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Representative Bias Effects on Investment Performance During Stock Market Volatility Events

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This study investigates the influence of familiarity bias and attention grabbing on abnormal returns during black swan events. The analysis employs the traditional Capital Asset Pricing Model, expanded with prospect theory and the Fama and French Three-Factor Model, incorporating psychological variables such as familiarity and attention grabbing. The population comprises all companies listed and actively traded on the Indonesia Stock Exchange from 1997 to 2020. A systematic sampling method was used to determine the sample, resulting in 5,615 observations based on trading days over 23 years across nine sectors. The findings reveal that familiarity bias does not uniformly occur across all sectors during black swan events. Sectors significantly affected, either positively or negatively, include agriculture, consumer goods, finance, mining, property and construction, and trade and services. Moderation analysis shows a negative relationship between attention grabbing and abnormal returns, which weakens during black swan events. This suggests that the negative impact of attention grabbing on abnormal returns diminishes under extreme market conditions. The study highlights the behavioral dynamics of capital markets during rare and unpredictable events, emphasizing the relevance of behavioral finance. It also supports the notion of increasing integration among global financial markets, as evidenced by similar reactions in international capital markets. This research is limited to representative biases, specifically familiarity and attention grabbing. Other psychological biases beyond representativeness remain unexplored and warrant further study, particularly during crisis periods. Additionally, the use of secondary data suggests future research could benefit from primary data collection for deeper behavioral insights.

1. Introduction

1.1 Background

Previous finance literature has focused on the occurrence of anomalies in financial markets as the battleground between traditional finance and behavioral finance. Proponents of behavioral finance argue that market anomalies are empirical evidence that markets move more in line with psychological factors or sentiment than rational measures of true market value. One of these market anomalies is the market response to rare events or Black Swan Events (BSE).

Rare events are different events or phenomena in people's lives that are related to the economy, have a big impact, are difficult to predict, and occur outside of normal expectations.

Examples of rare events are the Asian monetary crisis, global financial crisis, SARS, War on Terror September 11, 2001, Dot-Com Crash, European sovereign debt crisis, Crude Oil Crisis, and COVID-19. In the economics and business literature, these events are analogous to a "Black Swan" that has three characteristics: rarity, extreme impact, and low predictability (Taleb, 2007) . These events are the basis for testing basic assumptions in economics and finance, viz: rational utility (Goodell, 2020).

From another perspective, the behavioral economics literature tries to explain the anomalies that occur in the market with a psychological approach (Cifuentes & Faura, 2020; Thaler, 2016; Akerlof & Shiller, 2010). One of the psychological factors in financial markets is sentiment towards events related to investors' expectations. Positive market sentiment has a positive relationship with stock market movements.

Table 1.1 shows the trend of the Indonesia Stock Exchange (IDX) during sentiment black swan events from 1997-2020. This indicates how responsive the Indonesian stock market is to sentiment in the market and encourages economic agents to capitalize on moments of JCI movement.

Table 1.

Impact of Indonesian Capital Market During Black Swan Events

No.	Black Swan Events	Events Criteria
1	Asian monetary crisis in 1997	JCI decline
2	Dot-Com Crash 2000	JCI decline
3	War on terror September 11, 2001	JCI decline
4	SARS pandemic in 2002	JCI decline
5	The global financial crisis of 2008	JCI decline
6	European sovereign debt crisis in 2009	JCI decline
7	Fukushima nuclear disaster in 2011	JCI Rise
8	Crude oil crisis in 2014	JCI Rise
9	China's Black Monday in 2015	JCI decline
10	Brexit decision in 2016	JCI Rise
11	COVID-19 in 2020	JCI decline

Source of Processed Data, 2023.

Black Swan Events that have an impact on the Indonesian capital market at the regional and even global level based on a review of previous research for several events are presented in the following table.

Table 2.

Black Swan Events Have an Impact on the Indonesian Capital Market

Researcher and Year	Black Swan Events	Conclusion
Rizvi & Arshad (2015)	1997 Asian financial crisis	The Singapore and Korean stock markets were less affected, while the Indonesian and Malaysian markets were inefficient and affected by the crisis.
Ramiah & Graham (2013).	The war on terror of September 11, 2001.	Documented the clear and consistent negative impact of the September 11 terrorist attacks on 14 Indonesian industry sectors and market indices
Nippani & Washer (2004).	SARS pandemic in 2002	No evidence was found that SARS negatively impacted major stock indices related to Canada, the Hong Kong Special Administrative Region of China, Indonesia, the Philippines, Singapore and Thailand.
Majid & Kassim .(2009)	The global financial crisis of 2008.	During the crisis period, all stock markets recorded negative average daily returns. In particular, during the crisis period, the Indonesian market had the lowest average daily loss of 210.6 percent.
Shu et al.,(2018) .	China's Black Monday in 2015.	China's increasing influence in regional financial markets includes the Indonesian stock market.
Olivia et al., .(2020)	COVID-19 Outbreak	Stock prices on the IDX tend to follow the global pattern of falling sharply, then fluctuating at extremes. The JCI lost almost a third of its value, from a high of almost 6,400 points in January 2020 to just under 4,000 points in mid-March 2020.

Source of Processed Data, 2023.

Some rare events that show that the Indonesian capital market is integrated with regional and even global markets, as reported (Majid et al., 2008) , during the Asian financial crisis in 1997-1998, the Indonesian stock market was integrated with ASEAN, US and Japanese stock markets. During the terrorist attacks of September 11, 2001, the Indonesian stock market experienced a significant increase in correlation three months after September 11 (Hon et al., 2004) . During the SARS pandemic in 2004, Indonesian stock market returns showed a significant increase in cointegration relationship and dynamic co-movement, compared to the pre-SARS period (Bhuyan et al., 2010) . The 2008 global financial crisis as reported by (Majid & Kassim, 2009) , stock markets tend to show a greater degree of integration during crisis periods and the Indonesian stock market 0-17 percent (during the crisis). China's Black Monday event in 2015 as found from

research (Shu et al., 2018) , China's increasing influence in regional financial markets including the Indonesian stock market. During the COVID-19 pandemic, the stock markets of both Indonesia, Asia and the world were dynamically integrated due to the global crisis of the COVID-19 pandemic (Sugiyanto & Robiyanto, 2020) .

1.2 Problem Statement

Overall, this research argues that the behavior of the stock market when Black Swan Events impact the economy can be explained from a behavioral finance perspective. For example, the stock market falling at the beginning of the COVID-19 pandemic (March-June 2020) and then rising sharply in the following two quarters is anecdotal evidence to support this research argument. This research uses behavioral finance theory as a basic epistemological assumption to test the presence of representative bias in Black Swan Events that affect stock market volatility.

Interestingly, most empirical research in this area emphasizes the link between Black Swan Events that impact the economy and the stock market. This leaves an empty space as to what is the explanatory basis for the relationship. On the one hand, traditional finance theory tries to explain financial market movements with Fama's (1965) EMH approach, which explains that markets will adjust naturally when market shocks occur. However, empirical financial evidence shows the inability of traditional finance to explain the impropriety that occurs in financial markets when Black Swan Events occur.

For example, Choudhry et al. (2015) concluded that gold does not perform well as a safe haven during periods of financial crisis. This contradicts the theoretical argument of EMH where gold is supposed to be an investment hedge during crisis (Baur & McDermott, 2016) . This argument is corroborated by Junttila el at.(2018) who found the correlation between crude oil futures and aggregate US equities increased in the crisis period. Likewise, the findings of Henriques and Sadorsky(2008) concluded a positive association between crude oil commodity markets and five US recessions in 1973-1975, 1980-1982, 1990-1991, 2001, and 2008-2009.

During the COVID-19 pandemic, Phan & Narayan(2020) found a positive stock market when the country reached 100,000 infections and 100 deaths, for example, the reaction in 50% of the market was positive indicating a possible market correction. This is also supported by Narayan et al.(2021) said sectors, such as healthcare, consumer staples and information technology have been positively impacted by the pandemic while communications, energy, finance, and consumer discretion have been negatively impacted.

To fill the inability of traditional finance to explain market anomalies when rare events occur, contemporary finance literature offers behavioral finance as one of the causes of such

contradictory findings. The grand theory in this area of behavioral finance, prospect theory, suggests that investors make decisions following their psychology (Kahneman & Tversky, 1979), and the impact of Black Swan Events on the stock market likely depends on their psychological biases Daniel et al. (2002). Under circumstances of economic shocks, the psyches of economic agents may dominate rational thoughts when in a volatile market situation stemming from panic. The involvement of emotions, preferences, behavior, character, and various things related to economic agents causes economic agents to not always behave rationally in making decisions. In addition, prospect theory explains how economic agents make decisions in uncertain conditions.

Given the mismatch between EMH and real conditions during Black Swan Events that impact the economy, a better understanding of how investor psychology affects the stock market is critical to the finance literature (Hirshleifer, 2001; Brahmana et al., 2012; Goodell, 2020) . However, this important topic has received little or no direct attention in finance research and is thus poorly understood. This lack of attention may be driven by the difficulty of finding accurate ex-ante indicators of psychological biases. Therefore, this study proposes representative biases, such as familiarity bias and attention grabbing, as the psychological reasons behind the discrepancy. Addressing psychological biases in the gap between EMH and financial empirical findings is the focus of this study. To do so, this study addresses representational bias as a key factor to fill the gap. Representative bias is relying on stereotypes, analogies, or limited samples to refer to the totality of a group's opinions (Ross et al., 2016). Economic agents implement transaction decisions based on past knowledge that matches their mental representations. Examples of representational bias are familiarity bias, herding, and attention grabbing (Brahmana et al. .., 2012)

Related to Black Swan Events that have an impact on the economy, both variables are very important to explain the inability of EMH to explain market behavior. Meanwhile, attention grabbing could also be an explanation for the research gap of EMH. For example, Fong(2013) points out that investors are attracted to bullish stocks and tend to take opportunities due to loss aversion. During Black Swan Events that impact the economy, investor psychology is overshadowed by bearish markets and declining returns (Lowenstein, 2010) . However, if investors find a recommended market, they tend to take up due to their cognitive dissonance (Brahmana et al .., 2012)

In brief, this research is motivated by the inability of EMH to explain empirical findings in rare events that impact the economy. One of the estimation models based on traditional economics,

the Capital Asset Pricing Model (CAPM), will be modified so that it can explain market behavior during Black Swan Events that impact the economy. In other words, this study will add the CAPM's inability to capture extreme risk during Black Swan Events. This research proposes the traditional CAPM model by elaborating the prospect theory using the Fama and French Three Factor Model (FF3FM), adding psychological factors, namely familiarity and attention grabbing, which is the novelty of the research.

The reason for taking familiarity bias and attention grabbing is because in the literature review that these two representative biases have a measurement function using secondary data. In addition, in the behavioral finance literature there is a kind of consensus that investors who carry out representative bias are usually due to more attention grabbing and familiarity.

Based on the background of the problem, as previously described, the problem in this study is formulated as follows:

1. Does higher familiarity bias cause abnormal returns in black swan events?
2. Does higher attention grabbing cause abnormal returns in black swan events?

1.3 Objectives and Scope

Events that occur contain information that can affect the economy and capital markets. The information content of an event can affect the reaction of economic agents and market reactions. Market reaction occurs if there is a change in the price of securities originating from an event. Events that occur in the context of the capital market, there are regular and recurring events such as dividend distribution announcements. In addition to ordinary events, sometimes events occur beyond the expectations of economic agents, namely in the form of rare events. Both events can produce information containing good news and information containing bad news. In this study, the events taken are only events that are classified as bad news, with the criteria of an increase/decrease in JCI above 5%.

The general objective of this study is to examine the role of representative bias in black swan events that occur and impact the economy and stock market. Representative bias is defined along with decision-making procedures based on stereotypical thinking when there is a lack of information using shortcuts, past experience to achieve desired goals. Representative bias is commonly used, while making judgments under uncertainty (Jain et al., 2019) . black swan events are defined by the separate occurrence of rarely observed events. Although statistically unlikely, such events are plausible to the extent that historical examples of such events (or similar events) have been documented (wikipedia). This goal is achieved by collecting and managing data, analyzing, proving empirically, and discussing it. The objectives of this research specifically are:

1. Analyzing the role of higher familiarity bias in causing abnormal returns in black swan events.
2. Analyze the effect of higher attention grabbing on abnormal returns in black swan events.

2. Literature Review

2.1. Related Work

Efficient market theory embodies an important milestone in the advancement of financial theory and is one of the fundamental building blocks of finance, so efficient market theory forms an important part of discussing the behavior of financial markets and their organization (Smith, 1996) . Overall, EMH has become the basis of classical financial theory which explains that market participants have rational behavior. In fact, rational economic agents certainly maximize their utility, namely maximum return and minimum risk based on the information presented in the market. Almost all economic theories hold the view that economic agents often try to maximize their utility which states in decision making between risky choices. If the economic agent acts rationally then when the security price decreases, the security will be purchased. Conversely, if the security price rises, the security will be sold.

Empirically, several studies have argued the EMH approach regarding the rationality of economic agents when black swan events occur. Black swan events create uncertain market conditions. EMH theory embodies a hypothesis that the price of a security reflects all the information it contains. In economic conditions such as the Asian financial crisis, global financial crisis, and health crisis, EMH will explain that the market will respond rationally and not be able to generate abnormal returns.

In the event of the 2008 global financial crisis, research conducted by Mahmood et al.(2011) reported that the level of underpricing in the global economic crisis increased by an average of 10% and in the short term return performance fell further than the Asian financial crisis period. Interestingly, the findings show less **Initial Public Offering** (IPO) activity of companies in the event of a global financial crisis when compared to the Asian financial crisis. This means that the stock market follows a random walk process. From these conditions, economic agents cannot generate more profits by using and observing the behavior of stock price movements in the past.

This is in line with Tsenkov and Stoykova's research(2017) related to stock market efficiency in Southeast Europe. The results showed that eight of the eleven markets analyzed were inefficient using EMH during the global crisis. Rahim and Ahmad's research(2019) shows the existence of volatility persistence, volatility clustering, and leverage effects during the 2008

global crisis based on GARCH model estimation.

The current black swan event, the health crisis, several studies have also tested the EMH in the context of capital markets. Akhtaruzzaman et al.(2020) and Corbet et al.(2020) show a significant increase in the correlation between returns across stocks, sectors and markets during the pandemic. Dima et al.(2021) showed no fundamental changes in market mechanisms or investor decisions during the pandemic which of course contradicts the EMH. Dias et al.(2020) in their research stated mixed confirmation of the EMH by considering the conclusion of the rank variance test, the random walk hypothesis is rejected in the case of stock indices: Dow Jones, SSE and PSI 20, partially rejected in the case of indices: BEL 20, CAC 40, FTSTE Athex 20 and DEX 30, but accepted for indices: IBEX 35 and ISEQ. The results also show that prices do not fully reflect available information and price changes are not independent and identically distributed.

Doubts about the accuracy of market beta as CAPM's sole explanatory variable in predicting expected returns led FF3FM to become the most influential multifactor model. FF3FM views the risk and return relationship based on three factors, namely market return, firm size, and book to market equity. The factors offered by Fama and French become variables that affect portfolio returns, namely book to market and firm size, in FF3FM there are elements of High Minus Low (HML) and Small Minus Big (SMB) which are found and grouping the returns of securities that have high (H), medium (M), and low (L) book to market and grouping stock returns that have small (S) and large (B) company sizes. The Fama and French three-factor asset pricing model was developed in response to accumulating empirical evidence that the CAPM performed poorly in explaining realized returns (Gaunt, 2004) .

In a volatile economy, economic agents sometimes make decisions under conditions of rapidly changing information. Economic changes due to an event lead to cognitive biases that affect decision making under uncertainty and risk. As expressed by Kahneman and Tversky which is formulated in prospect theory. This theory explains how individuals give excessive weight to certain outcomes rather than uncertain ones. In this case, economic agents dig up information first and finally make several decision concepts (decision frames). Then the economic agent makes a decision by choosing one of the concepts that yields the greatest expected utility. The main element of prospect theory is an S-shaped value function that is concave (risk averse) in the gain domain and convex in the loss domain, both measured relative to a reference point (Grinblatt & Han, 2005) . In prospect theory, economic agents choose the bet with the highest overall value from a pair of alternatives (Bromiley, 2010) . Making choices

under uncertainty by maximizing a value function that evaluates changes in wealth, rather than an expected utility function ranks choices according to expected utility levels. Value functions are positive and concave in the positive change domain, negative and convex in the negative change domain (Ljungqvist & JR, 2005) .

Almost all capital and financial markets in the world experienced a decline when the health crisis hit. The market decline during the pandemic has resulted in investor behavior in Indonesia (Budiarso et al., 2020) . Efficient Market Theory, Prospect Theory, and Signaling Theory are consistent with the phenomena surrounding the COVID-19 pandemic in Indonesia. The shock of the health crisis at the end of 2019 until now has been felt by all countries, both countries that have advanced in terms of technology and those that have not. There is no significant impact of return volatility originating from developed countries on the Chinese stock market. Whereas China has a significant impact on the volatility of the most developed countries in the world (Switzerland, Sweden, the Netherlands, and the United Kingdom) except the United States during COVID-19 (Zhang et al .., 2021)

2.2. Research Gap

Familiarity is conceptually an attempt to process new information quickly and efficiently, the brain uses subconscious neural networks to shorten the lengthy calculations required for good decision-making. The volatile behavior of foreign and domestic institutional investors is more consistent with the familiarity explanation (Hiraki et al., 2003) . The highly significant preference of foreign and domestic institutional investors for well-capitalized firms is explained by investors' familiarity with the market conditions or location of their clients. The method used log market value of equity as the size of the company and export ratio (export sales divided by total sales) to measure investor familiarity. From the research of Che et al.(2020) provides evidence in favor of familiarity and hedging. When insurance companies buy shares in other insurance companies, they prefer companies that are similar to their own companies. The method used in investigating the nature of familiarity is the return of the transaction-based portfolio of insurance companies as an indicator of asymmetric information and tests whether trading in insurance company shares in the industry obtains superior returns.

Rare events cause extreme jumps in economic fundamentals which include the global financial crisis, the debt crisis, and the health crisis that led to the financial crisis. Empirical evidence on rare events over the last century with gross domestic product per capita impacts ranges between 15% and 64% (Barro, 2006) . Economic agents may largely dislike rare events

that are unknown when they occur and difficult to forecast. The world has recently experienced several rare events with catastrophic consequences: the global financial crisis, the European sovereign debt crisis , and the Fukushima nuclear accident. These events have in common that decision makers both market participants and regulators seem to be unprepared for them (Mackowiak & Wiederholt, 2018) .

H_1: Higher familiarity bias causes abnormal returns during black swan events.

Economic agents pay increased attention to events that have an impact on financial markets. IPO events are also the concern of many agents both before and after. The role of underpricing and its relationship with investor attention is seen from the post-IPO performance in the short and long term in IT companies. IT companies that IPO too cheaply in the early stages become investor attention. By using the Google Trends method to measure investor attention (Chang & Kwon, 2020) . Attention investors have a stronger impact than other macroeconomic variables. Using the same measurement to measure investor attention, also create dummy variables to reflect the impact of investor attention (Chen, 2015) . Investor attention is based on abnormal market activity. Investor attention is associated with a significant increase in the abnormal trading volume of stocks actively discussed online. Interestingly, less sophisticated individual investors continue to buy more attention-grabbing stocks for a week after active discussion of those stocks (Choi & Choi, 2019) .

Experienced investors act more carefully in making their investment decisions. Investors with more experience tend to have less home bias when stocks attract a lot of attention and less attention. In the study, the method used was the Google SVI active attention measure (Gavish et al., 2020) . Less experienced individuals have a tendency to chase stocks that attract attention. Attention-grabbing stocks can be abnormal volume, extreme returns, and company stocks at IPO. Medium and large investor groups, are sellers of attention-grabbing stocks and prefer non-attention-grabbing stocks, thus exhibiting behavior similar to institutional investors (Li et al .., 2015)

History has recorded several major events that have shaken the economies of all countries. The integration of financial markets with various markets in today's economy is very complex, such as financial markets with commodity markets. Demand side shocks, especially aggregate demand shocks, affect volatility by 10% of its total variability, in the long run. Using the method of calculating realized volatility RVgt using the Morgan Stanley Capital International country

index (Bastianin et al., 2016) . Stock market volatility of oil-exporting countries is more volatile than oil-importing countries, oil-exporting stock market volatility has a more homogeneous pattern than oil-importing countries. Using DiagBEKK method for estimation of varying correlations (Boldanov et al . ., 2016)

Political escalation is an issue that impacts the decisions of economic agents in financial markets. Arab Spring and political turbulence contribute to MENA stock market volatility, especially for Islamic indices; however there is little to no significant influence on interaction and integration with world markets. Adopting the empirical methodology of GARCH (Chau et al., 2014) . The existence of a bidirectional causal relationship between stock market volatility and the business cycle in each country when the financial crisis hit, using the univariate GARCH model method (Choudhry et al. . ., 2016)

H_2: higher attention grabbing causes abnormal returns during black swan events.

3. Methodology

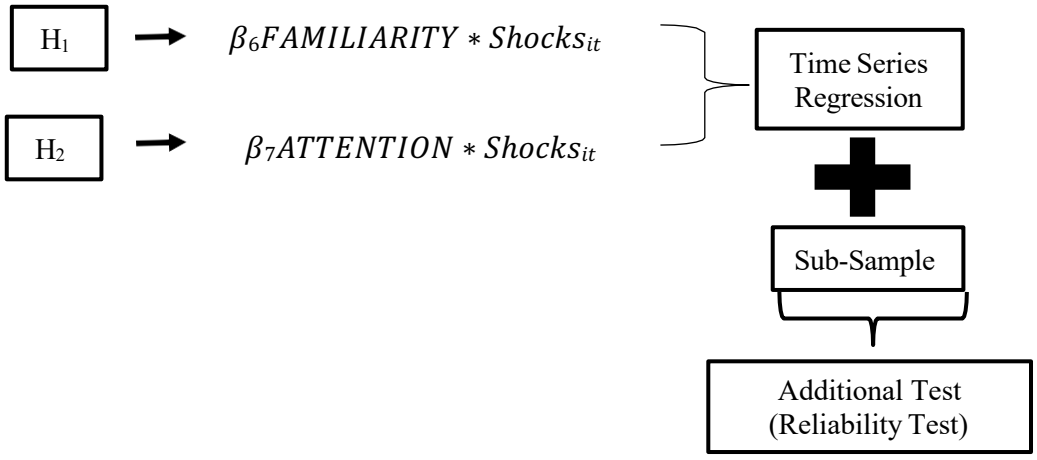
3.1 Data Collection

The type of data used in this study is secondary data derived from external sources, namely data published by the IDX through The Indonesia Capital Market Institute and Yahoo Finance. In addition to these three sources, data on Bank Indonesia Certificates (SBI) were taken from the Bank Indonesia website. Data retrieval method by downloading on the website and contacting the data source for data that is no longer available on the website such as contacting by sending an email todata@ticmi.co.id . The years of data used are the 1997 Asian Monetary crisis, the 2000 Dot-Com Crash, the September 11, 2001 war on terror, the SARS pandemic in 2002, the 2008 global financial crisis, the 2009 European sovereign debt crisis, the 2011 Fukushima nuclear disaster, the 2014 crude oil crisis, China's black Monday 2015, the 2016 Brexit decision and COVID-19 in 2020. Daily data in the form of individual stock volume, stock price and JCI, sectoral index, daily stock return, daily market return, daily volume, SBI rate, market capitalization, book to market ratio, and shock dummy.

3.2 Analysis Techniques

This subchapter is made to clarify the hypothesis testing procedure in this study. The main hypothesis test is the time series regression on model (6). The conclusion for the hypothesis test will be drawn from the beta coefficient values of β_6, β_7, β_8, and β_9. Meanwhile, the other beta coefficients in model (6) are control variables that aim to isolate the effect of the main independent variable and ensure that model (6) fulfills the Best, Linear, Unbiased, and Efficient elements in accordance with the procedures of (Petersen, 2009) and (Gujarati et at .., 2012)

Hypothesis Testing Workflow



This study adds three additional hypothesis tests (reliability tests) to ensure that the conclusions drawn are vigorous and robust. The first reliability test is a sub-sample method that aims to see the impact of representative bias on the performance of the Indonesian stock market when black swan events occur . The second reliability test is the event-study method used to see significant differences between the representative bias before, during, and after black swans. The hypothesis testing workflow procedure can be seen in Figure 3.2.

Model Specifications

The basic model is based on the unification of the Fama-French three factors and prospect theory. In finance, the Fama-French three factors is a model for estimating market risk according to three main asset price characteristics, namely Small Minus Big (SMB), High Minus Low (HML), and the market premium. This model was designed by Fama-French (1992) to describe the behavior of stock returns. The model is as follows:

$$r = r_f + \beta_1(r_m - r_f) + \beta_2(SMB) + \beta_3(HML) + \varepsilon \quad (1)$$

Where:

r = Stock return

r_m-r_f = Market risk premium

SMB = Small Minus Big

HML = High Minus Low

The behavioral finance literature empirically demonstrates that the assumption of rationality is a weak principle. Prior studies report that investment decisions are not entirely rational (e.g.,

Nofsinger, 2010), which contradicts the core assumptions of traditional finance. To address this issue, the present study incorporates behavioral variables within the theoretical framework of Kahneman and Tversky (1979). It is argued that psychological factors significantly influence investment decisions, and one such factor is representative bias (Brahmana et al., 2012). Therefore, the representative bias dimension is integrated into the proposed model.

$$\beta_1, \beta_2, \beta_3$$

$$\text{Representative Bias} = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)} \quad (2)$$

$$\text{Covariance}(R_e, R_m) = \frac{\sum(R_{e,n} - R_{e,avg})(R_{m,n} - R_{m,avg})}{(n-1)} \quad (3)$$

$$\text{Variance}(R_m) = \frac{\sum(R_{m,n} - R_{m,avg})^2}{n} \quad (4)$$

Where: Representative bias i t Representative bias it = Representative bias for security i in period t This study defines and limits representative bias to two constructs: familiarity bias (FB) and attention grabbing (AG). The dimensions of representative bias are divided into these two variables. In addition, firm characteristics such as market capitalization are included as control variables to isolate the primary effect of representative bias on market behavior.

$$\pi_t = \beta_0 + \beta_1 \text{FAMILIARITY}_t + \beta_2 \text{ATTENTION}_t + \beta_4 \text{Shocks}_t + \sum_{i=5}^{t} \beta_9 [\text{FAMILIARITY}_t + \text{ATTENTION}_t + DU + DL][\text{Shocks}] + \beta_6 SMB_t + \beta_7 HML_t + \beta_8 SIZE_t + e_t \quad (5)$$

Where:

PERF = Abnormal return

Familiarity $_t$ = Familiarity in period t

Attention $_t$ = Attention in period t

Shock = A rare economic event

SMB = Difference between small stock portfolio return and large stock portfolio return portfolio (company size approach).

HML = Difference of stock portfolio return with book to market ratio is high with the stock portfolio return with book to market ratio (approach to BE/ME).

Size $_t$ = Capitalization in period t

The explanation of the psychological effect when Black Swan Events occur will be measured by the interaction coefficient of each representative bias proxy (familiarity, and attention) with the shocks variable specified by $\sum^{i} [FAMILIARITY + ATTENTION][Shocks]$. If the interaction

i=1 coefficient between familiarity and shocks is positive and significant, the conclusion is that the extreme risk increase that occurs when black swan events occur is due to the high familiarity bias. If the interaction coefficient between attention and shocks is positive and significant, the conclusion is that the increase in extreme risk that occurs when black swan events occur is due to high attention bias.

3.3 Validation

This study adds a robustness test with a sub-sampling approach. This is to strengthen the conclusion of the hypothesis test derived from the model estimation above. The procedure is as follows.

1. The research period is broken down following black swan events.
   Then re-estimation of the model is carried out using the following model:
2. $$\pi_t = \beta_0 + \beta_1 FAMILIARITY_t + \beta_2 ATTENTION_t + \beta_5 SMB_t + \beta_6 HML_t + \beta_7 SIZE_t + e_t \quad \textbf{(6)}$$
   In the model, the shocks variable is omitted as it is already a manipulation variable for sub-sampling.
3. Inferences will belong to each research period. For example, when the model is re-estimated in the 1997 monetary crisis, and it is found that the familiarity coefficient is positive and significant, this means that high familiarity bias causes high risk during the 1997 monetary crisis period. Another example, when the model is re-estimated in the COVID-19 period, and the attention coefficient is positive and significant, this means that high attention bias causes high risk during the COVID-19 period.

The model reliability test is conducted to test the robustness of the main regression model (formula (5)) if the model is tested by modifying the regression model. In this study, the model reliability test was conducted to test the sensitivity and consistency of the research results using the main model. The main research model is research on all companies listed on the IDX during the 1997-2020 period. While the second model is formula number 6 in each period of rare events that have an impact on the economy such as the 1997 Asian monetary crisis, Dot-Com Crash 2001, the war on terror September 11, 2001, the SARS pandemic in 2004, the 2008 global financial crisis, the 2009 European sovereign debt crisis, the 2011 Fukushima nuclear disaster, the 2014 crude oil crisis, China's black Monday 2015, the Brexit decision 2016 and COVID-19 in 2020. Grouping companies based on industries that have been grouped by the IDX, namely nine sectors.

4. Results and Discussion

4.1 Key Findings

Good data distribution shows that the standard deviation value does not exceed twice the mean value (Edward & Livingston, 2004) . The sectors that have good data distribution are the basic and chemical industry sector (1,685), the infrastructure, utilities and transportation sector (1,736), and the trade, services and investment sector (1,467). A data distribution that exceeds twice its mean value indicates that the data distribution may be deviated. A large deviation in data distribution does not mean that it violates the normality test, because the normality test examines the distribution of residual data. Sectors with standard deviation values exceeding twice the mean value are the agriculture sector (2,094), consumer goods sector (7,209), financial sector (2,622), mining sector (2,081), miscellaneous industry sector (2,001), and property, real estate and building construction sector (2,069).

The agricultural sector shows that almost all independent variables are significantly correlated with abnormal returns, except attention grabbing and firm size. Correlations with major independent variables show negative associations except SMB. This indicates that large familiarity bias, market consensus in bearish conditions, opinion divergence in bullish conditions, and small attention grabbing correlate with low abnormal returns. Almost all correlation coefficients between independent variables are relatively small (-0.3 to 0.3), except for the familiarity bias-company size (0.3286) and SMB-HML (0.3978) correlations.

The Basic Industry and Chemical sector shows that almost all independent variables are significantly correlated with abnormal returns, except company size and SMB. Correlations with the main independent variables show negative associations except attention grabbing. This indicates that large familiarity bias, market consensus in bearish conditions, opinion divergence in bullish conditions, and small attention grabbing correlate with low abnormal returns. All correlation coefficients between independent variables are relatively small (-0.3 to 0.3).

In the Consumer Goods Industry sector, most of the independent variables show a significant relationship with abnormal returns, with the exception of attention grabbing and SMB. All major independent variables show a negative relationship, indicating that high familiarity bias, market consensus during bearish conditions, divergence of opinion during bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficient values between independent variables are in the small range (-0.3 to 0.3).

In the financial sector, most of the independent variables show a significant relationship with abnormal returns, with the exception of attention grabbing and firm size. All major independent variables show a negative relationship, indicating that high familiarity bias, market consensus in bearish conditions, divergence of opinion in bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficients between independent variables are in the small range (-0.3 to 0.3).

In the infrastructure, utilities and transportation sector, most of the independent variables show a significant relationship with abnormal returns, with the exception of familiarity bias, attention grabbing, and firm size. All major independent variables show a negative relationship, indicating that high familiarity bias, market consensus during bearish conditions, divergence of opinion during bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficients between independent variables are in the small range (-0.3 to 0.3), except for the correlation between familiarity bias and firm size which reaches 0.3734.

In the mining sector, most of the independent variables show a significant relationship with abnormal returns, with the exception of attention grabbing and firm size. The main independent variables show a negative relationship except DL, indicating that high familiarity bias, the existence of market consensus during bearish conditions, the occurrence of opinion divergence in bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficients between independent variables are in the small range (-0.3 to 0.3), except for the correlation of familiarity bias with company size which reaches 0.5091. In the miscellaneous industry sector, most of the independent variables show a significant relationship with abnormal returns, with the exception of familiarity bias and attention grabbing. All major independent variables show a negative relationship, indicating that high familiarity bias, market consensus in bearish conditions, divergence of opinion in bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficient values between independent variables are in the small range (-0.3 to 0.3), except for the SMB-HML correlation which reaches 0.5948.

In the property, real estate and building construction sector, most of the independent variables show a significant relationship with abnormal returns, with the exception of attention grabbing and firm size. All major independent variables show a negative

relationship, indicating that high familiarity bias, market consensus in bearish conditions, divergence of opinion in bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficients between independent variables are in the small range (-0.3 to 0.3).

In the trading, services and investment sectors, most of the independent variables show a significant relationship with abnormal returns, with the exception of attention grabbing and firm size. All major independent variables show a negative relationship, indicating that high familiarity bias, market consensus in bearish conditions, divergence of opinion in bullish conditions, and low attention grabbing are associated with low abnormal returns. Most of the correlation coefficients between independent variables are in the small range (-0.3 to 0.3).

The regression model estimation results in the agricultural sector show a positive relationship between familiarity bias and abnormal returns (β=0.264 SE=0.03), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.264%. However, black swan events moderate this relationship by weakening the effect of familiarity bias (β=-0.192 SE=0.03), which partially does not support hypothesis 1. The attention grabbing variable and its interaction with black swan events are insignificant, while the controlling variables firm size and SMB show a negative effect, while HML has a positive effect on abnormal returns.

The regression model estimation results in the basic and chemical industry sector show a positive relationship between familiarity bias and abnormal returns (β=0.144 SE=0.03), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.144%. Insignificant variables include attention grabbing, shock, interaction of familiarity bias with black swan events, interaction of attention grabbing with black swan events, as well as controlling variables of firm size and SMB, while HML shows a positive effect on abnormal returns.

The results of the analysis in the consumer goods industry sector show that black swan events strengthen the positive relationship between familiarity bias and abnormal returns (β=0.355, SE=0.19), which supports hypothesis 1. Shock variables have a significant negative impact on abnormal returns (β=-6.943, SE=2.94), indicating a significant difference of -6.943% between the presence and absence of black swan events. Insignificant variables

include familiarity bias, attention grabbing, the interaction of attention grabbing with black swan events, as well as the control variables of firm size and SMB, while HML shows a positive effect on abnormal returns. The regression model estimation results in the financial sector show a positive relationship between familiarity bias and abnormal returns (β=0.120 SE=0.04), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.120%. However, black swan events moderate this relationship by weakening the negative effect of familiarity bias (β=-0.084 SE=0.05), suggesting that the negative effect of familiarity bias on abnormal returns becomes less significant when black swan events occur. Insignificant variables include attention grabbing, shock, interaction of attention grabbing with black swan events, as well as controlling variables of firm ize and SMB, while HML shows a positive effect on abnormal returns.

The regression model estimation results in the infrastructure, utilities and transportation sector show a positive relationship between familiarity bias and abnormal returns (β=0.084 SE=0.04), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.084%. Insignificant variables include attention grabbing, shock, interaction of familiarity bias with black swan events, and interaction of attention grabbing with black swan events, as well as control variables of firm size and SMB, while HML shows a positive effect on abnormal returns.

The regression model estimation results in the mining sector show a positive relationship between familiarity bias and abnormal returns (β=0.220 SE=0.03), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.220%. The shock variable has a significant positive impact (β=2.389 SE=0.64), indicating a 2.389% difference in abnormal returns between the presence and absence of black swan events. Black swan events moderate the relationship by weakening the negative effects of familiarity bias (β=-0.140 SE=0.04) and attention grabbing (β=- 0.062 SE=0.04), which partially do not support hypotheses 1 and 2. The attention grabbing variable is not significant, while the controlling variables firm size and SMB show a negative effect, while HML has a positive effect on abnormal returns.

The regression model estimation results in the miscellaneous industry sector show a

positive relationship between familiarity bias and abnormal returns (β=0.148 SE=0.03), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.148%. Insignificant variables include attention grabbing, shock, interaction of familiarity bias with black swan events, and interaction of attention grabbing with black swan events, while the controlling variables of firm size and SMB show a negative effect, while HML has a positive effect on abnormal returns.

The regression model estimation results in the property, real estate, and building construction sectors show a positive relationship between familiarity bias and abnormal returns (β=0.107 SE=0.02), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.107%. The shock variable has a significant positive effect (β=1.252 SE=0.53), indicating a 1.252% difference in abnormal returns between the presence and absence of black swan events. Black swan events moderate the relationship by weakening the negative effect of familiarity bias (β=-0.084 SE=0.03), which partially does not support hypothesis 1. Insignificant variables include attention grabbing and its interaction with black swan events, while the controlling variable firm size is insignificant, while SMB and HML show a positive effect on abnormal returns.

The regression model estimation results in the trade, services and investment sectors show a positive relationship between familiarity bias and abnormal returns (β=0.115 SE=0.02), which supports hypothesis 1 and is consistent with the findings of Arena & Howe (2008), where every one unit increase in familiarity bias increases abnormal returns by 0.115%. The shock variable has a significant positive effect (β=0.883 SE=0.48), indicating a 0.883% difference in abnormal returns between the presence and absence of black swan events. Black swan events moderate the relationship by weakening the negative effects of familiarity bias (β=-0.061 SE=0.03) and attention grabbing (β=-0.264 SE=0.15), which partially do not support hypotheses 1 and 2. Insignificant variables include attention grabbing and firm size, while SMB shows a negative effect and HML has a positive effect on abnormal returns.RetryClaude can make mistakes. Please double-check responses.

4.2 Interpretation of Results

A summary of the results for the entire sample and sub-sample is presented in table 3. When viewed from all events that occur or called the full period, the psychological bias that makes abnormal returns significant is familiarity bias in sectors 1, 3, 4, 6, 8 and 9.

The sub-sample period, the Asian Monetary Crisis (KMA) event, only sector 2 has a familiarity bias that has a significant effect on abnormal returns. While the psychological bias of attention grabbing only affects sector 5 on abnormal returns. The Dot-Com Crash event related to familiarity bias is the same as the KMA event. Sector 2 only occurs psychological bias attention grabbing effect on abnormal returns. Familiarity bias is indicated to be significant in sectors 1 and 3 during the War on Terror (PMT) event. When SARS hit Indonesia in 2002, it caused familiarity bias in several sectors such as sectors 1, 2, 3, 4 and 7. Attention grabbing psychological bias did not occur in all sectors during the SARS event.

During the economic event, namely the Global Financial Crisis (GFC), familiarity bias occurs significantly on abnormal returns in sectors 2 and 3. Furthermore, attention grabbing occurs significantly on abnormal returns in sectors 4, 6 and 9. During the European Sovereign Debt Crisis (KUNE) event which has an association between familiarity bias and abnormal returns significantly occurs in sectors 1, 2 and 6. For attention grabbing in sectors 4 and 5 there is a significant influence on abnormal returns. Rare events in the form of the Fukushima Nuclear Disaster (BNF) psychological bias that occurs only in sectors 3, 7 and 8 for familiarity bias. On the other hand, familiarity bias occurs in 3 sectors for attention grabbing, namely sectors 1, 3 and 9.

At a time when the world's conditions require renewable energy due to the decline in energy and even crises such as the Crisis of Oil (CPO). The energy crisis also causes psychological bias in the form of familiarity bias in this event in several sectors, namely, sectors 1, 4, 8 and 9. For attention grabbing occurs in sectors 2, 5, 6, and 7. The dark period that occurred in China in the form of Black Monday China (BMC), did not cause familiarity bias and attention grabbing. When the UK's political decision to leave the Euro currency did not cause psychological bias (familiarity bias) but rather attention grabbing bias. The last event in this study, Covid-19, did not cause psychological bias in the form of familiarity bias and attention grabbing.

Table 3. Summary of Results

Events	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9
Full Period	Fam[-]		Fam[+]	Fam[-]		Fam[-]	Fam[-]	Fam[-]	
Asian Monetary Crisis		Fam[+] Size[-]			Atten[+] Smb[+] Hml[-]		Smb[-]		
Dot-Com Crash	Size[-] Smb[-] Hml[+]	Fam[+] Atten[-] Smb[-]	Smb[-] Hml[+]	Smb[-] Hml[+] Size[-]	Hml[+]	Smb[-] Hml[+]	Smb[-]	Smb[-] Hml[+]	
War on Terror	Fam[+] Size[-] Smb[-]	Smb[-]	Atten[+] Smb[-] Hml[+]	Smb[-] Hml[+]	Fam[+] Atten[-] Hml[+]	Smb[-] Hml[+]	Atten[+] Smb[-] Hml[+]	Smb[-] Hml[+]	
SARS 2002	Fam[+] Hml[+]	Fam[+] Smb[+]	Fam[+] Hml[+]	Fam[+] Smb[-]		Fam[+] Smb[-]	Size[-] Smb[-] Hml[+]		
Global Financial Crisis	Hml[+]	Fam[+]		Fam[+] Atten[-] Smb[-] Hml[-]	Hml[-]	Atten[-]		Atten[-]	
European Sovereign Debt Crisis	Fam[+] Smb[-] Hml[-]	Fam[+] Size[+] Hml[+]	Hml[+]	Atten[-]	Atten[-]	Fam[+] Size[+] Hml[+]		Hml[+]	
Fukushima Nuclear Disaster	Atten[-]	Hml[+]	Fam[+] Atten[-] Hml[-]	Size[+] Smb[-]	Size[+] Smb[+] Hml[+]	Fam[+] Hml[+]	Fam[+] Hml[+]	Atten[-]	
Crude Oil Crisis	Fam[+] Smb[-] Hml[+]	Atten[+]	Hml[+]	Fam[+] Atten[+] Hml[+]	Atten[+] Hml[+]	Atten[+]	Fam[+] Smb[-] Hml[+]	Fam[+] Hml[+]	
Black Monday China		Hml[+]	Hml[+]	Hml[+]		Hml[+] Smb[-]	Size[+] Hml[+]	Smb[-] Hml[+]	
BREXIT Decision	Smb[-] Hml[+]	Hml[+]		Atten[-]	Smb[+] Hml[+]	Hml[+] Smb[-]	Size[+] Hml[+]	Size[+] Hmb[-] Hml[+]	
COVID-19	Smb[-] Hml[+]	Size[-] Hml[+]	Smb[+] Hml[+]	Hml[+] Size[+]	Smb[-] Hml[+]	Hml[+] Smb[-]	Hml[+]	Smb[-] Hml[+]	

Source: Processed Data

Notes:

- Sector 1 = Agriculture
- Sector 2 = Basic Industry and Chemicals
- Sector 3 = Consumer Goods Industry
- Sector 4 = Finance
- Sector 5 = Infrastructure, Utilities, and Transportation
- Sector 6 = Mining
- Sector 7 = Miscellaneous Industries
- Sector 8 = Property, Real Estate, and Building Construction
- Sector 9 = Trade, Services, and Investment

5. Discussion

5.1 Comparison with Prior Research

The research results for familiarity bias vary, some are positive, some are negative, and also insignificant, meaning that they support EMH theory and some do not support it. Positive familiarity bias is indicated in the consumer goods, and financial industry sectors. This result supports the findings of Seiler et, al.,(2020) the level of familiarity bias and the subjective probability of an investment being successful tend to be positively correlated. That is, the more familiar an investor is with a company or investment, the higher the familiarity bias, the more irrational the market, the higher the abnormal return. The results that show negative are recorded in the agriculture, mining, property, real estate and building construction sectors, and the trade, services and investment sectors. While other sectors are not significant, namely the basic and chemical industry sector, infrastructure, utilities and transportation and miscellaneous industry sectors. In each black swan event and in each sector, it indicates that the effect of familiarity bias is not always the same to the market when black swan events occur. The effect also has a different magnitude of impact in each JCI sector.

There is much evidence that investors prefer familiar issuers in equity investment. This is because familiarity bias behavior tends to have issuers that are known especially in market stress in order to get abnormal returns. One of the characteristics of issuers that are known to investors so as to cause familiarity bias behavior is local issuers in the agricultural sector, consumer goods industry, finance, mining, property, real estate and building construction, and the trade, services and investment sector. These sectors are sectors dominated by local issuers, this is certainly in line with the findings of Ackert(2005) , that investors are more familiar with local and domestic issuers and are more likely to invest heavily in these issuers.

Several previous articles present the result that investment driven by familiarity bias is a rational response to information constraints as opposed to behavioral heuristics. Investment is driven by familiarity bias which is a rational response to information constraints (Gianneti & Simonov, 2006) . In addition to the news, of course there are many causes of investors doing familiarity. For example, Dong et.al. research,(2020) has presented empirical evidence regarding the discount given by US investors to non-US companies listed in the US in relation to US companies. This shows the negative effect of familiarity bias on investors' equity valuation based on income.

For the attention grabbing results of this study, it shows that significant negatives are found in the mining sector and the trade, services and investment sector, which supports the EMH theory. For other sectors, it is not significant, namely in the agriculture sector, basic and

chemical industries, consumer goods industry, finance, infrastructure, utilities and transportation, miscellaneous industries, and property, real estate and building construction sectors. Significant sectors attract investor attention because investors who act rationally initially become irrational when rare events occur. Investors who attract such attention will value securities based on fundamental value, which is the present value of future cash returns upon the occurrence of rare events.

Attention grabbing, such as sensational news or information that attracts excessive attention, can lead to inefficient markets as it interferes with market mechanisms that should reflect relevant information in asset prices. Investors who fixate on certain news events tend to respond emotionally rather than based on fundamental analysis. This creates irrational collective decisions and leads to price volatility that is disproportionate to changes in the intrinsic value of the asset. As a result, arbitrage opportunities may arise due to market inefficiencies, where savvy investors can take advantage of price gaps and irrational decisions.

Barber and Odean(2008) were the first to find that attention can increase stock prices in the short term. The findings of this study are also in line with the findings of Barber and Odean(2008) , basic and chemical industry sector, consumer goods industry sector, infrastructure, utilities and transportation sector, mining sector, miscellaneous industry sector, and property, real estate and building construction sector. But contrary to the agricultural sector, the basic industrial and chemical sector, the consumer goods industry sector, the financial sector, the infrastructure, utilities and transportation sector, the mining sector, and the trade, services and investment sector. The findings of the moderating results indicate the relationship between attention grabbing and abnormal returns, where black swan events weaken the negative relationship between attention grabbing and abnormal returns. This means that the negative effect of attention grabbing on abnormal returns will be minimized when black swan events occur.

5.2 Limitations

The limitations of this study are only representative bias from the cognitive bias side, namely familiarity bias, and attention grabbing. Meanwhile, there are many psychological biases outside of representative bias and also need to be observed when events occur. Data examination for familiarity bias is limited to overall market behavior. The behavior of familiarity bias between investors is certainly very different, both individual investors, institutions, local and foreign investors. This can certainly be tested on this bias which is a limitation in this study. In addition, due to limited **adjusted close** data, researchers use the closing price of shares for each stock per

day. The last limitation is that this research data uses secondary data so that it provides an opportunity for future research using primary data.

5.3 Future Research

Further research can expand the scope of the study in other countries to compare or verify these results. The findings of this study open up a new area of research, which focuses on the psychological biases of individual investors, their behavior, and their participation in the stock market. Finally, the researcher highlights future research that may be an extension of this study in the form of other psychological bias variables.

As the data used is still aggregate data, there is room for future research. The entry point for future research can be the use of micro data when the data is available in full. It is also possible for future research to test in other countries that have complete micro data.

6. Conclusion

Related to the conclusions from the findings that have been described in the section above. Familiarity bias behavior does not occur in all sectors in Indonesia during rare events. Sectors that are affected by rare events both positively and negatively are the agricultural sector, consumer goods industry sector, financial sector, mining sector, property, real estate and building construction sector, and trade, services and investment sector.

The findings of the moderation analysis indicate a correlation between attention grabbing and abnormal returns. In this context, black swan events weaken the negative relationship between attention grabbing and abnormal returns. In other words, the negative impact of attention grabbing on abnormal returns will be reduced when black swan events occur.

Black swan events by their nature create instability, uncertainty and anxiety in financial markets. Attention-grabbing approaches that use sensational news or information about black swan events can more easily capture the attention of investors who are seeking to understand extraordinary and high-impact events. Investors who are emotionally affected by this news tend to overreact and seek opportunities for unusual returns with quick responses to market changes triggered by the rare event. This can lead to extreme price fluctuations and provide opportunities for unusual gains during periods of market volatility.

Overall, the results of this study indicate that stock market behavior at the time of the black swan event will have an impact on the economy with a behavioral finance perspective. From several events that occurred outside the study also showed the same thing, namely there was a market reaction both the capital market in Indonesia and in other countries because the

stock market tends to show a greater level of integration.

Appendix

APPENDIX 1

List of Black Swan Events and criteria

No.	Black Swan Events	Basis for grouping Events (Taleb, 2007) .			Up. 5% decrea se	Period	Source
		Scarcity	Extreme Impact	Low Predictability			
1	1997 Asian Monetary Crisis	√	√	√	(12,1)	July 2, 1997 - January 13, 1998	(Brière et al., 2012)
2	Dot-Com Crash 2000	√	√	√	(20,3)	March 2000 - end of 2000	(Chen et al., 2017)
3	War on Terror Sep 11, 2001	√	√	√	(5,5)	March 10, 2001 - March 12, 2002	(Nikkinen et al., 2008)
4	SARS 2002	√	√	√	(6,5)	November 16, 2002 - March 2003	WHO
5	Global Financial Crisis 2008	√	√	√	(102,97)	September 7, 2008-March 10, 2009	(Brière et al., 2012)
6	European sovereign debt crisis in 2009	√	√	√	(10)	October 20, 2009 - April 1, 2010	(Ters & Urban, 2018)
7	Fukushima nuclear disaster in 2011	√	√	√	20,8	March 11, 2011 - July 5, 2012	(Pittauerová et al., 2011)
8	Crude oil crisis in 2014	√	√	√	38,8	June 2014 - January 2015	(Su et al., 2017)
9	Black Monday China 2015	√	√	√	(19,2)	November 28, 2014 - June 19, 2015	(Li et al., 2019)
10	Brexit decision in 2016	√	√	√	57,4	November 4, 2015 - June 23, 2016	(Davies & Studnicka, 2018).
11	COVID-19	√	√	√	(73,9)	February 1, 2020	Jiang et al., 2022

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The author realizes that this research still has limitations and shortcomings. Therefore, constructive criticism and suggestions are highly expected for the improvement of further research. Hopefully this research can make a meaningful contribution to the development of science, especially in the field of behavioral finance and can be useful for all readers.

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