical data as log returns of stock prices to compute statistical figures such as volatility, skewness, and kurtosis) seemed to have anchoring bias because they were likely to judge the options owing to past stock prices (Pompian, 2021, pp. 91-93). Since these financial analyses were widely used in financial institutes, brokerage companies, and general investors, representativeness and anchoring biases were the dominant identified factors.

Having belief in others. Investors seemed to have herding bias. They tended to judge the options through observing stock investment behavior of others (Shankar, 2022). In particular, the COVID-19 pandemic was occurring in the digital age, in which investors had already become netizens, who received and disseminated pieces of information via social media. The social media, therefore, had a profound role in reinforcing herd decisions of investors in stock markets.

Having belief in selves – personal memory, distortion of memory, abilities, experiences, and current state. Investors seemed to have availability, hindsight, overconfidence and self-attribution, disposition and snake-bite effects, and status quo biases.

Investors believing in their personal memory seemed to have availability bias. They were likely to judge the options based on the consequences of the options that once happened (Pompian, 2021, pp. 109-110). For example, an investor had ever encountered the financial crisis in 2008 and 2009. She remembered that she was provided beneficial advice from a brokerage company so that she received the benefit of investing in stocks during the financial crisis. Consequently, her investment decision was affected by available consequences encoded to her memory. Hence, facing the COVID-19 pandemic, she relied on the advice of this brokerage company while making stock investment decisions as she could imagine the consequences of relying on this advice.

Investors believing in personal distortion of memory seemed to have hindsight bias. They were likely to judge the options based on their cognitive error, which they remembered that they had precise predictions about the past stock market events, but actually, they did not (Pompian, 2021, pp. 73-74). Likewise, in the previous example, the investor experienced the financial crisis. However, the example of this bias was that she in actuality did not succeed in stock investment, but she remembered that she was successful in the investment because of her predictive ability. When she made the investment decision during the pandemic, her investment decision was affected by her own prediction, thus.

Investors believing in their personal abilities seemed to have overconfidence and self-attribution bias. They were likely to judge the options based on their past success, which they strongly believed that the past success was due to their abilities to predict stock market situations and to discover accurate information about stock investment (The Decision Lab, 2022). Likewise, in the first example, the investor succeeded in investing in stocks during the financial crisis because of receiving the advice from the brokerage company. However, the example of this bias was that she attributed the success to her own abilities. Hence, during the pandemic, her investment decision was affected by her own confidence.

Investors believing in their personal experiences seemed to have disposition effect and snake-bite effect biases. Investors having positive experience seemed to have disposition effect bias. They were likely to judge the options based on hope that negative return stocks would have recovery so that they insisted on holding these stocks (Baker & Ricciardi, 2014, pp. 52). For example, an investor experienced that a stock price in the financial crisis plunged, but it eventually recovered after a year. Hence, she was still holding loser stocks although the prices drastically dropped when the coronavirus began to be highly contagious. Conversely, investors having negative experience seemed to have snake-bite effect bias because they were likely to judge the options based on their investment failure, and thus, they refrained from investing in stocks in severely uncertain situations (Kartasova et al., 2014) such as the pandemic one. For example, the same investor experienced stock investment loss in the financial crisis. She definitely avoided the loss during the pandemic through hurriedly selling stocks in her portfolio. Her investment decision was affected by her personal experiences, thus.

Investors believing in their personal current state seemed to have status quo bias. They were likely to judge the options based on their existing condition, such as saving for health, and hence select an option that agreed with their current state (Pompian, 2021, pp.163-164). For example, an investor had a poor health condition, so she needed to have a budget for medical expenses. During the pandemic, she realized that there was a chance of creating wealth through investing in stocks. Since her investment decision was affected by her personal condition, she decided to leave her portfolio the same.

5.2 Limitations

This study had been conducted since the very first period of the COVID-19 pandemic when the number of survey studies was in miniature. The results of this study were, therefore, derived from synthesizing three different-feature studies, hence no homogeneity of hypotheses in the included studies. The meta-analysis was not able to be performed; also, there was no effect size to be reported. As a result, this study had no capacity for providing what degree of relationship exists between the identified factors and investor decisions. So as to indicate the effect size of potential factors in the future, the systematic review with meta-analysis should be conducted while having an appropriate number of studies in this field. However, this study performed the risk of bias assessment; the results of this study were qualified, thus.

5.3 Implications

With regard to individual practice, "the more we eliminate biases from our investment process, the better our investment returns" (Shankar, 2022). As a result, the results of this study allow investors in stock markets to comprehend themselves through recognizing facts in actuality that influenced their investment decisions and through realizing their investment behavior when they experienced the confusion. With regard to organizational practice, appropriate investment authorities such as the Securities and Exchange Commission (SEC) in Thailand, which has the responsibility to control fluctuations in stock prices, can implement several measures, namely a circuit breaker and short-selling restriction. Nonetheless, these measures are temporarily effective (Congressional Research Service, 2020). The results are recommended to the appropriate investment authorities in order to issue a guideline on investment in a state of disarray. The confusion can be relieved by reason of this manner accordingly. Furthermore, with regard to academic suggestion, the future research has room for exploring what investors perceive, what investors expect, and which type of biases obviously occur under the post-COVID-19 circumstances, as this study does not aim to answer what factor influences decisions of investors in stock markets in the aftermath of the pandemic.

5.4 Contributions

This study had a concern that stock market performances did not purely reflect investor decisions; as a result, this study did not identify factors affecting the decisions during the COVID-19 pandemic through including studies conducted by employing stock market indices. In spite of the fact that a prodigious number of those studies provided a vast variety of influential factors, such as lockdowns, stringency, social distancing, interest rate cuts, fiscal support, anxiety, fear, and attention measured by Google search volume, these factors were consequences of one factor, which was the number of confirmed cases. Environmentally, the number of confirmed cases was reflecting the seriousness of the COVID-19 situation. So as to control the contagion, non-pharmaceutical interventions were implemented in parallel with causing adverse economic impacts. To improve the economic impacts, there was the implementation of economic supports. Psychologically, the number of confirmed cases stirred investors in stock markets to have negative emotions, such as fear which was the development of anxiety, but nonetheless, the emotions were time-varying and moderated by each investor's bias. In order to survive on the emotional state, the investors made an effort to search for more information about the pandemic in the search engine. To conclude, investor decisions in the novel health crisis were actually affected by several primal factors. Therefore, identifying the factors through acknowledging studies employing primary data was advantageous to indicate the root of the decisions.

6. Conclusions

Since this study had an aim of identifying the factors having effects on stock investment decision-making in the existence of the COVID-19 pandemic, the systematic review was used to answer that there were four main factors impacting decisions and behavior of investors. First, the COVID-19 cases were considered as a numerical stimulus causing decision-making processes to respond (Holmes et al., 2016; Ratcliff & Mckoon, 2020). Second, time spent on stock markets was expressed to have a role in choice-making as well as behavior adaptation (Bhatia & Mullett, 2016). Third, expectations of pandemic risk were an occasional factor as investors basically held expectations of utilities on their investment decisions (Hommes, 2013). Last but not least, investor biases were described as their true beliefs used to evaluate their investment choices (Kelly, 2022, p. 172). These biases included herding, hindsight, overconfidence and self-attribution, representativeness, and anchoring biases. In spite of living without the COVID-19, investors are still encountering other types of uncertainty, or perhaps, ambiguity. Investor biases remain influential to their investment decisions. Investors should be cognizant of their personal beliefs that can interfere with their decisions, hence suboptimal investment ones.

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