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Investigation of winner-loser portfolio anomalies and size effect anomalies in LQ45 index, Indonesia stock exchange

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ABSTRACT

This study investigates the anomalies of winner-loser portfolios and anomalies of size effect on LQ45 stocks in the Indonesia Stock Exchange (IDX), period 2015-2020. The paired sample t-test (parametric) and Wilcoxon test (non-parametric) are used to test samples. Sample selection is carried out using the non-probability and purposive sampling methods. The shares of companies that met the sample criteria were 26. The primary data used cumulative abnormal returns and market capitalization as proxies for a company's stock size. The anomaly of the winner-loser effect phenomenon is observed by dividing the data into two periods: the formation period and the testing period. The periods are both short-term and long-term. The short-term period is six months, and the long-term is 12 months. The first finding shows reversals in average cumulative abnormal returns (CARs) on the winner-loser stock portfolio. In the testing period, the average CARs were turned down, and many average CARs became negative. Portfolio loser in the testing period, the average CARs reversed to positive. The second is a reversal in average CARs in winner-loser stock portfolios caused by the size effect. The performance of small winner-loser portfolios is proven to outperform big winners' portfolios. The reversal occurs in both the short-term and long-term. This finding suggests that behavioral finance can explain this market anomaly, and it is helpful for investors in coming up with strategies to get abnormal returns.

Contribution/Originality: This study's findings support findings of inefficiencies in Indonesia's capital market. Investors can also consider this finding to make transactions in the Indonesian capital market, especially for transactions in LQ45 shares.

1. INTRODUCTION

A capital market is a financial market that trades various long-term financial instruments (O'Sullivan, Sheffrin, & Swan, 2003; Ross, Westerfield, & Jordan, 2023). For fund owners or investors, the capital market is a place to invest (Beljan, Brener, & Dolinar, 2022). With the increasing interest in investing in the Indonesian capital market, as one of the emerging markets in the world, the availability of relevant information is increasingly needed by investors to determine investment strategies and make the right decisions. According to Liu, Yu, Shiu, and Shih (2022), one theory that investors can use as a reference is the Efficient Market Hypothesis (EMH) introduced by Fama (1970) is a weak, semi-strong, and strong form (Liu et al., 2022; Vukovic, Ingenito, & Maiti, 2023; Woo, Mai, McAleer, & Wong, 2020).

In EMH, stock prices in the market have fully reflected the available information (Cirino, Henrique, Souza, Aldo, & Coaguila, 2023; Fama, 1970; Lerskullawat & Ungphakorn, 2019). The EMH has some basic assumptions regarding efficient market conditions (Akhter & Yong, 2019; Cirino et al., 2023; Ross et al., 2023). First, rational investors will make investment decisions (Woo et al., 2020). Secondly, information is freely available to all participants in the capital market, and obtaining it does not cost money. However, when investing, investors do not behave rationally. This fact is due to a lot of irregularities in the stock market (Octavio & Lantara, 2014). In such situations, investors try strategizing for greater returns or profits (Maharani & Witiastuti, 2015). These irregularities in the stock market are often referred to as market anomalies.

According to Azevedo & Hoegner (2023) and Zhang, Bissoondoyal-Bheenick, & Zhong (2023), EMH is unable to explain market anomalies. The theory that can explain market anomalies is behavioral finance. According to Woo et al. (2020), a market anomaly is a market that does not meet the EMH criteria. One of the studies on stock market anomalies that are widely known is the research of De Bondt and Thaler (1985) regarding market overreaction (Vukovic et al., 2023). According to Chu and Song (2023) and Azevedo and Hoegner (2023), until now, the topic of market anomalies has been essential and exciting to discuss and research. They prove that psychological conditions, not rationality, sometimes influence investors' decisions. Overreaction is a phenomenon of overreaction from investors triggered by shocking information. This anomaly is based on investor attitudes, which tend to give greater weight to the latest information. Th heuristic representativeness theory (Kahneman & Tversky, 1974) explains this investor reaction. Investors' irrational attitude affects stock price movements beyond the theoretical value they should have. The price movement results in a reversal of the return.

Return reversal is a phenomenon that occurs in stocks that initially have positive returns. Then, suddenly, the stock turns negative. Conversely, stocks with negative returns turned positive (Chu & Song, 2023; Woo et al., 2020). De Bondt and Thaler (1985) stated that loser stocks could outperform winner stocks in overreacted market conditions. However, asymmetrical overreactions on the Shanghai Stock Exchange only occur in loser portfolios (Reddy, Qamar, Mirza, & Shi, 2021). Zarowin (1990) discovered a market anomaly in the form of a return reversal that only happens in small-scale companies. The anomaly means stock price movements occur asymmetrically between large and small sizes. The return reversal occurs due to the size effect (Ross et al., 2023; Salur & Ekinci, 2023; Traut, 2023).

According to Maharani and Witiastuti (2015), market overreaction occurs separately in certain months on the Indonesia Stock Exchange (IDX). Nurbasith (2019) tested winner-loser anomalies and size effects in the short, medium, and long term on stocks in all sectors of the IDX. His findings showed that winner-loser effect anomalies occurred in all sectors and time divisions. However, the size effect is not the factor that causes the winner-loser effect anomaly. This finding contradicts Pasaribu (2010) and Putra (2021) findings. Their conclusions stated that anomalous symptoms of overreaction did not occur on the IDX in all periods (quarterly, semester, and yearly), especially stocks incorporated in LQ45. Tanady & Sukamulja (2020) have also conducted research on winner-loser anomalies and size effects on winner-losers in LQ45 Index stocks. Research on winner-loser anomalies and size effects on winner-losers in LQ45 Index stocks has also been conducted by Tanady and Sukamulja (2020) and Shabri (2019). Tanady and Sukamulja (2020) concluded that market overreaction occurs in short and long periods. Nevertheless, according to Tanady and Sukamulja (2020), the influence of size consistently does not cause a market overreaction in stocks in the LQ45. Market anomalies related to the size effect are also not the case in China (Jansen, Swinkels, & Zhou, 2021; Reddy et al., 2021). Their findings differ from those of Shabri (2019), which states the size effect occurs in small-sized stocks.

Based on several previous studies, there have been inconsistencies in the research results on the winner-loser effect. This study used data from a more recent year than previous studies. This research will test the winner-loser effect phenomenon on stocks, both in the short-term and long-term, in the LQ45 index. In addition, this research will also test the effect of size on winner-losers in LQ45 index stocks. The first problem to be revealed in this study

is whether there is an abnormal return reversal on the winner-loser stock portfolios in the LQ45 Index. Second, whether the stock portfolio of small winner-losers has a greater return than that of large winner-losers. With these problems, this study aims to investigate or test winner-loser anomalies in stocks and the effect of stock size on winner-losers in the LQ45 Index, period 2015-2020, both in the short-term and long-term. This study is expected to be useful for market participants in making investment decisions (buying or selling securities) in the Indonesian capital market. After the introduction, the subsequent description of the study is: 1) literature review and hypothesis development; 2) research methods; 3) analysis of results and hypothesis development; and 4) conclusions.

2. LITERATURE REVIEW AND HYPOTHESIS

2.1. Financial Behavior, Market Anomaly, Market Overreaction, and Size

EMH studied conventional or traditional finance (Chu & Song, 2023; Hudson & Muradoglu, 2020; Woo et al., 2020). EMH's inability to explain the anomalous phenomenon of winner-loser stocks and other anomalies in the money and capital markets encourages more in-depth financial research into human behavior (Akhter & Yong, 2019; Shefrin, 2002). Such financial research shows behavioral finance research. Behavioral finance is a science that combines finance and psychology (Thaler, 1999). Behavioral finance examines investors' reasoning patterns for information, including the emotional processes involved and how these processes influence investors in determining investment strategies (Jiménez & Calisto, 2020; Ricciardi & Simon, 2000). In investor behavior, many behavioral biases can be related to irrational pricing (Azevedo & Hoegner, 2023; Traut, 2023). Behavioral finance occurs not only in investment decisions but also in funding decisions. Market anomalies occur because investment decisions made by investors refer to behavior. Research conducted by Miswanto (2017); Miswanto (2018); Miswanto (2021) and Ratih (2021) found a corporate funding decision with a behavioral approach. The approach is to mark the company with market timing theory.

The financial behavior of investors on stock market anomalies reflects the rationality that investors have limited and leads to irrationality. With such limitations, investor decisions cannot be easily arbitraged. Limited rationality presents inefficient market conditions (Woo et al., 2020; Zaremba, Umutlu, & Maydybura, 2020). Inefficiency is related to human behavior that leads to irrationally (Azevedo & Hoegner, 2023; Musnadi & Majid, 2018). Therefore, financial behavior can explain financial inefficiencies, such as market anomalies (Hudson & Muradoglu, 2020). In EMH, the market does not allow investors to get abnormal returns (Jiménez & Calisto, 2020; Liu et al., 2022). Conversely, market anomalies enable investors to obtain abnormal returns or profits (Jiménez & Calisto, 2020; Plastun, Kozmenko, Plastun, & Filatova, 2019). Cirino et al. (2023) state that there is a possibility of abnormal returns based on available information, and this phenomenon has become known as a market anomaly or financial anomaly. Some market anomalies occur only once and then disappear, while others sometimes occur continuously or frequently (Tversky & Kahneman, 1986). Market anomalies can also happen in a non-standardized market environment (Azevedo & Hoegner, 2023). Previous studies have shown anomalies exist in the U.S. and other countries (Salur & Ekinci, 2023).

One sign of a market anomaly is a market overreaction and return reversal (Reddy et al., 2021; Woo et al., 2020). The phenomenon of market overreaction explained by the overreaction hypothesis is one of the findings that refute the EMH (Kashif, Saad, Chhapra, & Ahmed, 2018; Woo et al., 2020). De Bondt and Thaler (1985) introduced this theory. Motivated by the theory of heuristic representativeness, the research of Kahneman and Tversky (1974) and De Bondt and Thaler (1985) stated that overreaction behavior occurs if investors receive unexpected new information, and this behavior affects stock price movements. De Bondt and Thaler (1985) prove that investors and market participants overreact to events in the market and violate Bayesian rules (Woo et al., 2020). Through market overreaction, investors get abnormal returns (Reddy et al., 2021; Truong, Cao, Friday, & Doan, 2023). Such an overreaction can result in the reversal of abnormal returns (Salur & Ekinci, 2023). Such reversals can occur in winner-loser portfolios and reversals due to the size effect (Woo et al., 2020).

Market overreaction occurs when investors decide to buy or sell stocks motivated by sentiment, intuition, and sometimes irrational emotions (Zaremba et al., 2020; Zhang et al., 2023). Investors' quick and excessive reactions to unexpected new information are what cause their unreasonable attitude (Zaremba et al., 2020). In this case, investors tend to overvalue in reaction to good news. Conversely, investors will undervalue in reaction to *bad news* (Truong et al., 2023). Winning portfolios occurs due to overvaluation and positive abnormal returns. Portfolio losers occur due to undervaluation and get negative abnormal returns (Boussaidi, 2017; Chen, Chou, Ko, & Rhee, 2021; Reddy et al., 2021). When the actual return exceeds the expected, the abnormal return is positive. Conversely, the abnormal return is negative when the actual return is lower than expected.

Market capitalization serves as a measure of stock size in anomaly size effect research (Jansen et al., 2021). Based on their size, company stocks can be categorized into two types: large and small. The stock portfolio is also grouped into two categories a large and a small stock portfolio (Lerskullawat & Ungphakorn, 2019). According to Banz (1981), the size effect anomaly occurs when large stock portfolios provide smaller returns than small ones. Conversely, a small-sized stock portfolio offers more significant returns than a large one (Traut, 2023; Woo et al., 2020).

2.2. Hypothesis Development

De Bondt and Thaler (1985) examined market overreaction to monthly New York Stock Exchange (NYSE) data from 1933 to 1980. Based on this research, the winner portfolio and the loser portfolio were found. The results of the study stated that there was a phenomenon of market overreaction, especially in loser stocks, which, in the testing period, outperformed the winning portfolio. The occurrence of return reversals between winner stocks and loser stocks is called the winner-loser effect (Vukovic et al., 2023). Some studies with similar results include finding Da Costa Jr (1994) on the Brazilian capital market, Fung (1999) on the Hong Kong capital market, Maharani and Witiastuti (2015) on the Indonesian capital market, Zhang et al. (2023) on the Australian capital market, andTruong et al. (2023) on the Vietnamese capital market. Chen et al. (2021) researched stocks listed on the NYSE, American Stock Exchange (AMEX), and National Association of Securities Dealers Automated Quotations (NASDAQ). The finding is that reversals in winner-loser portfolios occur in the short term. Using financial market data in the United States, Wei-Qi and Jingxing (2018) found reversals in both the medium- and long-term winner-loser portfolios. Using data from the Karachi Stock Exchange, Kashif et al. (2018) found that in these companies, loser portfolios outperformed winners in the 36 months following the period of portfolio formation, which is the period of portfolio testing. Using Mexican Stock Market data for 2002-2015, Jiménez and Calisto (2020) found that reversals in abnormal returns occur in winner-loser portfolios. Based on a review of the theory and previous studies described above, the first hypothesis (H1) is as follows:

H_1: There was a reversal in abnormal returns on the winner-loser stock portfolio in the LQ45 Index.

Zarowin (1990) conducted the same study using the same data sets as the De Bondt and Thaler (1985) study. Zarowin controls the size of the stock portfolios created. His research results show a difference between the abnormal return on a large stock portfolio and the abnormal return on a small stock portfolio (Ross et al., 2023). When anomalies occur, small stocks have greater returns (Balakumar, Dash, Maitra, & Kang, 2022). This phenomenon became known as the size effect. In their research, Jiménez and Calisto (2020) suggested a winner-loser portfolio influenced by the stock size. It's just that the object of research is not in the Mexican Stock Market, but the object of research is in LQ45 stocks, IDX. Using the sample company,Tailand, Lerskullawat and Ungphakorn (2019) found that company size affects overreaction. The subsequent finding was that more extensive stocks' overreaction appeared higher than smaller stocks. Using a sample of Brazilian companies, Miralles-Quirós, Miralles-Quirós, and Valente Gonçalves (2019) found stocks with smaller sizes to have higher profitability or performance than stocks with larger sizes. By using the company on the Shenzhen Stock Exchange (SZSE) and Shanghai Stock Exchange (SSE), Jansen et al. (2021) found that market anomalies occur due to the influence of size,

although the evidence is not so strong. Based on a review of theory and previous studies, it is suspected that the size effect affects the winner-loser effect in LQ45 index stocks. Therefore, the formulation of hypothesis 2 (H2) is as follows:

H2: There is a reversal in abnormal returns in winner-loser stock portfolios in the LQ45 Index caused by the size effect.

Based on the development of the hypothesis described above, The framework or model of this research can be described as follows.

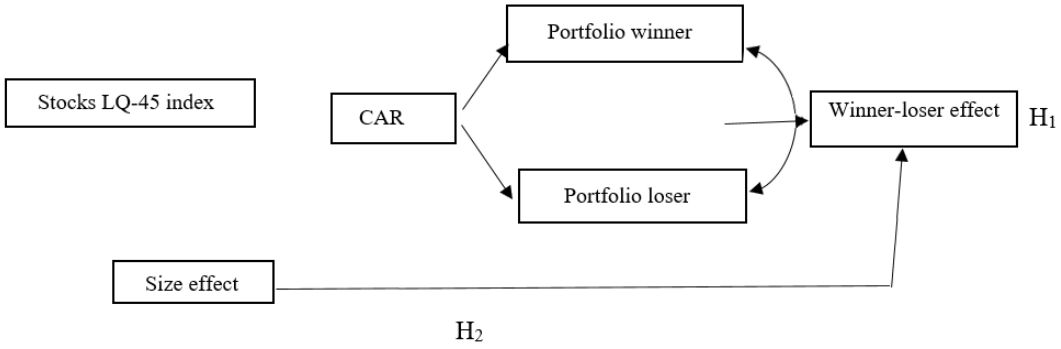

Figure 1. Research framework.

Figure 1 illustrates that this research is conducted on stocks listed on LQ45.The figure explains two hypotheses. The first hypothesis (H1) is that there is an abnormal reversal of returns in winner-loser portfolios. The second hypothesis (H2) is that there is an abnormal reversal of returns in winner-loser portfolios caused by the size effect. A cumulative abnormal return (CAR) represents the abnormal return.

3. RESEARCH METHODS

3.1. Research Samples and Data

The study used secondary data. The data consists of weekly closing price data of company stocks included in the LQ45 index from January 2015 to December 2020 and market capitalization data as a proxy for each stock size per quarter from January 2015 to December 2020. Sample selection is based on non-probability sampling with the purposive sampling method. The criteria for sampling are as follows: First, the shares used are listed on the IDX, had an IPO before or in 2015, and did not experience delisting from January 2015 to December 2020. Second, the shares used are stocks actively traded on the IDX from January 2015 to December 2020. Third, the stocks used by stocks on the LQ45 Index during the period 2015 to 2020. Secondary data was obtained from the Indonesia Stock Exchange (IDX), Investing.com, and Yahoo Finance. All data processing uses the SPSS program version 26.0.

3.2. Operational Definitions of Variables

The first variable is the cumulative abnormal return (CAR). Return reversal can be identified from abnormal returns as a proxy to indicate the occurrence of anomaly winner-loser effect phenomena. The stages of calculating CAR are as follows (Lerskullawat & Ungphakorn, 2019; Musnadi & Majid, 2018).

1. Calculating Realized Return

$$R_{i.t} = \frac{P_{i.t} - P_{i.t-1}}{P_{i.t-1}} \quad (1)$$

$R_{i.t}$ is return realized on stock i in the period of event t, P_t is tock price week t, and P_{t-1} is stock price week t-1

2. Calculating Expected Return with Market-Adjusted Model Method

$$E(R_{i,t}) = \frac{LQ45_{i,t} - LQ45_{i,t-1}}{LQ45_{i,t-1}} (2)$$

E(Ri.t) is expected returnof stocks i and $LQ45_{i,t}$is Index Value LQ45 week to t, $LQ45_{i,t}$

1 is Index Value LQ45 week to t-1

a. Calculating Abnormal Return

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \quad (3)$$

ARi,t = Abnormal return week to t, Ri,t = Realized return week to t, Rm.t = return expectation week t.

d. Calculating Cumulative Abnormal Return

$$CAR_t = \sum_{t-1}^{n} AR_{i.t} \quad (4)$$

CAR_t is Cumulative Abnormal Return, $ARi_{.t}$ = Abnormal return week to t.The CAR on the stocks in the portfolio is combined, and then calculated the average CAR for each portfolio.

The second variable is Stock Size. The stock size is grouped into large and small sizes. Market capitalization is used to measure the size of a company's stock. Market capillarization is calculated from the multiplication between the outstanding stock and the stock price (Jansen et al., 2021).

3.3. Analysis Methods and Techniques

The anomaly phenomenon of the winner-loser was observed based on research methods conducted by Ali, Annuar, Abidin, and Talib (2011); Lerskullawat and Ungphakorn (2019) and Reddy et al. (2021). They divided the data into two periods: the formation and testing periods. This study tested short-term and long-term reversal in both formation and testing periods. The difference between this study and the research conducted by Ali et al. (2011) and Lerskullawat and Ungphakorn (2019) is that their research did not conduct reversal testing in the short term. The difference between this study and Reddy et al. (2021) research is that their study did not conduct reversal testing in the long term. This study's short-term formation period is within the first semester or six months (January – June). The six-month testing period is formed after the formation period (July – December). Because the observation period began in 2015 and ended in 2020, the number of observations in the short-erm is 11 (eleven). The first observation used 2015 data. The second observation used 2016 data. The third observation used 2017 data. Last (eleventh) observation using 2020 data. The period of long-term formation is 12 months. The long-term testing period is formed 12 months after the formation period. The number of long-term observations is 5 (five). The first observations used data from 2015 and 2016. The second operation uses data from 2016 and 2017. The third observation used data from 2017 and 2018. The last (fifth) observation used data from 2019 and 2020. Table 1 shows the division of the observation period of 6 months (short-term) and the observation period of 12 months (long-term). Determining short-term and long-term observations follows the formation pattern in Tanady and Sukamulja (2020).

Table 1. Division of formation and testing periods.

No	Short-term period		Long-term period	
	Formation period	Testing period	Formation period	Testing period
1	Semester 1, 2015	Semester 2, 2015	2015	2016
2	Semester 2, 2015	Semester 1, 2016	2016	2017
3	Semester 1, 2016	Semester 2, 2016	2017	2018
4	Semester 2, 2016	Semester 1, 2017	2018	2019
5	Semester 1, 2017	Semester 2, 2017	2019	2020
6	Semester 2, 2017	Semester 1, 2018		
7	Semester 1, 2018	Semester 2, 2018		
8	Semester 2, 2018	Semester 1, 2019		
9	Semester 1, 2019	Semester 2, 2019		
10	Semester 2, 2019	Semester 1, 2020		
11	Semester 1, 2020	Semester 2, 2020		

The winner-loser anomaly testing steps are as follows: First is sample collection. The second calculates stock returns using the weekly closing price from January 2015 to December 2020. Third, calculate market returns using

the closing price of the LQ45 index for the period January 2015 to December 2020. Fourth, calculate abnormal stock returns using data from calculating stock returns and market returns. Market returns are calculated using weekly closing price data from the LQ45 index, as done by Nurbasith (2019). Fifth, calculate the cumulative abnormal return based on the predetermined formation and testing periods. Sixth, form a winner stock and a loser stock for each stock. The creation of a portfolio of winner and loser stocks is as follows: The selected samples are grouped into 2 with the same number based on the CAR size. Stocks with a low CAR are the first group of loser stock portfolios. Stocks with a high CAR are the second group of winning stock portfolios. Seven tested the data distribution or sample normality using the Shapiro-Wilk test. Eighth observed the presence or absence of CAR mean reversals in both winner and loser portfolios. The ninth tested the significance of the reversal of the average CAR winner and average CAR loser. The paired sample t-test method tests normally distributed samples, and then the Wilcoxon Test (non-parametric) tests samples that are not normally distributed.

The effect of stock size on winner-loser anomalies in LQ45 index stocks was tested after steps 1 to 9 in the H1 test were completed. Then,H2 testing is continued by performing the following steps: First, sort stocks by stock size. Second, form a portfolio of winners and losers for each category of stock size: large and small. The four portfolios created are Loser Large, Loser Small, Winner Large, and Winner Small.Third, observe the presence or absence of CAR mean reversals in each portfolio. The fourth tested the significance of the reversal of the average CAR winner and average CAR loser. The paired sample t-test method (parametric) tests normality-distributed samples (Musnadi & Majid, 2018), and the Wilcoxon Test (non-parametric) tests samples that are not normally distributed (Aminimehr, Raoofi, Aminimehr, & Aminimehr, 2022).

4. RESEARCH RESULTS AND DISCUSSION

4. 1. Descriptive Statistics

The number of types of shares in LQ45 is 45. However, the shares of companies that met the sample criteria were 26. The stocks of the selected LQ45 are grouped into two. First are winner stocks, and second are loser stocks. Therefore, the winner's shares are 13, and the loser's shares are 13. Winner stocks are stocks that have a higher CAR than loser stocks. Tables 2 and 3 show statistical descriptions of the number of samples (N) in 32 observations. The table also shows the average, standard deviation (Standard Deviation), minimum portfolio value (Min.), and maximum portfolio value (Max.) on CAR in each observation.

Table 2. Descriptive statistics of CAR portfolio winner.

Obs.	N	Formation				Testing			
		Average	Std.dev.	Min.	Max.	Average	Std. dev.	Min.	Max.
The observation period is six months									
1	13	0.089	0.113	-0.019	0.303	0.063	0.121	-0.143	0.322
2	13	0.165	0.099	0.062	0.398	-0.032	0.191	-0.362	0.215
3	13	0.204	0.160	0.037	0.550	0.074	0.292	-0.242	0.651
4	13	0.202	0.224	-0.021	0.651	-0.063	0.222	-0.469	0.319
5	13	0.101	0.090	-0.003	0.319	0.070	0.122	-0.150	0.255
6	13	0.143	0.126	0.004	0.486	0.048	0.259	-0.313	0.623
7	13	0.170	0.189	0.020	0.623	-0.053	0.159	-0.312	0.234
8	13	0.150	0.105	0.032	0.420	0.019	0.172	-0.345	0.289
9	13	0.162	0.157	0.035	0.633	-0.020	0.130	-0.163	0.294
10	13	0.073	0.111	-0.057	0.294	0.018	0.170	-0.271	0.237
11	13	0.163	0.095	0.050	0.394	0.005	0.269	-0.313	0.497
Observation period one year									
1	13	0.204	0.147	0.039	0.616	-0.180	0.361	-0.993	0.207
2	13	0.321	0.385	-0.027	1.202	0.033	0.254	-0.385	0.523
3	13	0.192	0.153	-0.004	0.523	0.016	0.141	-0.195	0.237
4	13	0.193	0.177	0.051	0.672	-0.039	0.252	-0.451	0.250
5	13	0.181	0.235	0.032	0.928	0.080	0.206	-0.162	0.617

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The one-year (12-month) observation period shows long-term reversal testing from observations 1 to 5. N is the number of samples.

Table 2 displays the sample count (N), mean, standard deviation, lowest value, and highest value of each observation in the winning portfolio with 6- and 12-month test periods. In the winning portfolio, all observation periods show an average value of formation periods greater than the average test period ($CAR_f > CAR_t$). For example, observation 2 shows that the average formation period is 0.165, while the average test period is -0.032. The difference between the average CAR formation period and positive testing in all observation periods proves a reversal of CAR in the winner's portfolio.

Table 3. Descriptive statistics of CAR portfolio loser.

Obs.	N	Formation				Testing			
		Average	Std.dev.	Min.	Max.	Average	Std.dev.	Min.	Max.
The observation period is six months									
1	13	-0.171	0.090	-0.326	-0.042	-0.032	0.245	-0.452	0.398
2	13	-0.134	0.146	-0.452	0.002	0.096	0.235	-0.215	0.550
3	13	-0.140	0.104	-0.362	-0.013	-0.099	0.358	-0.980	0.353
4	13	-0.226	0.282	-0.980	-0.027	0.011	0.096	-0.159	0.134
5	13	-0.153	0.135	-0.469	-0.015	-0.100	0.235	-0.413	0.486
6	13	-0.174	0.124	-0.413	0.002	-0.012	0.162	-0.232	0.343
7	13	-0.134	0.096	-0.313	0.003	0.066	0.191	-0.317	0.420
8	13	-0.137	0.117	-0.317	0.011	0.043	0.197	-0.141	0.633
9	13	-0.099	0.083	-0.345	-0.033	-0.058	0.174	-0.323	0.235
10	13	-0.151	0.092	-0.323	-0.061	0.018	0.181	-0.185	0.394
11	13	-0.127	0.084	-0.271	0.032	0.162	0.176	-0.120	0.543
Observation period one year									
1	13	-0.255	0.245	-0.778	0.002	0.219	0.462	-0.298	1.202
2	13	-0.282	0.293	-0.993	-0.045	-0.115	0.309	-0.573	0.254
3	13	-0.274	0.176	-0.573	-0.042	0.033	0.298	-0.505	0.672
4	13	-0.143	0.128	-0.505	0.004	0.025	0.301	-0.293	0.928
5	13	-0.196	0.154	-0.451	0.025	0.123	0.236	-0.174	0.693

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The one-year (12-month) observation period shows long-term reversal testing from observations 1 to 5. N is the number of samples

In Table 3, all observation periods in the loserportfolio show a lower average value of the formation period than the average test period ($CAR_f < CAR_p$). For example, observation 2 shows that the average formation period was -0.134, while the average test period was 0.096. The difference between the average CAR formation period and negative testing in all observation periods proves a CAR reversal in the loser portfolio.

4.2. Normality Test

A normality test should be performed before testing the significance of the reversal of the average CAR on the stock portfolio of winners and losers. The test uses a paired sample t-test or average difference test. Data normality testing is performed by the appropriate Saphiro-Wilk Test method to test small samples.

Table 4 shows the normality test results of the sample portfolio winners and losers, both in the formation and testing periods. Based on the Saphiro-Wilk Test, the data is normally distributed when the significance value exceeds 0.05. Testing the significance of the mean reversal of CAR in normally distributed samples using a paired sample t-test. Samples that are not normally distributed using the Wilcoxon test. In the winning portfolio, the observation periods tested using the Wilcoxon test are 1, 2, 3, 4, 6, 7, 9, 12, 13, 15, and 16. The loser portfolio has observation periods of 2,3, 4, 8, 9, 10, 12, 13, and 15.

Table 4. Shapiro-Wilk portfolio winner and loser normality test results.

Obs.	Significance value			
	Winner		Loser	
	Formation	Testing period	Formation	Testing period
The observation period is six months				
1	0.015 *	0.601	0.508	0.982
2	0.019 *	0.426	0.030 *	0.190
3	0.007 *	0.027	0.430	0.015 *
4	0.028 *	0.968	0.000 *	0.363
5	0.197	0.510	0.072	0.250
6	0.031 *	0.191	0.767	0.575
7	0.003 *	0.870	0.572	0.921
8	0.082	0.769	0.114	0.001 *
9	0.000 *	0.119	0.001 *	0.585
10	0.260	0.387	0.018 *	0.214
11	0.150	0.346	0.970	0.453
Observation period one year				
1	0.014 *	0.063	0.036 *	0.069
2	0.005 *	0.888	0.005 *	0.140
3	0.497	0.644	0.348	0.875
4	0.003 *	0.071	0.013 *	0.001 *
5	0.000 *	0.061	0.404	0.117

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The one-year(12-month) observation period shows long-term reversal testing from observations 1 to 5. Sign* indicates data that is not normally distributed.

4.3. Hypothesis Testing

The results of testing the first hypothesis (H1) are analyzed as follows: Data is processed after forming a portfolio of winner and loser stocks in each period. Portfolios of winners and losers are based on CAR's high standard. Testing in each formation period and test period is carried out by testing the average difference of paired sample t-tests for samples with a normal distribution. The Wilcoxon test examines samples that are not normally distributed.

Table 5. Results of paired sample t-test and Wilcoxon test of winner's stock portfolio.

Obs.	Dist. N/A	Average CAR formation period	Average CAR testing period	Average CAR difference	t-value	Sig.
6-month observation period						
1	TN	0.089	0.063	0.025	-0.035	0.972
2	A	0.165	-0.032	0.198	-2.481 **	0.013
3	A	0.204	0.074	0.130	-2.132 **	0.033
4	A	0.202	-0.063	0.265	-2.201 **	0.028
5	N	0.101	0.070	0.032	1.058	0.311
6	A	0.143	0.048	0.096	-1.922 *	0.055
7	A	0.170	-0.053	0.224	-2.760 ***	0.006
8	N	0.150	0.019	0.131	2.971 **	0.012
9	A	0.162	-0.020	0.182	-2.901 ***	0.004
10	N	0.073	0.018	0.055	1.005	0.335
11	N	0.163	0.005	0.158	1.8289 *	0.092
12-month observation period						
1	A	0.2040	-0.1800	0.3840	-2.9700 ***	0.0030
2	A	0.3210	0.0330	0.2880	-1.8520 *	0.0640
3	N	0.1920	0.0160	0.1760	2.6270 **	0.0220
4	A	0.1930	-0.0390	0.2320	-2.3410 **	0.0190
5	A	0.1810	0.0800	0.1010	-1.5720	0.1160

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The 12-month observation period shows long-term reversal testing from observations 1 to 5. N indicates a normally distributed sample, and A indicates an abnormally distributed sample.***, **, and * showed significance at 1%, 5%, and 10%, respectively.

Table 5 shows the difference in the average CAR between the formation and the testing period in all observation periods, so it can be said that there was a reversal in all winners' portfolio observations in both the 6-month and 12-month periods. In addition, the paired sample t-test and Wilcoxon test results also prove that the reversal in the majority winner's portfolio is significant. Reversals in winning stocks are significant except in periods 1, 5, 10, and 16.

Table 6. Results of paired sample t test and Wilcoxon test of loser stock portfolio.

Obs.	Dist. N/A	Average CAR formation period	Average CAR testing period	Average difference	t-value	Sig.
6-month observation period						
1	N	-0.171	-0.032	-0.139	-2.420 **	0.032
2	A	-0.134	0.096	-0.230	2.341 **	0.019
3	A	-0.140	-0.099	-0.042	-1.153	0.249
4	A	-0.226	0.011	-0.238	2.981 ***	0.003
5	N	-0.153	-0.100	-0.052	-0.577	0.574
6	N	-0.174	-0.012	-0.162	-2.565 **	0.025
7	N	-0.134	0.066	-0.201	-3.043 ***	0.010
8	A	-0.137	0.043	-0.181	-2.552 **	0.011
9	A	-0.099	-0.058	-0.041	-0.734	0.463
10	A	-0.151	0.018	-0.169	-1.922 *	0.055
11	N	-0.127	0.162	-0.289	-4.574 ***	0.001
12-month observation period						
1	A	-0.255	0.219	-0.474	-2.587 ***	0.010
2	A	-0.282	-0.115	-0.167	-1.223	0.221
3	N	-0.274	0.033	-0.307	-3.169 ***	0.008
4	A	-0.143	0.025	-0.168	-1.712 *	0.087
5	N	-0.196	0.123	-0.319	-3.993 ***	0.002

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The 12-month observation period shows long-term reversal testing from observations 1 to 5. N indicates a normally distributed sample, and A indicates an abnormally distributed sample.***, **, and * showed significance at 1%, 5%, and 10%, respectively.

Results on loser portfolios are shown in Table 6. The table shows that the average CAR reversal occurred throughout the observation period. Significant anomalies existed in almost all observation periods except periods 3, 5, 9, 10, and 13. The two tables above prove the winner-loser effect, both short-term and long-term, on the stocks in the LQ45 Index.

The results of testing the second hypothesis (H2) are analyzed as follows: Data processing is carried out after dividing the winner portfolio into large and small portfolios and the loser portfolio into large and small portfolios. The portfolio in winner large consists of the winner's stocks with a high market capitalization, while the portfolio in winner small consists of the winner's stocks with a low market capitalization. On the other hand, the loser's large portfolio consists of loser stocks with a high market capitalization. In contrast, the loser's small portfolio consists of loser stocks with low market capitalization.

Tables7a and 7b show the reversal of the average CAR in most winning stocks with large market capitalizations. The reversal proved statistically significant. Such reversals occurred in observation periods 2, 3, 7, 8, 9, and 11. On the other hand, the CAR mean reversal also happened in all stocks with small market capitalizations, except in 11 periods. The reversal of the average CAR proved statistically significant. Reversals occur in periods 4, 7, 9, 12, and 13. Therefore, there is a reversal in average CAR, both in winning stocks with large and small market capitalizations, both in the short-term and long-term, although such reversals occur inconsistently.

Table 7a. Results of paired sample t-test and Wilcoxon test of winner large stock portfolio.

Obs.	Dist. N/A	Average CAR formation period	Average CAR testing period	Average difference	t-value	Sig.
6-month observation period						
1	A	0.081	0.048	0.033	-0.314	0.753
2	N	0.190	-0.070	0.260	2.475 **	0.056
3	N	0.157	-0.020	0.177	5.458 ***	0.003
4	N	0.114	0.024	0.090	1.481	0.199
5	N	0.087	0.025	0.061	1.342	0.237
6	N	0.093	0.004	0.088	1.623	0.165
7	N	0.082	-0.043	0.124	3.417 **	0.019
8	N	0.143	-0.001	0.144	2.453 *	0.058
9	N	0.110	-0.033	0.143	3.563 **	0.016
10	N	0.031	0.058	-0.026	-0.531	0.618
11	N	0.189	-0.144	0.333	2.568 **	0.050
12-month observation period						
1	N	0.151	-0.182	0.333	2.380 *	0.063
2	N	0.130	0.104	0.027	0.236	0.823
3	N	0.188	0.085	0.103	2.068 *	0.094
4	N	0,108	-0,041	0,1480	1.785	0,134
5	N	0.109	0,043	0,0650	1.550	0,182
Average CAR of winner large stocks (Average period of 6 months + 12 months)			-0.009			

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The 12-month observation period shows long-term reversal testing from observations 1 to 5. N indicates a normally distributed sample, and A indicates an abnormally distributed sample. ***, **, and * showed significance at 1%, 5%, and 10%, respectively.

Table 7b. Results of paired sample t-test and Wilcoxon test of winner small stock portfolio.

Obs.	Dist. N/A	Average CAR formation period	Average CAR testing period	Average difference	t-value	Sig.
6-month observation period.						
1	N	0.113	0.089	0.025	0.438	0.680
2	A	0.157	0.045	0.110	-1.153	0.249
3	N	0.268	0.213	0.056	0.441	0.677
4	N	0.307	-0.157	0.465	2.477 *	0.056
5	N	0.119	0.084	0.035	1.095	0.324
6	N	0.190	0.087	0.103	0.656	0.541
7	N	0.282	-0.078	0.360	2.695 **	0.043
8	A	0.113	0.026	0.086	-1.153	0.249
9	N	0.225	-0.008	0.233	3.792 **	0.013
10	N	0.130	-0.041	0.172	1.949	0.109
11	N	0.148	0.182	-0.034	-0.368	0.728
12-month observation period						
1	A	0.238	-0.171	0.409	-2.201 **	0.028
2	N	0.555	-0.025	0.580	2.601 **	0.048
3	N	0.170	-0.036	0.207	1.566	0.178
4	A	0.294	0.024	0.269	-1.572	0.116
5	A	0.270	0.141	0.129	-0.524	0.600
Average CAR of small winner stocks (Average period of 6 months + 12 months)			0.028			

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The 12-month observation period shows long-term reversal testing from observations 1 to 5. **, and * show significance at 1%, 5%, and respectively. N indicates a normally distributed sample, and A indicates an abnormally distributed sample.

Table 8a. Results of paired sample t-test and Wilcoxon test of loser large stock portfolio.

Obs.	Dist. N/A	Average CAR formation period	Average CAR testing period	Average difference	t-value	Sig.
6-month observation period						
1	N	-0.146	0.061	-0.207	-2.061 *	0.094
2	A	-0.070	-0.034	-0.036	-0.734	0.463
3	A	-0.139	-0.086	-0.052	-0.943	0.345
4	A	-0.178	0.068	-0.245	-1.992 **	0.046
5	N	-0.125	-0.095	-0.029	-0.365	0.730
6	N	-0.097	-0.037	-0.061	-0.719	0.504
7	A	-0.121	0.166	-0.287	-2.201 **	0.028
8	N	-0.111	0.001	-0.112	-1.834	0.126
9	N	-0.091	-0.139	0.048	0.563	0.598
10	N	-0.203	0.050	-0.253	-2.062 *	0.094
11	N	-0.081	0.045	-0.126	-1.990	0.103
12-month observation period						
1	A	-0.154	0.016	-0.170	-1.782 *	0.075
2	N	-0.267	-0.011	-0.256	-1.216	0.278
3	N	-0.239	0.104	-0.343	-2.540 *	0.052
4	N	-0.072	-0.022	-0.050	-0.661	0.538
5	N	-0.256	0.019	-0.275	-2.841 **	0.036
Average CAR loser large stock (Average period of 6 months + 12 months)			0.007			

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The 12-month observation period shows long-term reversal testing from observations 1 to 5. N indicates a normally distributed sample, and A indicates an abnormally distributed sample.**, and * show significance at 1% and 5% respectively.

Table 8b. Results of paired sample t-test and Wilcoxon test of loser small stock portfolio.

Obs.	Dist. N/A	Average CAR formation period	Average CAR testing period	Average difference	t-value/Z	Sig.
6-month observation period.						
1	N	-0.207	-0.122	-0.085	-1.171	0.295
2	N	-0.196	0.227	-0.424	-2.676 **	0.044
3	A	-0.130	-0.154	0.024	0.114	0.914
4	N	-0.308	-0.043	-0.265	-1.992 **	0.046
5	N	-0.198	-0.094	-0.105	-0.561	0.599
6	N	-0.233	-0.046	-0.186	-2.822 **	0.037
7	N	-0.132	-0.093	-0.039	-0.520	0.626
8	N	-0.136	0.105	-0.241	-1.581	0.175
9	A	-0.114	-0.010	-0.104	-1.363	0.170
10	N	-0.115	-0.047	-0.068	-1.251	0.266
11	N	-0.149	0.262	-0.411	-5.1030 ***	0.004
12-month observation period						
1	N	-0.364	0.402	-0.765	-2.198 *	0.079
2	A	-0.294	-0.238	-0.056	-0.314	0.753
3	N	-0.317	-0.017	-0.300	-1.757	0.139
4	A	-0.207	0.057	-0.264	-1.572	0.116
5	N	-0.173	0.250	-0.423	-3.225 **	0.023
Average CAR loser small stock (Average period of 6 months + 12 months)			0.028			

Note: The 6-month observation period shows short-term reversal testing from observations 1 to 11. The 12-month observation period shows long-term reversal testing from observations 1 to 5. N indicates a normally distributed sample, and A indicates an abnormally distributed sample.***, **, and * show significance at 1%, 5%, and 10%, respectively.

Tables8a and 8b show that the average CAR reversal in the loser's large portfoliooccurred in almost all observation periods except for observation 9. In small loser portfolios, average CAR reversals arise in almost all observation periods except observation 2. The average CAR reversal in a large portfolio is statistically significant. Such reversals occurred in periods 1, 4, 7, 10, 12, 14, and 16. On the other hand, there are also some significant reversals in the average CAR in the small loser portfolio. Such reversals occur in periods 2, 4, 6, 11, 12, and 16. The performance of small winning and losing stock portfolios has also proven to outperform large winning and

losingportfolios. See Table 9 for the winner's small stock performance of 3.2%. This figure is calculated from the average CAR winner (0.023) minus the average CAR (-0.009). The performance of losing small shares was 2.1%. This figure is calculated from the average CAR loser small (0.028) minus the average CAR loser large (0.007). Thus, the performance of the winner's small shares is 3.2% superior to the winner's large stocks. The performance of loser small shares is 2.1% superior to loser large stocks.

Table 9. Performance comparison of large and small stocks.

Winner		Loser	
Size	**Average CAR testing period**	**Size**	**Average CAR testing period**
Small	0.023	Small	0.028
Large	-0.009	Large	0.007
Difference	0.032	Difference	0.021

The results of the size effect test on the portfolio of winners and losers above show a statistically significant reversal, both in winner stocks and loser stocks. So, size, as measured by market capitalization, affects the reversal of the average CAR in winner and loser stocks, both in the short-term and long-term, although the influence is inconsistent. As a result, the sixe effect is what causes winner-loser anomalies in stocks in the LQ45 Index.

4.4. Discussion

The results of the H1 prove that the winner-loser effect occurs, both in the short (6 months) and long (12 months) observation periods, on stocks in the LQ45 Index in the 2015–2020 period. The existence of these anomalies provides an opportunity for investors to take advantage of abnormal returns. A significant reversal in the average CAR during the formation and testing periods, both in the short-term and long-term, is proof of winner-loser anomaly. The reversal occurred in both the winner portfolio and the loser portfolio. As shown in Table 5, the reversal of the winning portfolio indicates that initially, the portfolio had a high positive average CAR in the formation period. After that, the winning portfolio in the testing period went down, and even many average CARs became negative. As shown in Table 6, reversals in loser portfolios show that during the formation period, the average CARs are negative. Portfolio loser in the testing period, the average CARs reversed to positive. However, investing in equity stocks is always accompanied by risk. Investors investing in stocks must consider the risks that will occur. According to Boussaidi (2017) and Zaremba et al. (2020), investing in loser stocks tends to be riskier than a portfolio of winner stocks. This study's results are consistent with De Bondt and Thaler (1985) findings regarding market overreaction caused by the emergence of investor overreaction to information. This research is also in line withTanady and Sukamulja (2020), which state that there is an overreaction of short-term and long-term periods in the portfolio of winners and losers in stocks included in the LQ45 Index with an observation period during 2015-2019. This result is the same as the study conducted by Meiliani, Puspita, Tarigan, and Fathoni (2021), which found a market overreactionon the IDX, especially in LQ45 Index stocks during 2016-2019.

The results of the H2 show a stock size effect on the winner-loser effect on stocks in the LQ45 Index. According to the research by Zarowin (1990), the performance of stocks with small sizes can outperform stocks with large sizes. This performance can be observed from the average CAR in winner and loser stocks, which experienced a significant reversal after being grouped by company size. The reverse of the CAR mean in all size groups indicates that winner-loser anomalies occur in the portfolio of stocks, both in the short-term and long-term, in the LQ45 Index. The reversal is due to the size effect.

This research can prove the impact of the size of a stock on winner and loser stocks in the LQ45 Index. Small-cap stocks perform better than large-cap stocks. Small-cap stocks performed 3.2% better in the winning portfolio than large-cap stocks. In loser portfolios, small-cap stocks performed 2.1% more than large-cap stocks. However,

investing in equity stocks is always accompanied by risk. Investors investing in stocks must consider the risks that will occur. Small-cap stocks are riskier than large-cap stocks (Nidar & Ulfa, 2017; Zhang et al., 2023).

The findings of this research are consistent with Banz (1981) and Salur and Ekinci (2023). His findings state that stocks with large sizes provide smaller returns. Conversely, companies with small sizes offer greater returns. Octavio and Lantara (2014) conducted research with similar findings. The finding is that stock size influences market overreaction in the Kompas100 Index portfolio. Pandey, Sehgal, Mohapatra, and Samanta (2021) studied four Western European countries. The findings also fit this study: low-cap stocks provide greater returns than high-cap stocks. Nidar and Ulfa (2017) also found that the size effect occurs on stocks in the portfolio of winners and losers. Shares of small companies are superior or have higher returns than shares of large companies (Miralles-Quirós et al., 2019). The findings of market anomalies in the form of winner-loser portfolio reversals and the influence of size on the winner-loser portfolios mentioned above indicate inefficiencies in the market. Market inefficiencies occur because the assumptions of the EMH cannot be met. Assumptions that are violated are all about information. In practice, information is not freely available to all market participants, and obtaining it sometimes costs money. Therefore, investors, in making investment decisions, use a behavioral finance approach. EMH cannot explain the phenomenon of market anomalies in winner-loser portfolios. Only behavioral finance can explain the phenomenon. The science of behavioral finance is a relatively new financial science. The findings of this study can add to and enrich the importance of behavioral finance. Calendar anomalies (weekend effect, January effect, and reverse weekend effect), book-to-market effect/value anomaly, momentum effect, disposition effect, equity premium puzzle, ostrich effect, herd effect, bubbles, and volume and volatility are just a few examples of the many financial decisions that only behavioral finance can explain (Woo et al., 2020). Indonesia is one of the emerging markets in the world (Akhter & Yong, 2019; Fatarina, Usman, & Kurniawati, 2023). Emerging markets are characterized by less liquid markets, higher transaction costs, less developed equity markets, and high growth potential (Miralles-Quirós et al., 2019; Reddy et al., 2021). These characteristics are indicative of an inefficient market and support the occurrence of winner-loser market anomalies (Wei-Qi & Jingxing, 2018). The Indonesian capital market, categorized as an emerging market, supports the findings of this study.

5. CONCLUSION

This study examines or investigates the presence of winner-loser effect anomalies on stock portfolios included in the LQ45 Index, IDX. This research uses weekly stock closing price data to calculate abnormal returns and market capitalization as a proxy for stock size. The findings of this study indicate there are market anomalies as follows: First, in LQ45 stocks, both short-term and long-term, there is a reversal in abnormal returns in winner-loser portfolios. In the testing period, the average CARs were turned down, and many average CARs became negative. Portfolio loser in the testing period, the average CARs reversed to positive. Second, in LQ45 stocks, both short-term and long-term, there is a reversal in average CAR in the winner-loser portfolio due to the size effect. The performance of small winner-loser portfolios is proven to outperform big winners' portfolios. Therefore, there is a market anomaly in the LQ45 stock market caused by investors who have an overreaction to the information in the market. The third finding is the reversal in both the short-term and long-term. The research results imply that investors can consider these findings when investing in LQ 45 shares, IDX. Important information investors in emerging markets think in Indonesia, especially in stocks in LQ45, that the findings of this study indicate market inefficiencies. In such a market, investors will respond by using a behavioral finance approach to make transactions in the market. The theoretical implication of this theory, which De Bondt and Thaler (1985) introduced, occurred in LQ45 shares on the IDX. This study has limitations. Investors overreacted to the study's findings during the study period because it only looked at abnormal reversals of returns based on formation and testing periods and did not control for any potential specific information. Suggestions in connection with the research are as follows: First, investors who want abnormal returns by taking advantage of winner-loser anomalies can carry out contrarian

strategies by buying loser or short-selling winner stocks. Investors may also consider buying stocks with small market capitalizations. The second suggestion for academics who retest winner-loser anomalies is to use intraday prices and short-term observation periods to see winner-loser anomalies in the short term. The third suggestion is that researchers can then use different criteria in sampling, such as using other indices set by the IDX, such as the Jakarta Composite Index (JCI), Jakarta Islamic Index (JII), Sectoral Index, IDX80, IDX30, Kompas100, and Bisnis-27.

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REFERENCES

Akhter, T., & Yong, O. (2019). Adaptive market hypothesis and momentum effect: Evidence from Dhaka stock exchange. *Cogent Economics & Finance*, *7*(1), 1650441. https://doi.org/10.1080/23322039.2019.1650441

Ali, N., Annuar, A. M., Abidin, S., & Talib, N. A. (2011). Does Syariah-compliant stocks overreact? *International Research Journal of Finance and Economics*, *77*, 18–24.

Aminimehr, A., Raoofi, A., Aminimehr, A., & Aminimehr, A. (2022). A comprehensive study of market prediction from efficient market hypothesis up to late intelligent market prediction approaches. *Computational Economics*, *60*(2), 781-815. https://doi.org/10.1007/s10614-022-10283-1

Azevedo, V., & Hoegner, C. (2023). Enhancing stock market anomalies with machine learning. *Review of Quantitative Finance and Accounting*, *60*(1), 195-230. https://doi.org/10.1007/s11156-022-01099-z

Balakumar, S., Dash, S. R., Maitra, D., & Kang, S. H. (2022). Do oil price shocks have any implications for stock return momentum? *Economic Analysis and Policy*, *75*, 637-663. https://doi.org/10.1016/j.eap.2022.06.016

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*, *9*(1), 3-18. https://doi.org/10.1016/0304-405x(81)90018-0

Beljan, K., Brener, M., & Dolinar, D. (2022). The long-term capital-market performance of the forestry sector: An investors' perspective. *Forests*, *13*(8), 1329. https://doi.org/10.3390/f13081329

Boussaidi, R. (2017). The winner-loser effect in the Tunisian stock market: A multidimensional risk-based explanation. *Borsa Istanbul Review*, *17*(3), 178-189. https://doi.org/10.1016/j.bir.2017.02.001

Chen, T.-Y., Chou, P.-H., Ko, K.-C., & Rhee, S. G. (2021). Non-parametric momentum based on ranks and signs. *Journal of Empirical Finance*, *60*, 94-109. https://doi.org/10.1016/j.jempfin.2020.11.004

Chu, X., & Song, S. (2023). Cross-sectional reversal of intraday returns and investor heterogeneity in an emerging market. *Borsa Istanbul Review*, *23*(3), 614–627. https://doi.org/10.1016/j.bir.2023.01.002

Cirino, W., Henrique, G., Souza, D., Aldo, R., & Coaguila, I. (2023). Influence of economic policy uncertainty on accruals and abnormal returns. *Advances in Scientific and Applied Accounting*, *16*(1), 46–60. https://doi.org/10.14392/asaa.2022160102

Da Costa Jr, N. C. (1994). Overreaction in the Brazilian stock market. *Journal of Banking & Finance*, *18*(4), 633-642. https://doi.org/10.1016/0378-4266(94)00011-5

De Bondt, W. F., & Thaler, R. (1985). Does the stock market overreact? *The Journal of Finance*, *40*(3), 793-805. https://doi.org/10.1111/j.1540-6261.1985.tb05004.x

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, *25*(2), 383-417. https://doi.org/10.1111/j.1540-6261.1970.tb00518.x

Fatarina, T., Usman, B., & Kurniawati, H. (2023). An assessment of female executives' influence on bank performance in Indonesia based on critical mass theory. *International Journal of Management*, *12*(1), 26-43. https://doi.org/10.18488/11.v12i1.3262

Fung, A. K.-W. (1999). Overreaction in the Hong Kong stock market. *Global Finance Journal*, *10*(2), 223-230. https://doi.org/10.1016/s1044-0283(99)00016-2

Hudson, R., & Muradoglu, Y. G. (2020). Personal routes into behavioural finance. *Review of Behavioral Finance*, *12*(1), 1-9. https://doi.org/10.1108/rbf-12-2019-0176

Jansen, M., Swinkels, L., & Zhou, W. (2021). Anomalies in the China A-share market. *Pacific-Basin Finance Journal*, *68*, 101607. https://doi.org/10.1016/j.pacfin.2021.101607

Jiménez, J. G. M., & Calisto, E. O. (2020). Testing the overreaction hypothesis in the Mexican stock market. *Contaduría y Administración*, *65*(1), 1–23. https://doi.org/10.22201/fca.24488410e.2019.1794

Kahneman, D., & Tversky, A. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

Kashif, M., Saad, S., Chhapra, I. U., & Ahmed, F. (2018). An empirical evidence of over reaction hypothesis on Karachi stock exchange (KSE). *Asian Economic and Financial Review*, *8*(4), 449–465. https://doi.org/10.18488/journal.aefr.2018.84.449.465

Lerskullawat, P., & Ungphakorn, T. (2019). Does overreaction still exist in Thailand? *Kasetsart Journal of Social Sciences*, *40*(3), 689-694. https://doi.org/10.1016/j.kjss.2018.02.001

Liu, G., Yu, C.-P., Shiu, S.-N., & Shih, I.-T. (2022). The efficient market hypothesis and the fractal market hypothesis: Interfluves, fusions, and evolutions. *Sage Open*, *12*(1), 1-8. https://doi.org/10.1177/21582440221082137

Maharani, S., & Witiastuti, R. S. (2015). Market overreaction phenomenon on the Indonesian stock exchange. *Management Analysis Journal*, *4*(1), 30–38. https://doi.org/10.15294/maj.v4i1.7209

Meiliani, M., Puspita, D., Tarigan, M., & Fathoni, A. F. (2021). Comparative analysis of market overreaction in Indonesia and Singapore stock exchange 2016-2019. *International Journal of Economics, Business and Applications*, *6*(2), 19-44. https://doi.org/10.31258/ijeba.6.2.19-44

Miralles-Quirós, J. L., Miralles-Quirós, M. D. M., & Valente Gonçalves, L. M. (2019). The profitability of moving average rules: Smaller is better in the Brazilian stock market. *Emerging Markets Finance and Trade*, *55*(1), 150-167. https://doi.org/10.1080/1540496x.2017.1422428

Miswanto, M. (2017). Equity market price and its effect on capital structure and equity issue. *Advanced Science Letters*, *23*(9), 8056–8059. https://doi.org/10.1166/asl.2017.9834

Miswanto, M. (2018). Equity issue and a long-term effect of equity market timing on capital structure. *International Journal of Engineering & Technology*, *7*(3.21), 82-88. https://doi.org/10.14419/ijet.v7i3.21.17100

Miswanto, M. (2021). *The impact of equity historical market price on capital structure*. Paper presented at the Recent Developments in Asian Economics International Symposia in Economic Theory and Econometrics.

Musnadi, S., & Majid, M. S. A. (2018). Overreaction and underreaction anomalies in the Indonesian stock market: A sectoral analysis. *International Journal of Ethics and Systems*, *34*(4), 442-457. https://doi.org/10.1108/ijoes-12-2017-0235

Nidar, S. R., & Ulfa, N. (2017). Overreaction market analysis, dividend policy, firm size, and seasonality to price reversal phenomena. *Accounting and Finance Review*, *2*(2), 73-77. https://doi.org/10.35609/afr.2017.2.2(10)

Nurbasith, N. (2019). *Testing winner-loser anomalies and size effects on stocks in various sectors on the Indonesian stock exchange*. Doctoral Dissertation, Universitas Gadjah Mada.

O'Sullivan, A., Sheffrin, S. M., & Swan, K. (2003). *Economics: Principles in action* (Vol. 157). Upper Saddle River: Pearson Prentice Hall.

Octavio, D. Q., & Lantara, I. W. N. (2014). Market overreaction, size effect or liquidity effect? Study on the Indonesian stock exchange. *Jurnal Manajemen Strategi Bisnis Dan Kewirausahaan*, *8*(1), 11-17.

Pandey, A., Sehgal, S., Mohapatra, A. K., & Samanta, P. K. (2021). Equity market anomalies in major European economies. *Investment Management and Financial Innovations*, *18*(2), 245-260. https://doi.org/10.21511/imfi.18(2).2021.20

Pasaribu, R. B. F. (2010). *Overreaction anomaly on the Indonesian stock exchange: LQ-45 stock research*. Germany: University Library of Munich.

Plastun, A., Kozmenko, S., Plastun, V., & Filatova, H. (2019). Market anomalies and data persistence: The case of the day-of-the-week effect. *Journal of International Studies*, *12*(3), 122-130. https://doi.org/10.14254/2071-8330.2019/12-3/10

Putra, A. S. (2021). *Overreaction analysis: The existence of winner-loser anomalies in LQ45 stocks*. Doctoral Dissertation, Universitas Gadjah Mada.

Ratih, D. (2021). Equity market timing and capital structure: Evidence on post-IPO firms in Indonesia. *International Journal of Emerging Markets*, *16*(2), 391-407. https://doi.org/10.1108/ijoem-04-2018-0197

Reddy, K., Qamar, M. A. J., Mirza, N., & Shi, F. (2021). Overreaction effect: Evidence from an emerging market (Shanghai stock market). *International Journal of Managerial Finance*, *17*(3), 416-437. https://doi.org/10.1108/ijmf-01-2019-0033

Ricciardi, V., & Simon, H. K. (2000). What is behavioral finance? *Business, Education & Technology Journal*, *2*(2), 1-9.

Ross, S., Westerfield, R., & Jordan, B. (2023). Essentials of corporate finance. In (11th ed., pp. 656). New York, United States of America: McGraw Hill LLC.

Salur, B. V., & Ekinci, C. (2023). Anomalies and investor sentiment: International evidence and the impact of size factor. *International Journal of Financial Studies*, *11*(1), 1-21. https://doi.org/10.3390/ijfs11010049

Shabri, A. (2019). *Anomaly analysis of size effect in Indonesia stock exchange LQ-45 company study for the 2015-2017 period*. Other Thesis, Yogyakarta Veterans National Development University.

Shefrin, H. (2002). *Beyond greed and fear: Understanding behavioral finance and the psychology of investing*. New York: Oxford University Press. https://doi.org/DOI:10.1093/0195161211.001.0001.

Tanady, M., & Sukamulja, S. (2020). Market overreaction on the Indonesian stock exchange with size effect as a moderating variable. *Jurnal Ekonomi Bisnis dan Kewirausahaan*, *9*(3), 206-217.

Thaler, R. H. (1999). The end of behavioral finance. *Financial Analysts Journal*, *55*(6), 12-17. https://doi.org/https://doi.org/10.2469/faj.v55.n6.2310

Traut, J. (2023). What we know about the low-risk anomaly: A literature review. *Financial Markets and Portfolio Management*, *37*, 297–324. https://doi.org/10.1007/s11408-023-00427-0

Truong, L. D., Cao, G. N., Friday, H. S., & Doan, N. T. (2023). Overreaction in a frontier market: Evidence from the Ho Chi Minh stock exchange. *International Journal of Financial Studies*, *11*(2), 1-12. https://doi.org/10.3390/ijfs11020058

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, *59*(4), S251–S278. https://doi.org/10.1086/296365

Vukovic, D. B., Ingenito, S., & Maiti, M. (2023). Time series momentum: Evidence from the European equity market. *Heliyon*, *9*(1), e12989. https://doi.org/10.1016/j.heliyon.2023.e12989

Wei-Qi, L., & Jingxing, Z. (2018). BM (book-to-market ratio) factor: Medium-term momentum and long-term reversal. *Financial Innovation*, *4*(1), 1-29. https://doi.org/10.1186/s40854-017-0085-6

Woo, K.-y., Mai, C., McAleer, M., & Wong, W. K. (2020). Review on efficiency and anomalies in stock markets. *Economies*, *8*(1), 1-51. https://doi.org/10.3390/economies8010020c

Zaremba, A., Umutlu, M., & Maydybura, A. (2020). Where have the profits gone? Market efficiency and the disappearing equity anomalies in country and industry returns. *Journal of Banking & Finance*, *121*, 105966. https://doi.org/10.1016/j.jbankfin.2020.105966

Zarowin, P. (1990). Size, seasonality, and stock market overreaction. *Journal of Financial and Quantitative Analysis*, *25*(1), 113-125. https://doi.org/10.2307/2330891

Zhang, X., Bissoondoyal-Bheenick, E., & Zhong, A. (2023). Investor sentiment and stock market anomalies in Australia. *International Review of Economics & Finance*, *86*, 284-303. https://doi.org/10.1016/j.iref.2023.03.024d