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How do Institutional Investors Approach Disposition Effect in Crises?

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Abstract

This work project investigates how institutional investors cope with the disposition effect in crisis and non-crisis environments. Specifically, the internal and external idiosyncratic characteristics of institutional investors are used to find reasons for differences in the magnitudes of factors aggravating disposition effect. The study lays the foundation for easy-to-implement countermeasures against the disposition effect. This is achieved by consolidating countermeasures used by institutional investors in crisis and non-crisis environments into the self-developed SAFE(R) framework and by proposing action points for each investor group to overcome their specific obstacles that cause an increase in disposition effect.

Keywords:

Behavioural biases, behavioural finance, crises environment, disposition effect, institutional investors

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Appx.	Appendix
C.	Crises
CDS	Credit Default Swap
GFC	Great Financial Crisis
H1 / H2	Hypothesis 1 / Hypothesis 2
Inv.	Investor
Mgmt.	Management
N/A	Not applicable
NC	Non-Crises
Vs. Lit.	Versus Literature
VUCA	Volatility, Uncertainty, Complexity, Ambiguity

Introduction

In the today's VUCA world, managing behavioural biases has become ever more important and essential for professional investors to build representative judgements, decrease the complexity of decision-making and safely navigate the wealth of their clients (McKinsey & Company 2019). This work focuses on one of these behavioural biases, the **disposition effect**. The disposition effect is defined as a bias where *"investors are more prone to selling the winning stock and tend to hold on to the loss-making asset"* (Kumar and Goyal 2015).

> *"Purely from the gut, one would say 'I'll throw out the winner, because that just gives a good feeling'. One thinks to himself: 'It's a crisis, I've lost a lot of money, but I've won something else, you can take that gain and let the other stocks go their way'." – Inv. 1*

The tendency of throwing out winners and holding on to losers to 'get a good feeling' has been widely found among both professionals and amateurs (Aren, Aydemir, and Şehitoğlu 2016; Andreu, Ortiz, and Sarto 2020). Yet, particularly professionals bear the duty to make rational decisions, as their decisions represent the interests of their clients, and therefore shoulder a great responsibility to identify and control behavioural biases. When uncertainty among clients and professionals increases in crises, it is even more important to safely steer the clients' wealth (Graseck et al. 2020). This need ultimately translates into the objective of the work project to understand and examine how institutional investors approach disposition effect, especially in crises. Specifically, factors that aggravate the disposition effect and external and internal factors that mitigate the disposition effect were studied, paying particular attention to their role in crises. For this purpose, a causal relationship model was developed based on the literature review. In the course of the study, it emerged that the disposition effect is influenced not only by aggravating and mitigating factors, but also by investors' approach towards it. Consequently, this model was substantiated and extended to include this third influencing variable. These approaches were summarized in a self-developed 'SAFE(R)' framework, which contributes to both practitioners and academics by providing an easy-to-implement approach to counteract the disposition effect. To address these objectives properly, the work project is structured as

follows. Section One gives an overview of the existing literature on disposition effect among institutional and individual investors, focussing on factors aggravating and internal and external factors mitigating the effect in non-crises and crises. Section Two presents the research design, data collection, and data analysis process. Section Three analyses the results obtained from the interviews. It places a special focus on the interviewed institutional investors response to the aggravating factors in non-crises and crises, their idiosyncratic characteristics influencing those factors and their countermeasures towards disposition effect. Section Four compares the results with the existing literature and highlights contributions, limitations, and further research gaps.

1 Theoretical Background

The following section reviews the existing literature on how institutional investors approach disposition effect in crises. In the first part, the aggravating factors of the disposition effect are outlined, focusing on its manifestation among institutional investors and in the environment of crises. The second part examines mitigating internal and external factors.

1.1 Disposition Effect – Theoretical Framework

Traditional theories and principles on investment decisions in financial markets have emerged and been studied extensively over the past decades, building its pillars on Miller & Modigliani arbitrage principles (Modigliani and Miller 1958), Markowitz portfolio theory (Markowitz 1952), Sharpe's capital asset pricing model (Sharpe 1964) and Black & Scholes option pricing theory (Black and Scholes 1973). These approaches, however, consider investors to be rational and markets to be efficient, whereas under real circumstances investors violate the principle of utility maximization and display irrational behaviour (Kalra Sahi 2012). Behavioural finance offers an approach to better understand irrational investor behaviour and combines economic and psychological aspects of financial decision making (Shukla, Rushdi, and Katiyar 2020).

In 1979, Kahneman and Tversky developed the prospect theory, which states that an investor is emotionally greater impacted by loss than by profit, as an alternative to the classical expected

utility function, which claims that an investor chooses the alternative with the highest expected utility, to explain decision-making under uncertainty (Appx. 1). Their discovery facilitated multiple authors to research other anomalies and to develop various theorems, among others: the **disposition effect**. The disposition effect is defined as the tendency of investors to realize gains too soon and hold on to losses too long, firstly noted by Constantinides in 1984 and truly developed by Shefrin and Statman in 1985. The importance and relevance of it is accepted widely in the community (Weber and Hsee 1998; Barberis and Xiong 2009).

1.1.1 Aggravating Factors of Disposition Effect

Amplifiers and mitigators of disposition effect have been widely discussed in literature (Appx. 2). Due to the limited scope of the work, this part will focus solely on amplifiers to address the goal of analysing specific approaches institutional investors apply to mitigate disposition effect in crises. The following biases amplify the disposition effect.

First, the *prospect theory* value function shows that investors assess their losses and gains in an asymmetric manner with respect to a reference point, displaying a risk-seeking behaviour in the area of losses and a risk averse one in the area of gains (Kahneman and Tversky 1979) (Appx. 1). Consequently, the risk averse nature towards gains, leads investors to sell winning investments and the risk seeking nature towards losses, leads investors to hold on to losses instead of realizing them, causing disposition effect (Odean 1998; Grinblatt and Han 2005; Lucchesi, Yoshinaga, and De Castro Junior 2015; Jiao 2017).

Second, *mental accounting* refers to the inclination of investors to classify funds in accordance with their mental accounts, where each mental account has its distinctive value to the investor without interaction between the accounts (Thaler 1999). The behaviour to create different mental accounts can result in disposition effect. If so, investors segregate gains and integrate losses. As gains are concave and losses are convex, it is best to consolidate losses in one mental

account to decrease the severity of pain and segregating gains in multiple mental accounts to maximize joy (Grinblatt and Han 2005; Hur, Pritamani, and Sharma 2010).

Third, *lack of self-control* implies a lack of self-controlling measures, such as stop loss, to force investors to realize loss. Missing ex-ante self-control measures lead to emotional indulgence in the decision-making process itself, and thus to disposition effect. (Thaler and Shefrin 1981; Feng and Seasholes 2005; Richards, Rutterford, and Fenton-O'Creevy 2011; Fischbacher, Hoffmann, and Schudy 2017).

Fourth, *regret aversion* comprises the idea that investors experience negative emotions when selling an investment that underperformed not-selected alternatives. The investor always wants to avoid regret, hence they avoid selling (Shefrin and Statman 1985).

Fifth, *overconfidence* is defined as the overestimation of ones' knowledge and decision-making capabilities (Schiller 2000; Fromlet 2001). Menkhoff (2010) defines three dimensions of overconfidence: unrealistic positive self-evaluation, illusion of control and miscalibration. Investors believe all possible gains have been realized for their sold winning investments and future gains will come for their losing investments, hence amplifying disposition effect (Liu and Chen 2008; Ben-David and Hirshleifer 2012; Trejos et al. 2019).

Sixth, *mean reversion* describes investors belief that asset prices will revert to the average price over time (Poterba and Summers 1988). The belief in mean reversion leads to realizing winners sooner fearing to regret selling the stock before it reverts to the mean. Investors hold on to losers, believing that investments will revert to the mean (Odean 1998; Da Costa, Mineto, and Da Silva 2008; Jiao 2017).

1.1.2 Disposition Effect of Institutional Investors in Financial Crises

This part combines literature on disposition effect among institutional investors as well as literature on the manifestation of disposition effect in crises. Multiple researchers have observed evidence of the disposition effect with individual investors (Aren, Aydemir, and Şehitoğlu

2016). Much fewer papers, however, analyse this phenomenon among institutional ones and have been contradictory for the past several years (Andreu, Ortiz, and Sarto 2020). When comparing both investor groups, the disposition effect was found to be stronger for individual investors (Chen et al. 2007), nonetheless, still significant for institutional ones (Shapira and Venezia 2001; Singal and Xu 2011; Wermers 2003). Literature on disposition effect in bear markets is rather rudimentary (Cheng, Lee, and Lin 2013), while the literature on disposition effect of institutional investors in crises is almost non-existent (Sun, Tsai, and Wang 2013). The literature review clarified that the disposition effect is amplified in crises environments due to, firstly, a shift in the effectiveness of previously mentioned aggravating factors, and, secondly, the appearance of two new amplifiers of disposition effect.

(1) The disposition effect intensifies in crises due to a shift in the intensity of previously mentioned aggravating factors (1.1.1). – First, research has shown that institutional investors are prone to *prospect theory*, being mainly focused on gains and trivializing the possibility of losses, however, less than individual investors (Abdellaoui, Bleichrodt, and Kammoun 2013). Also, as prospect theory is a concept of investors perception of gains and losses, in crises, investors will be more likely placed in the lower left quadrant (Appx. 1), hence experiencing heavy loss and negative utility, leading to high risk-seeking behaviour, by holding on to losses. Second, *mental accounting* was found prevalent among individual and institutional investors, where individual investors are more prone to this bias (Abbink and Rockenbach 2006; Zahera and Bansal 2019). Mental accounts are formed to maximize emotional satisfaction, as losses are aggregated and winners are separately listed (Grinblatt and Han 2005). Consequently, during crises the mental loss accounts excessively extend on aggregated terms. The enlarged loss accounts increase the disposition effect in crises, since investors' reluctance to realize losses increases with the loss's magnitude and risk-taking behaviour only decreases after the loss is realized (Merkle, Müller-Dethard, and Weber 2021).

Third, institutional investors are better at exercising *self-control* measures than individual investors (Lai, Tan, and Chong 2013). Additionally, Lai et al. discovered that investors agree on average more to exercise self-controlling measures under bull market conditions than under bear market conditions. Hence, lack of self-control increases in crises, enhancing the bias.

Fourth, *regret aversion* was found significant among institutional investors at the Nairobi Stock Exchange (Waweru, Munyoki, and Uliana 2008). Moreover, Subash (2012) observed that institutional investors exhibit it to a lesser extent than individual investors. Since in crises regret aversion intensifies as paper losses increase, investors are observed to increase their preference for inaction, resulting in an amplified disposition effect in crises (Alpert and Raiffa 1982).

Fifth, *overconfidence* is observed to be equally present among institutional and individual investors (van de Venter and Michayluk 2008; Waweru, Munyoki, and Uliana 2008). Regarding crisis environments, this bias was found to decrease during market downturns. Jlassi, Naoui, and Mansour observed in 2014 that institutional investors overconfidence decreases during crises period but persists, as investment values heavily decline and investors start to doubt their abilities (Abbes 2013). Generally, overconfidence is found to have no effect on performance or even lead to increased performance according to Ko and Huang (2007). Consequently, overconfidence even decreases in crises, mitigating disposition effect.

Sixth, *mean reversion* does not discriminate by investor type as it is found significant among individual and institutional investors (Lehenkari 2012). However, there is no research that compares the belief between investor types, hence no conclusion about the difference in the degree of believe was yet observed. The belief in mean reversion is especially prevalent among institutional investors when information ambiguity is high, as they believe with greater confidence in their own abilities rather than in public valuation signals, while expecting to benefit from mean reversion (Ben-David and Doukas 2006). Boyarchenko (2012) discovered that CDS spreads increased during the GFC due to, an increase in ambiguity about the quality

of market signals and raised ambiguity in the overall economy. Hence, information ambiguities' rise during crises leads to greater belief in mean reversion, which increases disposition effect.

(2) The disposition effect intensifies in crises due to the appearance of two additional amplifiers. Cici (2012) reveals that institutional investors experience a stronger disposition effect when they are in *need to find cash*, since being forced to sell positions to meet margin calls or redemptions, caused by portfolio outflow. Under these conditions, investors are more likely to achieve their liquidity requirement by selling portfolio winners. Ben-David, Franzoni, and Moussawi (2012) noted that in the GFC redemptions and margin calls were the main reason for the fire sale. Thus, an enhanced call for redemptions causes an increase in disposition effect, also among institutional investors.

Moreover, investors are more prone to disposition effect when experiencing *extreme losses* (Grinblatt and Keloharju 2001; Lee 2010). As markets suffer steep declines in prices during crises, aggregate loss and market inefficiency extremize (Lim, Brooks, and Kim 2008), leading to enhanced disposition effect among institutional investors.

1.2 External and Internal Factors Mitigating Disposition Effect

Although there is no specific research on approaches institutional investors display to diminish disposition effect in crises, the available literature generally covers several factors that mitigate the disposition effect (see, for example, Chen et al. 2007; Vaarmets, Liivammgi, and Talpsepp 2015). Broadly, the mitigating factors can be grouped into two distinct categories: external and internal factors. External factors include independent and immutable conditions, namely team or single investors (Rau 2015), size of fund family and role of the fund management company (Andreu, Ortiz, and Sarto 2020). Internal factors include parameters that are investor specific, namely learning ability and intelligence (Vaarmets, Liivammgi, and Talpsepp 2015), education (Choe and Eom 2009), experience and professional training (Menkhoff 2010; Chou and Wang

2011), age and gender (Talpsepp 2010; Cheng, Lee, and Lin 2013), as well as wealth (Dhar and Zhu 2006; Chen et al. 2007).

(1) Focussing on the external factors – Rau has found in 2015 that investors in *teams* exhibit a stronger disposition effect than subjects investing alone. Similarly Cici (2012) found among mutual funds that working in a team cannot reduce the disposition effect. Moreover, *size of fund family* and *role of the fund management company* were found to influence disposition effect by Andreu, Ortiz, and Sarto (2020). They found that smaller firms exhibit a higher disposition effect and that independent management companies show a stronger tendency to exhibit disposition effect than bank-affiliated funds.

(2) Focussing on the internal factors – First, existing literature found *experience* to weaken disposition effect (Chen et al. 2007). Also, experience was found to decrease the emotional attachment to stocks and enhance rational thinking (Menkhoff 2010). Specifically, the type of experience resulting from historical long-term investment performance as opposed to an adoption of momentum strategy of the institutional investors power to influence asset prices will lead to a weaker disposition effect (Chou and Wang 2011).

Second, Choe and Eom (2009) tested the disposition effect in future markets and found that *professional training* and *education* are the main explanatory factors for its weak evidence. The more investors know about behavioural biases, the more likely they are to observe their own acts of irrationality and use measures against them, thereby reducing the disposition effect.

Third, an investors *ability to learn* and his *intelligence* were found to mitigate the disposition effect (Vaarmets, Liivammgi, and Talpsepp 2015), which was tested using mathematical and logical tests. Additionally, this ability is found to mitigate disposition effect more than professional training and experience.

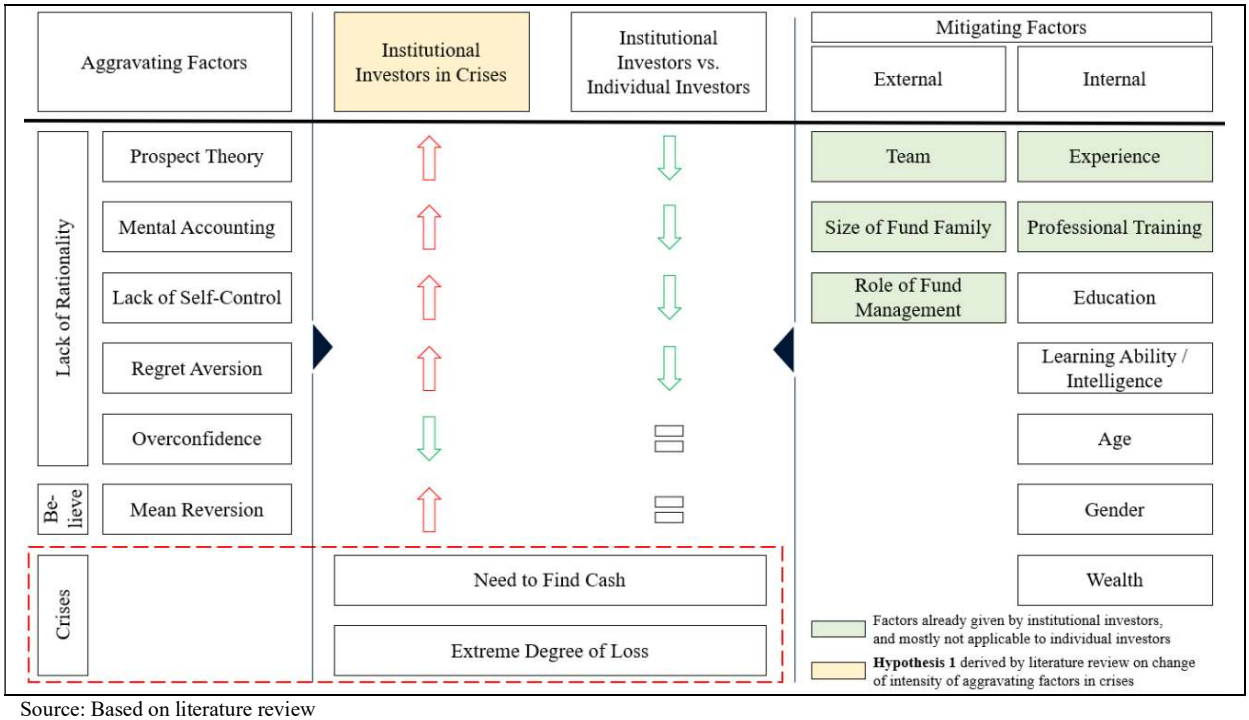
Fourth, the differences in investors *age* and *gender* were observed to affect the disposition effect. Middle-aged investors seem to be more prone to the disposition effect, using age as a

proxy for life experience and sophistication (Chen et al. 2007). Moreover, women tend to exhibit a stronger disposition effect than men (Talpsepp 2010).

Finally, *wealth* seems to impact a decrease in the disposition effect positively. Dhar and Zhu (2006) discovered that wealthier investors exhibit lower disposition effect. Moreover, Vissing-Jorgensen (2003) discovered that wealthier U.S. UBS and Gallop investors show weaker disposition effect. However, Chen et al. (2007) does not conclude this result as he uses age as a proxy for wealth. Separating age and wealth into two distinct internal mitigating factors concludes that younger age and greater wealth decrease the disposition effect.

In summary, institutional investors exhibit a weaker disposition effect than individual investors because many mitigating factors, such as experience and professional training, are given among them. However, in crises several factors increase in intensity, also among institutional investors, causing also those experienced and professional institutional investors to experience an augmentation in the disposition effect. Figure 1 below summarizes the theoretical background.

Figure 1: Theoretical Background – Summary



Source: Based on literature review

Note: The arrows depic the change in the respective aggravating factor among (1) institutional investors in crises, e.g. institutional investors show higher prospect theory in crises than non-crises and (2) institutional investors in comparison to individual investors, e.g. institutional investors show lower prospect theory than individual investors

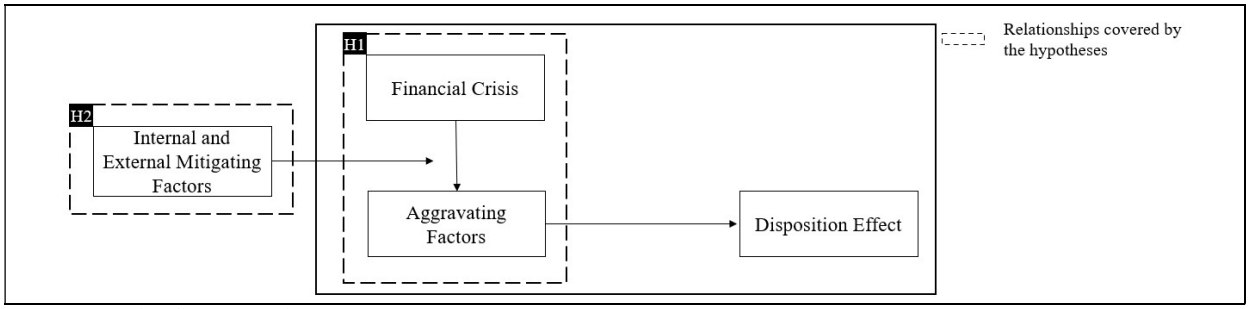
2 Methodology

2.1 Research Design

The purpose of this research project is to establish how institutional investors approach the disposition effect in crises. In order to outline the interdependencies involved, a combination of descriptive and explanatory research was used (Robson 2002). The descriptive approach enables a categorization of investors based on the literature. The explanatory approach helps to apprehend the reasons for change of impact of factors in crises using semi-structured interviews. The combined approach will disclose how and why aggravating and mitigating factors increase or diminish the disposition effect among institutional investors in non-crises and crises.

Based on this, two hypotheses were derived by conducting literature research to crystalize factors influencing disposition effect of institutional investors in all market environments. The first hypothesis was additionally derived by analysing the specific literature of each aggravating factor to determine whether it is enhanced or diminished in crises (Figure 2).

Figure 2: Causal Relationships Disposition Effect



Source: Based on literature review

H1: A crisis environment intensifies prospect theory, mental accounting, lack of self-control, regret aversion and mean reversion, which all aggravate the disposition effect. A crisis mitigates overconfidence. In crises the aggravating factors need to find cash and extreme degree of losses additionally aggravate the disposition effect.

H2: Internal and external factors influence disposition effect in crises.

The hypotheses were tested though semi-structured interviews. This setting was chosen as the case-based interviews could only fully be explored by a flexibilization of the interview process to ensure a flowing conversation and to omit or add questions based on the context (Saunders, Lewis, and Thornhill 2019). Moreover, Saunders et al. (2019) have found that managers rather

agree to be interviewed than filling out a questionnaire, hence the likelihood of portfolio managers participating increased.

Consequently, the combined approach serves as a window into the underlying reasons of investor behaviour and aims at contributing to the theoretical framework. By focusing on the 'how' and 'why', this approach aims at revealing rich, in-depth information rather than using quantitative methods to test general propositions.

2.2 Data Collection Process

In order to test the hypothesis and understand how institutional investors approach disposition effect in crises, I conducted three test interviews and ten interviews with institutional investors from eight different companies (Appx. 3). The data collection process started by contacting five test interview partners among which three agreed to an interview. Among them, two have an industry and one has an academic background (Appx. 4). After reviewing the test interviews, the questionnaire was adjusted by rewording, adding, and omitting certain questions to capture relevant data more adequately and efficiently. In a second step, 15 institutional investors were contacted via a written expose (Appx. 5) and selected with respect to the following criteria:

1. The interviewee is considered an institutional investor under the law applicable
2. The interviewee is actively involved in the investment decision process

The first criterium functions as a borderline to distinguish between individual and institutional investors following the prevailing law. All respondents work as portfolio managers in Germany, Switzerland, or England. The European Union defines institutional investors in the 'Directive 2014/65/EU' (Appx. 6), according to which all interview partners in Germany and one partner in England are considered institutional investors. Although England is not a part of the EU anymore, I consider the law to apply to the English participant, as I interviewed him before the official Brexit (European Union et al. 2020). Furthermore, one portfolio manager's company is registered in Switzerland. However, as his firm solely acts as a fund advisor for an asset

manager listed in Germany, I consider him an institutional investor. The second criterium reinforces the quality of the results, as only investors actively involved in the decision-making process can first-hand explain their own decisions and influences on them. In summary, all investors contacted fulfilled the prior defined criteria.

Additionally, I did not restrict criteria such as years of experience or size of fund family but instead attempted to use their heterogeneity to facilitate the analysis of different results. Among the 15 contacted investors, ten portfolio managers allowed me to set up an interview. All interviews, moreover, were conducted via telephone, due to Covid-19 measures. As the participant necessarily reveals very sensitive information not only about the investments made but also about the investor himself, all investors agreed to audio recording but denied their disclosure and requested that their persona and their company be anonymized (Appx. 7).

The interview was constructed using a semi-structured interview guide drawing on existing literature (Appx. 8). The questionnaire is divided into three parts (1) external and internal mitigating factors, (2) aggravating factors for crises and non-crises and (3) knowledge about and approaches towards disposition effect. The interview guide consists of 42 questions, among which the first twelve are closed, and the others openly formulated. The semi-structured interview ensured comparability between participants, whilst still allowing sufficient room for individuality in the responses (Edwards and Holland 2013). This added to the depth and quality of the findings, as respondents were able to focus more on the important matters to them and shorten the more irrelevant topics.

2.3 Data Analysis Process

Analysing the data began with re-listening to the audio recordings and creating summaries of each interview. Afterwards, the three parts of the interview were evaluated. First, external and internal factors of all participants were summarized (Appx. 9). Second, all aggravating factors were assigned with quotes from each participant. Third, quotes illustrating the knowledge and

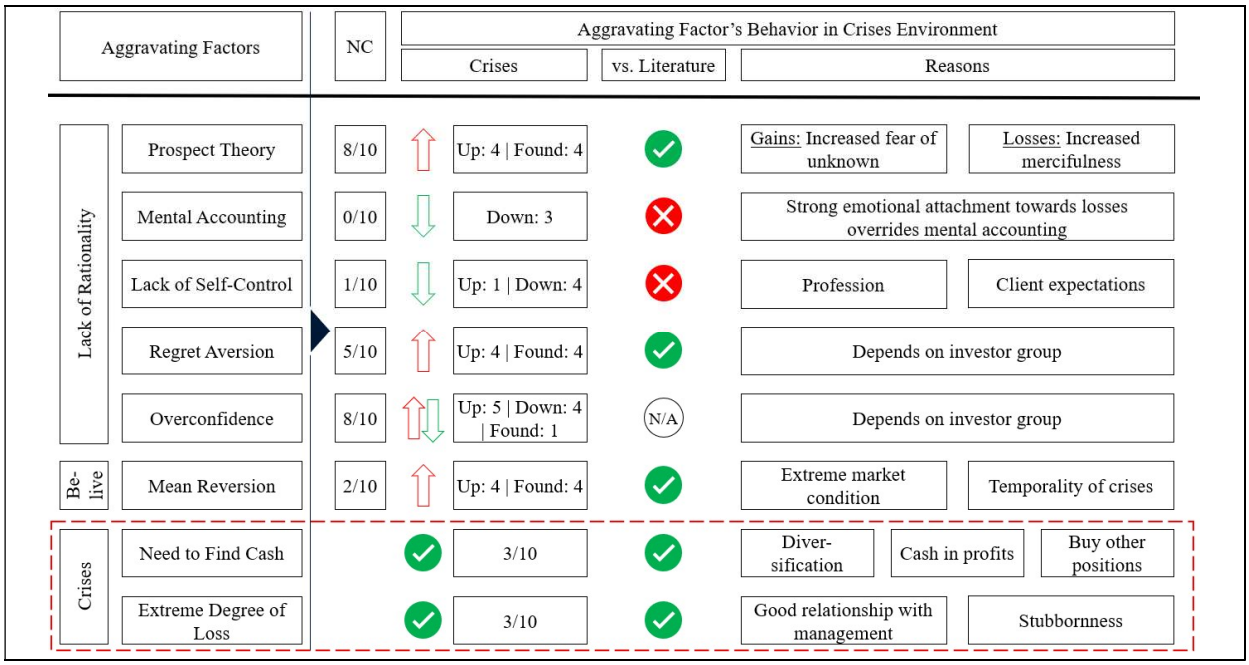
actions portfolio managers take to mitigate the disposition effect were consolidated (Appx. 10 – 12). To offset a too subjective assessment, the classification of the quotations was checked by a third party. In a third step, all the quotes from the second part of the interview were translated into numbers, by assigning a 0 if the factor was not found, a 1 if the factor was found, a 2 if the factor aggravated in crises and a -1 if the factor diminished in crises (Appx. 13). This assignment was also checked by a third party. Finally, this table was used in further analysis to more accurately capture how each investor, in crises and non-crises, copes with the respective aggravating factor, as well as to facilitate different groupings among investors based on their differentiating internal and external factors to find potential explanations for the different approaches and manifestations of the disposition effect.

3 Results

3.1 Increase in Disposition Effect in Crises, due to Increase in Aggravating Factors

The overall number of aggravating factors shown by portfolio managers increased in crises (Appx. 14), where the reasons for change differ for each factor, summarized in Figure 3.

Figure 3: Reasons for Change in Aggravating Factors in Crises – Summary



Source: Based on literature review and interviews

Example: Prospect theory is found among 8 out of 10 investors in non-crises. Among those investors, half of them were even more prone to prospect theory in crises than in non-crises. This finding is consistent with literature review. Reasons for the change include increased fear of the unknown and increased mercifulness.

First, *prospect theory* was found prevalent among most institutional investors, with increasing tendency in crises and is, thus, consistent with the literature review. Reasons for the intensification are (i) increased risk aversion towards gains due to increased fear of the unknown and (ii) increased risk-seeking towards losses due to increased mercifulness.

Gains: "In crises everyone checks where they still have profits on and then kick the stuff out". – Inv. 3
Losses: "In times of crises I am more merciful to myself as everyone loses." – Inv. 1

In the area of gains, raised uncertainty in crises evokes the fear of the unknown and thus the investors desire to escape risk by 'cashing in profit'. In the area of losses, self-mercifulness elicited by downward comparison fuels the risk-seeking behaviour of investors.

Second, *mental accounting* was observed not to occur among institutional investors during non-crises. In contrast to the literature, in crises mental accounting even decreased among Inv. 1, 3 and 9, as they summarized winners and pointed out their loosing positions. This result could be explained by the strong emotional weight investors attribute to large losses, where this powerful emotional attachment overrides the potentially positive feeling induced by pointing out gains.

"I called the bank and sold 4-5 shares, especially technology shares, still in profit. I should have sold this bank ETF, but unfortunately I didn't.". – Inv. 3

Third, in contrast to the literature, most investors had clear processes and *self-controlling measures* to select investments and decide on their further handling. Interestingly, this self-control even elevates among Inv. 2, 6, 8, and 10 in crises (Appx. 15). It is not surprising that existing self-controlling measures are increasingly found among institutional investors because their profession and clients expect them to do so. Only Inv. 3 showed a lack of self-control, he had no self-measures for any environment and even described himself as irrational in crises.

Fourth, the results on *regret aversion* are consistent with the literature review, as this factor was found among half of the portfolio managers in non-crises, showing an even stronger magnitude in crises. In addition, two distinct modes of comparing stocks with other potentials were observed: (1) comparing to avoid regret and (2) comparing to assess investment decision and

to make changes if necessary. The investors using the second type do regret their decision, but instead of practicing the disposition effect, they act on the regret. The reasons for regret aversion greatly differ between different types of investors and is further examined in part 3.2.

Mode 1: "I hope that something positive will come out of the news and that we hopefully won't have to sell at a loss." – Inv. 10

Mode 2: "I'm comparing the opportunities. But here I rather ask myself whether the other share is still worth buying." – Inv. 8

Fifth, *overconfidence* was found among most institutional investors in non-crises, hence confirming the literature review. In crises, albeit, the changes and levels of overconfidence diverge so greatly, that no conclusion can be drawn yet. Part 3.2 seeks to get a deeper understanding by grouping the investors.

Sixth, two investors displayed the *belief in mean reversion* in non-crises. Both investors use mean reversion strategies such as 'Bollinger Bands' or 'Relative Strength Index' as indication for price movements. In crises, eight of the investors were found to justify their holding on to losses or selling winners before the crisis's hits, believing stocks would return to their normal level after the crises. This stems from the view that a crisis is an extreme market condition, that has historically proven to be mostly temporary. These findings match the literature review.

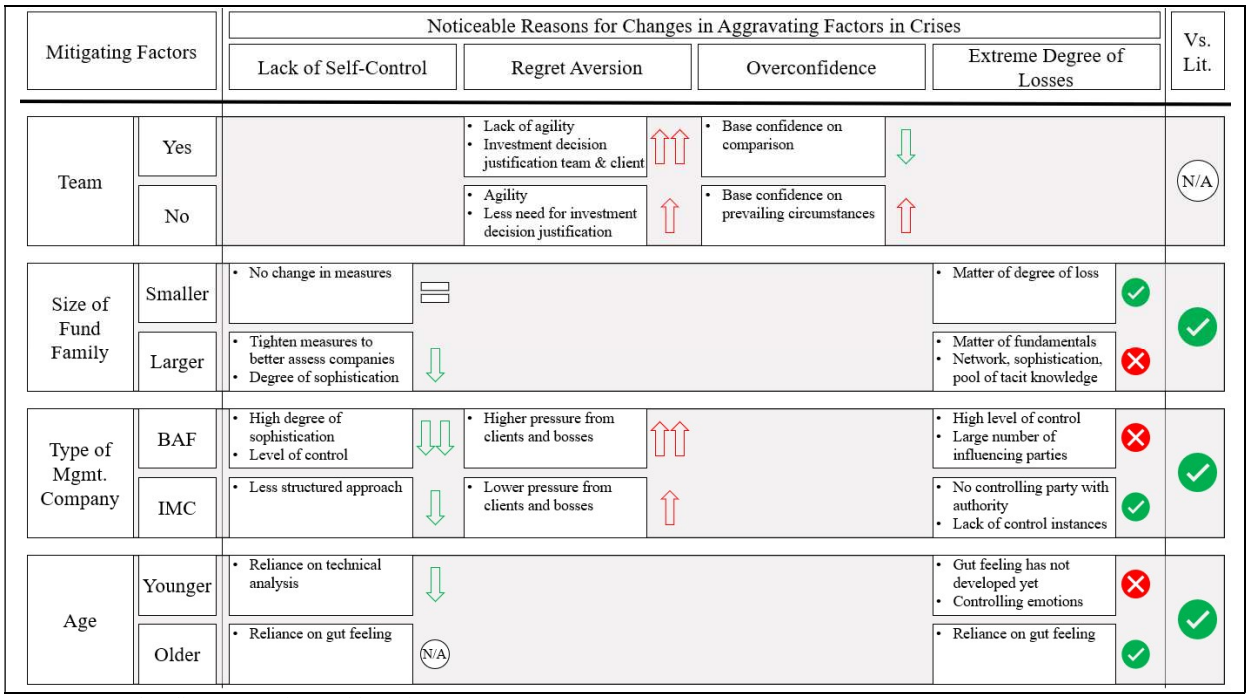
Seventh, three respondents sold winners when they *needed cash*, two said they observed others in the industry doing so while three investors tended to consider stock liquidity when they needed cash (Appx. 16). Thus, additionally to the literature review, the factor of stock liquidity must be taken into consideration. Reasons mentioned for selling winners when needing cash where diversification reasons, to cash in profits and to buy other positions.

Eight, Inv. 1, 3 and 4 held on to the losers because of their *extreme degree of loss*, listing good relations with management and stubbornness as reasons (Appx. 17). In contrast, half of the participants stated that they would only sell companies whose business models were negatively affected by the crisis. Thus, the results coincide with the literature review.

3.2 Disposition Effect in Crises is Influenced by Internal and External Factors

Grouping the institutional investors based on their heterogeneity of internal and external factors helped to find potential explanations for the different manifestations of the disposition effect. In the following, only notable differences in the aggravating factors between the different investor groups are mentioned and examined in more detail in order to reduce the work project to the essentials, summarized below (Figure 4).

Figure 4: Variations in Aggravating Factors in Crises Across Groups – Summary



Source: Based on literature review and interviews

Note: Vs. Lit.: Versus Literature [Green check: Results are in accordance with literature | N/A: Results are not clear]

Example 1: When grouping investors based on their type of management company, the higher pressure form clients among BAFs than among IMCs lead to a steeper increase in regret aversion in crises than the increase among IMCs.

Example 2: When grouping investors based on their type of management company, BAFs didn't hold on to losses because of their sheer magnitude whearas IMCs did. This is attributable to the differences in level of control.

(1) Grouping investors by their affiliation to a ***team*** *reveals interesting differences in overconfidence and regret aversion* – Investors working in a team and alone were equally represented (Appx. 18).

Single investors were generally more *overconfident* than team investors, with enforced tendencies in crises. Single investors mentioned prevailing circumstances such as funds' structure and performance as reasons for their confidence level. Team investors, in contrast,

based their confidence on comparisons, such as lower experience level, bad investment decisions, high level of self-reflection and missing courage (Appx. 19). This can be linked to a study conducted by Richins (1991) who found that heavy comparing can lead to lower self-esteem. We could conclude that team investors compare themselves more directly to their teammates than single investors do with other investors. Thereby they are lowering their confidence and consequently disposition effect.

Additionally, in crises *regret aversion* increased more among team investors than single investors. An answer for that difference might be provided by Inv. 5 and 10, stating that a lack of agility among team managed funds and an increased need for investment decision justification in front of the team lead to postponement of investment decisions, keeping losers longer in the portfolio and thus strengthens disposition effect (Appx. 20).

In summary, contrary to the literature, there is no clear answer to the difference in disposition effect between the groups in crises and non-crises. For single investors, the disposition effect increases in crises. For team investors it is ambiguous, as they show less overconfidence, with increasing tendency in crises, but also greater regret aversion.

*(2) Grouping investors by their **fund family size** discloses noticeable disparities in self-controlling measures and extreme degree of loss* – Four interviewees have a small family fund **size** of smaller or equal to €200m and six have a larger one with over €200m (Appx. 21).

Most investors tightening their *self-controlling measures* to better assess companies in crises belong to large family funds (Appx. 15). This observation is not surprising, as the degree of sophistication of larger family funds may justify this result. Thus, the disposition effect is particularly decreased among larger family funds by their tighter self-controlling measures.

Additionally, two reasons for holding on to large losses in crises were found: (i) because of their sheer *extreme degree of loss* or (ii) because the fundamentals did not change (Appx. 22). Smaller fund family investors tended to justify their investment decisions with the first reason,

whereas the majority of larger fund family investors justified it with the second reason and sold the loss-making positions, whose business models would be greatly damaged by the crisis. This may stem from the sophistication of larger family funds, providing their investors with an experienced, intellectually stimulating network and larger pool of tacit knowledge.

Overall, consistent with the literature, smaller firms exhibit a higher disposition effect. Beyond that, the results break down that the difference stems from tighter measures of larger family funds as well as holding on to extreme degree of losses of smaller family funds. Interestingly, the disposition effect is stronger for both during crises but less present for larger than for smaller family funds in each scenario.

(3) Grouping the investors by their ***type of management company*** *reveals disparities among self-controlling measures, regret aversion and extreme degree of loss* – Eight investors manage independent management companies ('IMCs') and two are portfolio managers in bank-affiliated funds ('BAFs') (Appx. 23).

The portfolio managers in BAFs tightened their *self-controlling measures* in crises, whereas among IMCs only few did. When focussing on the portfolio managers that do increase their self-controlling measures in crises it is noticeable that only the BAF managers use actual templates to assess their companies. IMCs, in contrast, only do so in a less professional, less structured manner (Appx. 15). This may emanate from the higher degree of sophistication and level of control in BAFs found by Andreu, Ortiz, and Sarto in 2020.

Additionally, all BAF managers show *regret aversion* in crises, whereas more than half IMC managers do. Generally, one can say that regret aversion increases over all groups in crises. Interestingly, the BAF-investors mention the same reason for higher regret aversion (Appx. 24). When bosses, client advisors and clients panic and urge the fund manager to *"do something […]* (he is) *influenced by it;* (he is) *not free in* (his) *decisions"* (Inv. 8), fearing to lose his job, get low monetary compensation and to lose his good lifestyle. In contrast, most managers

working in IMCs are self-employed and three of them manage a fund in which the client can only get in or out four times a year. Thus, the pressure from clients and bosses is much lower. Additionally, all three fund managers that *hold on to extreme losses* because of the sheer magnitude, are working at IMCs and are self-employed. In this setting, no boss can ask the fund manager about loss-making position or demand him to *"do something"* (Inv. 8). Consequently, there is no controlling party with authority to challenge the fund manager about his losses, providing ample room for disposition effect.

In summary, in accordance with the literature review, BAF investors show less disposition effect than IMCs in both scenarios. BAFs tighten their self-controlling measures in crises, have increased regret aversion and no sign of holding on to extreme losses due to their magnitude, all evoked by the high degree of sophistication, large number of influencing parties and control in BAFs. Furthermore, IMCs were found to have increased regret aversion and to hold extreme losses in crises, attributable to the lack of control instances when compared with BAFs.

*(4) Grouping investors by **age** highlights differences among self-controlling measures and extreme degree of loss (Appx. 25)* – Investors older and younger than 50 are equally represented. Most investors found to increase their *self-controlling measures* in crises are 50 or younger. Inv. 10 is the youngest one, age 25, and gives potential explanation to that phenomenon by stating *"Compared to the older people in the team, I definitely make decisions less based on gut feeling [..] it simply hasn't developed for me yet"*. Inv. 8, age 42, also states that controlling emotions and the *"so called gut feeling"* is the most important trait to stay rational in crises. In contrast, Inv. 3, age 62, bases a lot of investment decisions on his gut feeling, being the only one whose lack of self-control increased in crises. Thus, self-control and the relying on gut feeling seem to be intertwined, where disposition effect is higher for investors relying heavily on their gut feeling (Appx. 26). Since younger investors lack the necessary experience for developing a gut feeling, they show less of disposition effect triggered by it. Also, all investors

who *held on to extreme losses* are older than 50 years, among which are exactly the two who rely on their gut feeling (Appx. 17).

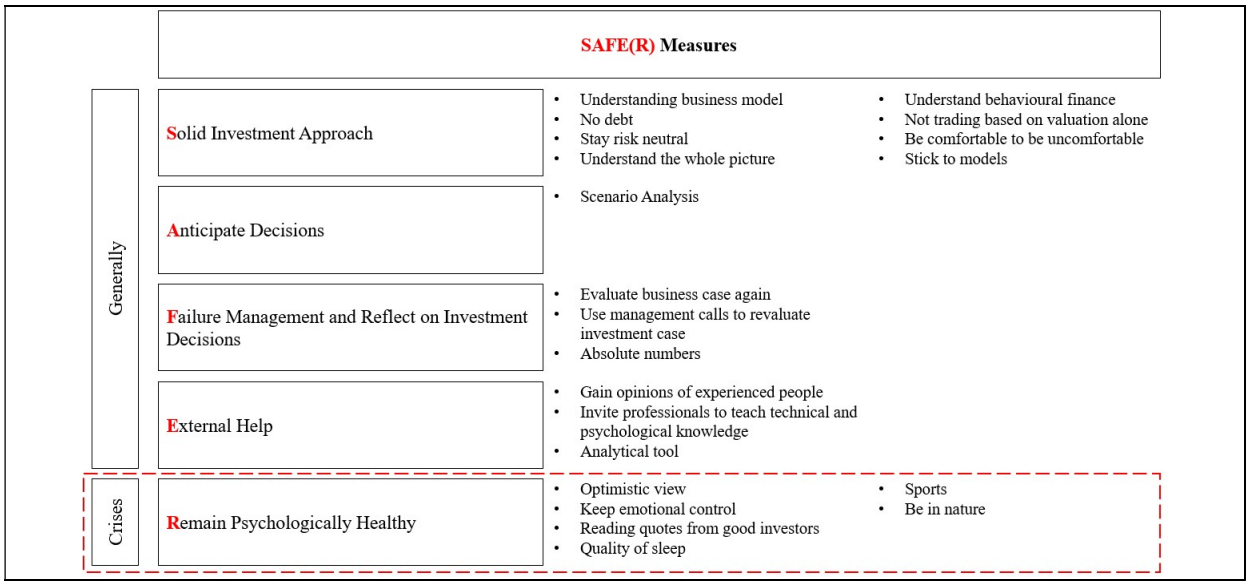
Overall, the result builds on the existing literature by finding that in crises disposition effect is less pronounced among younger investors as they rely more on self-controlling measures and do not hold on to extreme losses as their younger age forces them to rely on technical analysis rather than gut feeling.

3.3 Institutional Investor's Approaches to Mitigate the Disposition Effect

Nine out of ten investors knew about the disposition effect. Also, nine out of ten investors believed that the effect is amplified in crises, naming the following reasons: It gives a good feeling, which you need more in a crisis; Not knowing the company behind the share; Increased uncertainty in crises; Increased risk aversion towards gains; Everything intensifies in crises; Shorter time to make decisions, gather information and form an opinion; Fear, emotionality and high pressure; Evaluating reasons for losses less in crises, as everyone loses; Hope; Clinging on to old investment theses; Increase in belief in mean reversion (Appx. 27).

The heuristics participants used to counteract the disposition effect in non-crises and crises crystallizes four main strategies in all environments: (1) Solid investment approach, (2) Anticipate decisions, (3) Failure management and reflection on investment decisions and (4) External help. In crises one additional strategy appears: (5) Remain psychologically healthy (Appx. 11 and 12). These countermeasures can be used as inspiration for own measures or as guideline for any investor to mitigate the disposition effect, especially in crises, thus, may help to stay SAFE in all environments and even SAFER in crises when disposition effect increases. Investors using four to five of these measures were found to show overall fewer aggravating factors enhancing disposition effect, especially in crises (Appx. 28). In contrast, institutional investors using only one or two of these measures, show clearly more of these aggravating factors, especially in crises. Figure 5 below illustrates the SAFE(R) framework.

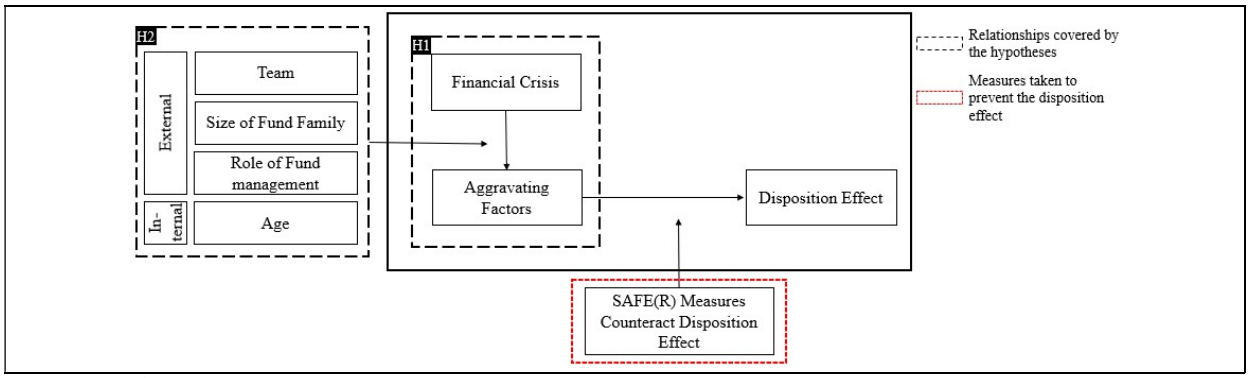
Figure 5: SAFE(R) Framework



Source: Interviews

One can conclude that the overall disposition effect increases among institutional investors in crises. The degree of disposition effect, however, may vary based on the heterogeneity factors and dedicated countermeasures. Therefore, the findings approved, clarified, and extended the originally formulated hypotheses in section 2.1 (Figure 2) and are highlighted in Figure 6 below.

Figure 6: Causal Relationship Disposition Effect – Revised



Source: Interviews

4 Discussion

4.1 Practical Implications

The study has not only shown that disposition effect exists among institutional investors and intensifies in crises, but also used the participants experience to extract potential explanations for changes in disposition effect aggravating factors. Besides the heterogenous characteristics – Team, Size of Fund Family, Role of Fund Management and Age – the counteracting measures

have likewise been identified as crucial in influencing aggravating factors and thus the disposition effect. The following formulates action points for each investor group to tackle their specific bottleneck that causes disposition effect.

1. Incorporate necessary agility among team investors – This action is very important to decrease disposition effect among institutional team investors. Implementing clear processes for asset choices and allocating more control to each investor over investment decisions, by for example splitting them among each other, ultimately leads to less justification in front of the team, no unnecessary postponements of investment decisions and diminishes disposition effect. This action will especially be helpful in crises, where shorter time to make decisions, gather information and form opinions mark the environment.

"You have already less time in crises, and in this crisis it was extreme. The amount of time to make decisions, to gather information, to form an opinion was terrible." – Inv. 6

2. Increase the sophistication and professionalization levels in smaller family funds – Many of the differences in aggravating factors among institutional investors of smaller or larger family funds stems from the high sophistication of larger funds. Regret aversion in non-crises may be counteracted by professionalizing procedures. Tightening self-control and adapting the mindset of larger investors to re-evaluating business models going into the crises may benefit the overall level of disposition effect and possibly closes the gap between larger and smaller family funds.

"Really look at the business case again and the financials. With small companies, of course, you have to make sure they're going to survive it. […] [One must] *re-evaluate the future viability and the financial stability of each company." – Inv. 6*

3. Embed the devil's advocate principle to challenge decisions in IMCs – Investors in BAFs have a natural devil's advocate, a controlling party with authority to question the fund managers investment decisions narrowing the room for disposition effect. IMCs, in contrast, lack a control authority, demanding high levels of self-control to counteract the disposition effect. Embedding the 'devil's advocate' principle in investment processes, by for instance clearly documenting reasons for investing, can filter many emotional decisions and thus counteract disposition effect.

4. Know, control and monitor 'gut feeling' developed by older investors over time – This action point is especially important for older investors, who have been increasingly found to hold on to extreme losses based on their gut feeling. Knowing one's emotions and questioning their roots is necessary to rationally manage and control investment decisions, especially in crises. Confronting the 'gut feeling' with the results of technical analysis and other control measures can be a start to counteract the disposition effect in this matter.

> *"The closer you are to your feelings and know why you are in a good mood or a bad mood, the more you can take control of it. With most people, emotions take control – they call it gut feeling." – Inv. 8*

On top of it all, the SAFE(R) framework equips every investor, regardless of their distinctive group, with easily implementable measures to reduce the disposition effect, especially in crises.

4.2 Contribution to Existing Literature

As research on disposition effect of institutional investors in crises is almost non-existent, the work project has contributed by systematically finding that the disposition effect increases among institutional investors in crisis environments. Moreover, the existing literature generally has not yet distinguished between changes in aggravating factors to understand the roots of increases or decreases in disposition effect and has certainly not further analysed the change of these factors in crisis and non-crisis environments. Additionally, existing literature analysed the internal and external factors predominantly using statistical surveys. Since this research method focuses on mathematically evaluating multiple choice questions, it rather finds if the respective factor has an influence, but not why. The interview set-up of this study made it possible to ask the 'how' and 'why' and by that gets to the roots that cause the differences in groups. In addition, there has been no research on the measures institutional investors take to prevent the disposition effect and how these change during crises, summarized in the SAFE(R) framework.

4.3 Limitations

The conducted study could be valuable for every institutional investor but also individual investors, who are confronted with disposition effect. However, it does have its limitations. One

main limitation is its' lack of diversification among investors. In particular, since only one woman participated, no statements could be made with regard to gender, although this would certainly have made very exciting comparisons possible. Also, a greater number of BAF investors, and more diversity in other characteristics would provide even more insight into the motivations and behaviours of institutional investors and may clarify some of the study's vague or literature-contradictory findings. Moreover, the investor exhibition of aggravating factors is very personal and may not reflect the true behaviour and reasoning of their respective group. In addition, a different grouping of investors could have yielded different results. Beyond that, taking other internal and external characteristics such as self-employment or fund performance into account could have potentially supplemented and extended the findings. The study also draws on statements made by interview partners without empirically validating them, on the grounds that this would have exceeded the work project's scope.

These limitations must be factored into the evaluation of the work and its propositions. However, since this area of research has barely been investigated so far, these results contribute to the prevailing literature and stimulate further research.

4.4 Research Outlook

During the course of this study, multiple research gaps were encountered. First, a need for more quantitative studies on institutional investors exhibition of disposition effect in crises was identified. Moreover, the impact of low self-esteem, hence the opposite of overconfidence, on disposition effect has not yet been analysed. It would be interesting to see, if an underestimation of ones' own abilities may lead to an increased disposition effect and how this relationship behaves in crises. Furthermore, a quantitative analysis of each impact of the aggregating factors on the disposition effect in crises and non-crises would provide more insights and statistical significance. Concluding, disposition effect among institutional investors is not yet fully understood. Further research on the suspenseful and heterogenous influences is required.

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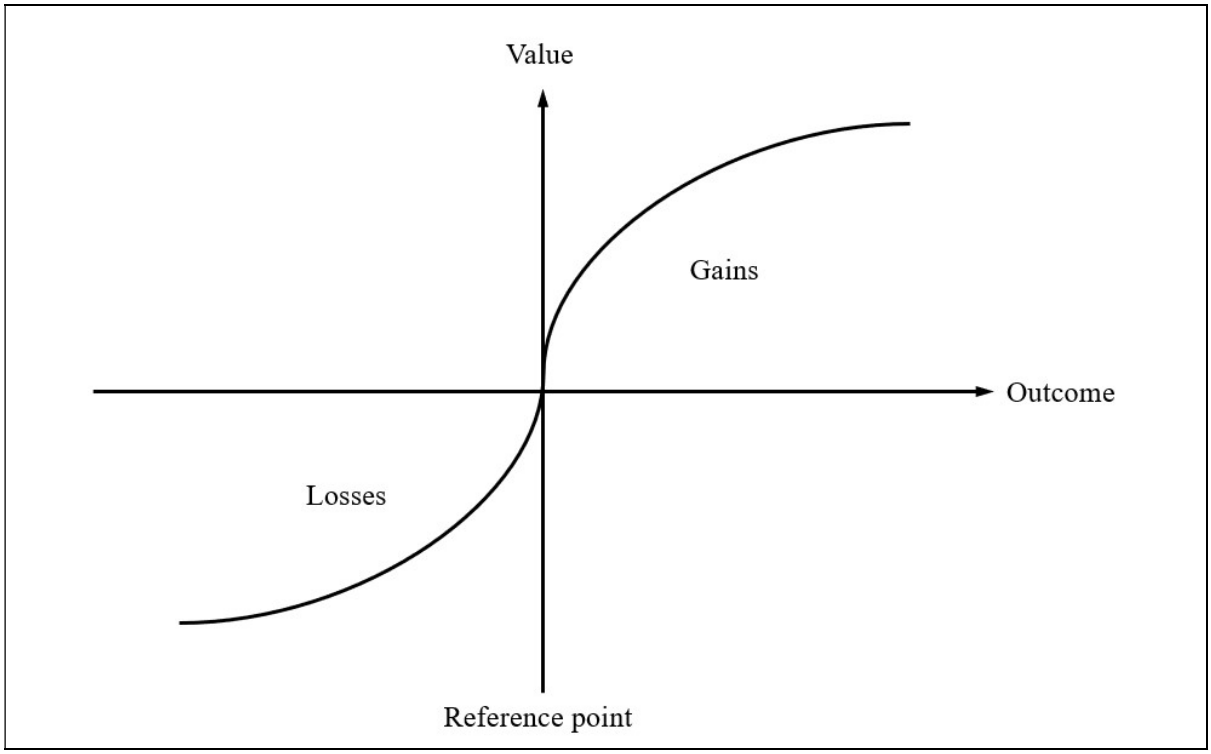
Appendix

Appendix 1: Prospect Theory



Source: Based on Kahneman and Tversky 1979

Appendix 2: Causes and Mitigators of Disposition Effect

Cause	Description	Investment Implication	Aggravating Factor of Mitigator	Included*
Prospect theory	Investors assess their loss and gain in an asymmetric manner with respect to a reference point, displaying a risk-seeking behaviour in the domain of losses and a risk averse one in the domain of gains (Daniel Kahneman and Tversky 1979).	The risk averse nature towards gains, leads investors to sell winning investments and the risk seeking nature towards losses, leads investors to hold on to losses instead of realizing them, leading to disposition effect. There is no portfolio rebalancing desire, even though rebalancing practices have been discovered to have a positive effect on performance, as profits can be channelized into new investments (Odean 1998; Grinblatt and Han 2005; Jiao 2017; Lucchesi, Yoshinaga, and De Castro Junior 2015).	Aggravating Factor	Yes
Mental accounting	Investors classify funds differently and in accordance with their mental accounts, where each mental account has its distinctive value to the investor without interaction among them (Thaler 1999).	The need to fulfil different accounts can result in disposition effect. If so, Investor's segregate gains and integrate losses. As gains are concave and losses are convex, it is best to consolidate losses in one mental account to decrease the severity of pain and segregation gains in multiple mental accounts to maximize joy (Grinblatt and Han 2005; Hur, Pritamani, and Sharma 2010).	Aggravating Factor	Yes
Regret aversion	Investors experience negative emotions (regret) when the chosen investment alternative underperformance not-selected ones, and pride if the selected investment outperformance. The investor always wants to avoid regret and seek pride	The investor avoids regret and seek pride, leading to holding losses too long and realizing gains too soon (Tenberge 2009; Zuchel 2001).This pride is diminished, when the winning stock continues to rise (Muermann, Mitchell, and Volkman 2006; Tenberge 2009).	Aggravating Factor	Yes

Lack of self-control	Distinct methods to control ones' actions, such as stop loss (Bell 1982).	Investors can delay selling winners and resist holding losers by setting stop loss orders (Kaustia 2004; Feng and Seasholes 2005; Richards, Rutterford, and Fenton-O'Creevy 2011; Fischbacher, Hoffmann, and Schudy 2017).	Aggravating Factor	Yes
December effect	Investors tend to sell assets in the month of December in order to avoid additional tax charges (Shefrin and Statman 1985).	Realizing losses in the month of December is beneficial to avoid additional tax charges works diminishes the disposition effect (Odean 1998; Grinblatt and Keloharju 2004; Boolell-Gunesh, Broihanne, and Merli 2009).	Mitigator	No
Over-confidence	Overestimation of one's own knowledge and decision-making capabilities (Schiller 2000; Fromlet 2001)	Investors believe that for their sold winning investments, all possible gains have been realized and for their corresponding losing investments, future gains will come (Ben-David and Doukas 2006; Liu and Chen 2008; Parveen 2016).	Aggravating Factor	Yes
Sign realization preference	The probability of investors to sell their investment if the profit is zero is smallest at zero and increases for both, gains and losses (Ben-David and Hirshleifer 2012). Investors always prefer to realize winners over looser.	The preference of realizing gains over looser leads to the disposition effect as investors than hold on to looser and realize winners. However, losses Ben-David and Hirshleifer (2012) have found the disposition effect is NOT primarily driven by preferring to realize positive investments than negative ones (Ingersoll and Jin 2013).	Explanatory	No
Mean reversion	Investors believe that asset prices will revert back to the average price over time (Poterba and Summers 1988)	The belief in mean reversion leads to realizing winners sooner fearing to regret selling the stock before it reverts back to the mean. Investors hold on to the losers as they believe that investments will revert back to the mean (Odean 1998; Da Costa, Mineto, and Da Silva 2008; Jiao 2017).	Aggravating Factor	Yes

Entrap-ment research	Research that deals with the question why investors stick irrationally to a losing course of action to justify that their past decision was not a fault (Staw 1981).	Literature on entrapment, escalation of commitment and sunk cost are combined in the disposition effect (Zuchel 2001).	Explanatory	No
Social trust	The belief in the honesty, reliability, and integrity of society.	A higher level of social trust can on the one hand augment investors trust into the credibility of fund performance and by that increase their investments in superior funds, mitigating the disposition effect. On the other hand, it can reduce investors reaction on negative signals of agency issues, leading to an enhanced disposition effect (Li, Massa, and Zhang 2016; Heimer 2016).	Not defined	No

Source: Literature review

Note: Included meaning that only aggravating factors are included in the literature review in section 3.1.2, as it is the goal of the thesis to focus on how institutional investors approach those aggravating factors, and thus disposition effect in crises

Appendix 3: Contacted Interview Partners

Count	Entity	Interview Partner	Consent	Contacted?	Position
1	Company 1	Inv. 1	Yes	Yes	Owner and portfolio manager
2	Company 2	Inv. 2	Yes	Yes	Owner and portfolio manager
3	Company 3	Inv. 3	Yes	Yes	Owner and portfolio manager
4	Company 4	Inv. 4	Yes	Yes	Owner and portfolio manager
5	Company 2	Inv. 5	Yes	Yes	Owner and portfolio manager
6	Company 5	Inv. 6	Yes	Yes	Owner and portfolio manager
7	Company 2	Inv. 7	Yes	Yes	Board member and portfolio manager
8	Company 6	Inv. 8	Yes	Yes	Portfolio manager
9	Company 7	Inv. 9	Yes	Yes	Portfolio manager
10	Company 8	Inv. 10	Yes	Yes	Portfolio manager
11	Company 5	Inv. 11	No	Yes	Owner and portfolio manager
12	Company 6	Inv. 12	No	Yes	Portfolio manager
13	Company 6	Inv. 13	No	Yes	Portfolio manager
14	Company 8	Inv. 14	No	Yes	Portfolio manager
15	Company 8	Inv. 15	No	Yes	Portfolio manager
16	Company 6	Test Inv. 1	Yes	Yes	Assistant to portfolio manager
17	Company 7	Test Inv. 2	Yes	Yes	Assistant to portfolio manager
18	University 1	Test Inv. 3	Yes	Yes	PhD in Finance
19	Company 10	Test Inv. 4	No	Yes	Owner and portfolio manager
20	Company 10	Test Inv. 5	No	Yes	Owner and portfolio manager

Source: Own source

Appendix 4: Test Interview Partners

	Test Inv. 1	Test Inv. 2	Test Inv. 3
Entity	Company 6	Company 7	University 1
Background	Industry	Industry	Academic
Country	Germany	Germany	Germany
Role	Assistant to portfolio manager	Assistant to portfolio manager	PhD in Finance
Size of Fund Family	10bn€	7tr€	N/A
Role of Fund Mgmt. Company	BAF	IMC	University
Education	Master's in Finance	Master's in Finance	Currently undertakes his PhD in Finance
Experience	Low	Low	N/A
Professional Training	Yes	Yes	No
Age	30	24	25
Gender	Male	Female	Male
Interview Date	05.12.2020	05.12.2020	07.12.2020

Source: Own source

Appendix 5: Expose – Interview Request

Dear Mr./Mrs. [*Name*],

My name is Valentina Heimann, and I am currently in my last semester of the master's in finance at Nova School of Business and Economics in Lisbon, Portugal.

In the course of my work project at the Chair of Business and Economic History, equivalent to the master's dissertation to complete my degree in Finance, I am currently conducting interviews on the topic: "How do institutional investors approach disposition effect in crises?". I would be very grateful if you would be willing to support me by taking some time for an interview with me.

The interview is scheduled for about one hour but may vary according to your time preferences. It can be conducted by phone or personally. The main goal of the interview is to gather a greater understanding on measures and tools institutional investors use to assess and minimize their tendency to display disposition effect in financial crises.

Since you have extensive knowledge about the industry and manage [*Fund name*] successfully, even in rough times, an interview with you would be a great help!

I would be very happy about your commitment and support.

Thank you and have a nice day.

Sincerely,

Valentina Heimann

Link Chair of Business and Economic History: https://www2.novasbe.unl.pt/en/faculty-research/faculty/faculty-detail/id/19/alvaro-ferreira-da-silva

Appendix 6: Definition Institutional Investor (Directive 2014/65/EU) – Excerpt

I. CATEGORIES OF CLIENT WHO ARE CONSIDERED TO BE PROFESSIONALS

The following shall all be regarded as professionals in all investment services and activities and financial instruments for the purposes of the Directive.

(1) Entities which are required to be authorised or regulated to operate in the financial markets. The list below shall be understood as including all authorised entities carrying out the characteristic activities of the entities mentioned: entities authorised by a Member State under a Directive, entities authorised or regulated by a Member State without reference to a Directive, and entities authorised or regulated by a third country:

(a) Credit institutions;

(b) Investment firms;

(c) Other authorised or regulated financial institutions;

(d) Insurance companies;

(e) Collective investment schemes and management companies of such schemes;

(f) Pension funds and management companies of such funds;

(g) Commodity and commodity derivatives dealers;

(h) Locals;

(i) Other institutional investors;

(3) National and regional governments, including public bodies that manage public debt at national or regional level, Central Banks, international and supranational institutions such as the World Bank, the IMF, the ECB, the EIB and other similar international organisations.

(4) Other institutional investors whose main activity is to invest in financial instruments, including entities dedicated to the securitisation of assets or other financing transactions.

The entities referred to above are considered to be professionals. They must however be allowed to request nonprofessional treatment and investment firms may agree to provide a

higher level of protection. Where the client of an investment firm is an undertaking referred to above, the investment firm must inform it prior to any provision of services that, on the basis of the information available to the investment firm, the client is deemed to be a professional client, and will be treated as such unless the investment firm and the client agree otherwise. The investment firm must also inform the customer that he can request a variation of the terms of the agreement in order to secure a higher degree of protection. It is the responsibility of the client, considered to be a professional client, to ask for a higher level of protection when it deems it is unable to properly assess or manage the risks involved. This higher level of protection will be provided when a client who is considered to be a professional enters into a written agreement with the investment firm to the effect that it shall not be treated as a professional for the purposes of the applicable conduct of business regime. Such agreement shall specify whether this applies to one or more particular services or transactions, or to one or more types of product or transaction.

Source: The European Parliament and The Council of the European Union 2014

Appendix 7: Interview Setup

Interview Partner	Interview Type	Interview Duration	Interview Date	Position
Inv. 1	Telephone	1:15h	09.12.2020	Owner and portfolio manager
Inv. 2	Telephone	1:01h	09.12.2020	Owner and portfolio manager
Inv. 3	Telephone	00:55h	10.12.2020	Owner and portfolio manager
Inv. 4	Telephone	01:32h	10.12.2020	Owner and portfolio manager
Inv. 5	Telephone	1:53h	11.12.2020	Owner and portfolio manager
Inv. 6	Telephone	00:58h	05.12.2020	Owner and portfolio manager
Inv. 7	Telephone	1:06h	10.12.2020	Board member and portfolio manager
Inv. 8	Telephone	01:37h	15.12.2020	Portfolio manager
Inv. 9	Telephone	01:12h	17.12.2020	Portfolio manager
Inv. 10	Telephone	00:51h	07.04.2021	Portfolio manager
Test Inv. 1	Telephone	01:12h	05.12.2020	Assistant to portfolio manager
Test Inv. 2	Telephone	00:52h	05.12.2020	Assistant to portfolio manager
Test Inv. 3	Telephone	01:43h	07.12.2020	PhD in Finance

Source: Own source

Appendix 8: Semi-structured Interview Guide

Introduction	
Introduction	1. Introduction into the interview process
External Factors	
Team	2. Are you working in a team or individually?
Size of fund family	3. What is the size of fund family?
Role of fund mgmt. company	4. Is your fund independently managed or is it bank affiliated?
Internal Factors	
Age	5. How old are you?
Fond volume	6. What is your asset under management?
Professional training	7. What relevant professional training have you experienced for you current position?
Experience	8. How long have you invested professionally? 9. What other investment relations have you pursued, other than your current position? 10. How many crises did you experience?
Education	11. What is your academic background?
Learning ability / Intelligence	12. Explain a recent mistake in the last crisis, what did you learn from it? How do you plan to utilize this knowledge in the next crisis?
Causes	
Prospect theory	13. Tell me about a recent loss and a recent gain that were similar in size.
Prospect theory in crises	14. Tell me about a loss and a gain in a crisis that were similar in size.
Mental accounting	15. Tell me about your losses and gains.
Mental accounting in crises	16. When thinking back about the last crisis you experienced. Tell me about your losses and gains.
Regret aversion	17. After a stock purchase, do you still compare the stock with the alternatives you considered buying? 18. Have you ever put off an investment decision about holding or selling a stock because of wanting more positive news about a stock?
Regret aversion in crises	19. During the last crisis, did you regret selling a stock too late/too soon or did you hold it? Why did you hold it? Why did you sell it in the end? 20. After selling, did you regret selling because you saw that it increased after you sold it? 21. Did you change your behaviour towards losses in crises after experiencing several crises?
Overconfidence	22. How would you asses the quality of your investment decisions in comparison to other institutional investors? 23. Do you show above average performance in your work?
Overconfidence in crises	24. Did you perform above average during the last crisis?

	25. Have you done everything in your power to manoeuvre the fund safely through the crisis? What were your main obstacles?
Mean reversion	26. Do sell stocks because you believe that they are overpriced and will soon revert to mean? 27. Do you keep stocks because you believe that they will revert to mean?
Mean reversion in crises	28. In a recent market downturn, did you keep stocks believing they are oversold and will soon revert to mean? 29. How does this believe change in market conditions?
Need to find cash (crises)	30. Did you experience a need to find cash during the last crisis? What positions did you sell to meet that goal? How did the realized position perform in comparison to the rest of your portfolio? 31. Would you rather sell winners in those conditions or losers?
Extreme losses (crises)	32. During the last crisis, how did you handle extreme losses?
Lack of self-control	33. Do you implement measures, such as stop losses or other ex-ante rules to control your investment losses and gains?
Lack of self-control in crises	34. How do you change that controlling measures during crises? 35. How did you do it in the past crisis you experienced?
Knowledge and approaches to mitigate disposition effect in crises and non-crises	
Knowledge	36. Do you know about the disposition effect?
Own assessment	37. Would you say you exhibit greater disposition effect in crises?
Self-measures against disposition effect	38. Do you take measures to prevent this behaviour?
Self-measures against disposition effect in crises	39. How do these countermeasures change in crises? 40. What did you learn from your past crisis? Do you do anything differently now? 41. How do you manage to keep rational in crises and times of uncertainty? 42. Do you implement self-controlling measures to approach disposition effect in crises?

Source: Own source, based on literature review

Appendix 9: External and Internal Mitigating Factors of Interviewees

	External				Internal						
Inv.	**Team**	**Family fund size group**	**Family fund size**	**Role of Mgmt. Company**	**Age group**	**Age**	**Gender**	**Learning ability**	**Education**	**Professional Training**	**Wealth**
1	Yes	Small	€200m	IMC	Older	56	Male	Yes	High	Yes	N/A
2	No	Large	€2bn	IMC	Younger	37	Male	Yes	High	Yes	N/A
3	Yes	Small	€60m	IMC	Older	62	Male	Yes	High	Yes	N/A
4	No	Small	€60m	IMC	Older	62	Male	Yes	High	Yes	N/A
5	No	Large	€2bn	IMC	Younger	47	Male	Yes	High	Yes	N/A
6	Yes	Small	€60m	IMC	Older	61	Male	Yes	High	Yes	N/A
7	No	Large	€2bn	IMC	Older	53	Male	Yes	High	Yes	N/A
8	Yes	Large	€10bn	BAF	Younger	42	Male	Yes	High	Yes	N/A
9	No	Large	€7tr	IMC	Younger	33	Male	Yes	High	Yes	N/A
10	Yes	Large	€86bn	BAF	Younger	25	Female	Yes	High	Yes	N/A

Source: Interviews

Appendix 10: Knowledge and Belief that Disposition Effect Amplifies in Crises

Interview Partner	Knowledge	Belief if Disposition Effect Amplifies in Crises
Inv. 1	Yes	Yes
Inv. 2	Yes	Yes
Inv. 3	No	Yes
Inv. 4	Yes	Yes
Inv. 5	Yes	Yes
Inv. 6	Yes	Yes
Inv. 7	Yes	No
Inv. 8	Yes	Yes
Inv. 9	Yes	Yes
Inv. 10	Yes	Yes

Appendix 11: Self-Measures against Disposition Effect

Inv.	Count in non-crises*	Self-Measures	Supporting Quote
1	2	Understanding business model Focusing on a limited market Learn from mistakes	"Yes, that is exactly the point. I do almost only German stocks, because I need this home turf to have a competitive advantage. I only need shares that are not properly valued, that's my point. With companies I've known for 10 years, I know that the sellers are people who don't really understand the company. Focusing on a limited market is actually my attempt to handle these psychological traps that the market gives you." "Because I know the numbers, I know the management, I understand the business model." "After my very first crisis, 40% of my money was gone. After that I thought to myself: Not like that. Then I started to deal with the topic again."
2	2	Processes modelled for certain scenarios Documentation in investor letters	"Yes, I have control mechanisms. For the risk assessment, I have processes modelled for certain scenarios. This weights the risk-reward ratio. In addition, the documentation in the investor letters helps me to extend the holding period. This is the classic endowment effect."
3	4	No measures	"Selling profits too quickly, yes, yes there might be something to that. I definitely do that." "Self-measures? I don't know."
4	4	Reflection and learning from mistakes	"Learning from one's own mistakes and understanding the psychological background through reflection"
5	1	Investment Approach	"My investment approach is my self-measure."
6	3	Understanding business model Being confronted with profits and losses	"I have a daily portfolio list where I can see if the stock is in profit or loss. That means I am confronted with my profits and losses every day. I also have lists of the respective industries and see how each behaves. Only when I understand how the underlying investment works, I invest."
7	3	Analytical tool Reflect Invite professionals to teach technical	"We have an analytics tool, that helps us to reflect our own actions, among other also our executed disposition effect." "We also always invite different trainers for our investment team, on the one hand for the technical knowledge but also to enhance sports / mental

		and psychological knowledge	processes.”
8	1	Understanding business model	“Only investing in companies where I stand behind the business model.”
9	2	Investment approach	“Stick to your rules. In a straight process there is no space for hope.”
10	2	Gain opinions of experienced people	“I think what really helps is to talk to other, more experienced people about their opinion and do your technical analysis.”

Source: Interviews

Appendix 12: Self-Measures against Disposition Effect in Crises

Inv.	Count in crises*	Self-Measures in Crises	Supporting Quote
1	4	No debt Scenario analysis Know business model	"Be aware that anything can happen, but it should never kill you. Once in the multiplication is 0, the product is zero. […] That's why I don't have debt." "Draw up scenarios, don't go into the crisis overindebted, know the company well, test your theses again and again."
2	3	Stay risk neutral Be in nature Consult professionals to teach technical and psychological knowledge	"I tighten my measures in crises. Because the risk ratio changes, but I stay risk neural. You sometimes have to make decisions more quickly in crises." "Being in nature helps to keep calm." He participates at Inv. 7 expert meetings.
3	6	Don't have overly pessimistic expectations	Question: "How do you keep rational in crisis?" Him: "Well who can... So not at all." "One shouldn't have overly pessimistic expectations."
4	6	Understand the whole picture Understand behavioural finance	"Imagine you are an eagle, then you see the water surface from above, but if you are a fish, then you see it from below. You have to take both perspectives to understand the whole picture." "You must have a lot of understanding of behavioural finance."
5	2	Understand business model Consult professionals to teach technical and psychological knowledge	"My way of buying companies, knowing my companies is the big difference for me in crisis or not crisis environments. As a value investor, this is my measurement against such psychological pitfalls." He participates at Inv. 7 expert meetings.
6	4	Scenario Analysis Absolute	"I make myself a handwritten note and draw up scenario analyses. There is also a great tool in Bloomberg under Value at Risk, called Scenarios. […] I do this once a month, in crises every day. Besides, absolute numbers

		numbers Mental strengths achieved through sports and sleep	are very powerful, percentages are not as powerful as absolute numbers. They get under your skin in a completely different way. At some point you think to yourself, I can't sustain this position like this." "Activities that have nothing to do with the job keep you from going crazy in crises. Sports, sleeping, cycling. This is what I do when I must make a crisis decision. The most important thing in a crisis is to be able to make decisions. For that you need mental strength. If you don't have it, you have to get it through resources."
7	5	Take care of physical and mental health	"I stay calm in crises by taking care of my physical and mental health, by sleeping, walking and so on."
8	0	Sports and reading quotes from good investors	"Manage to stay rational in crises and times of uncertainty by doing sports and reading quotes from good investors, that grounds me. I ask myself 'imagine the stock market was only up once a year. How would you trade?'."
9	6	Not trading based on valuation Optimistic view Be comfortable to be uncomfortable Stick to models Quality of sleep	"In crisis I try to avoid trading based on valuation." "The world only ends once, and it's not going to be now." "In these moments you need to be comfortable being uncomfortable." "Sticking to and using my models helps. They don't have biases." "Quality of sleep is important."
10	3	Talk to experienced people Evaluate business case again Use management calls	"Talking to people who have been through several crises and say, 'keep your feet still'. Maybe really look at the business case again and the financials. With small companies, of course, you have to make sure they're going to survive it from a balance sheet standpoint." "You then re-evaluate the future viability and the financial stability of each company." "We use management calls and ask how they see the whole thing and how they feel about the business model."

Source: Interviews

Appendix 13: Aggravating Factors in Non-Crisis and Crisis Environments as Numbers

	Aggravating Factor	Inv. 1	Inv. 2	Inv. 3	Inv. 4	Inv. 5	Inv. 6	Inv. 7	Inv. 8	Inv. 9	Inv. 10
Non-crisis environment	Mental Accounting	0	0	0	0	0	0	0	0	0	0
	Prospect Theory	1	1	1	1	0	1	1	0	1	1
	Lack of Self-Control	0	0	1	0	0	0	0	0	0	0
	Regret Aversion	1	0	1	1	0	0	1	0	0	1
	Overconfidence	0	1	1	1	1	1	1	1	1	0
	Mean Reversion	0	0	0	1	0	1	0	0	0	0
	Total	2	2	4	4	1	3	3	1	2	2
Crisis environment	Mental Accounting	-1	0	-1	0	0	0	0	0	-1	0
	Prospect Theory	2	1	2	1	0	1	2	0	2	1
	Lack of Self-Control	0	-1	2	0	0	-1	0	-1	0	-1
	Regret Aversion	2	0	2	2	0	0	1	1	1	2
	Overconfidence	-1	2	-1	1	2	2	2	-1	2	-1
	Mean Reversion	1	1	1	1	0	1	0	1	1	1
	Need to find cash	0	0	0	0	0	1	0	0	1	1
	Extreme degree of loss	1	0	1	1	0	0	0	0	0	0
	Total	4	3	6	6	2	4	5	0	6	3

Source: Interviews

Appendix 14: Aggravating Factors Found Among Interviewees Across Market Environments

Aggravating factor	Found in non-crisis	Found in crisis	Increase in crisis	Decrease in crisis	Change*
Prospect theory	8	4	4	0	4
Mental accounting	0	0	0	3	-6
Lack of self-control	1	0	1	4	-7
Regret aversion	5	3	4	0	6
Overconfidence	8	1	5	4	-5
Mean reversion	2	8	0	0	6
Need to find cash		3			3
Extreme degree of loss		7			7
TOTAL	22	18	14	10	8

Source: Interviews

Note: 'Change' is derived by calculating: 'Found in crisis' + ('Increase in crisis' * 2) – 'Found in non-crisis' – ('Decrease in crisis' *2). 'Increase in crisis' and 'decrease in crisis' are multiplied by two, as the factors are found and aggravated / diminished.

Appendix 15: Reasons for Self-control in Crises

Reasons	Self-control in crises	Team	Family fund size	Role of Mgmt. Company	Age	Gender	Supporting Quotes
Not rational	Lower	Yes	Small	IMC	Older	Male	Question: "How do you keep rational in crisis?" Inv. 3: "Well who can... So not at all"
Assess fund	Higher	Yes	Small	IMC	Older	Male	"I make myself a handwritten note and draw up scenario analyses. (…). I do this once a month, in crises every day." – Inv. 6
Assess companies	Higher	No	Large	IMC	Younger	Male	"I tighten my measures in crises. Because the risk ratio changes." – Inv. 2
Assess companies	Higher	Yes	Large	BAF	Younger	Male	"I have an Excel sheet that shows me what the valuation of the company is right now. I check this very intensively, especially in crises. That helps me assess the companies and strike when they're cheap." – Inv. 8
Assess companies	Higher	Yes	Large	BAF	Younger	Male	"We use management calls and ask how they feel about the business models perspective in the crises." "I always do the technical analysis in an Excel sheet before investing, especially in crises." – Inv. 10

Source: Interviews

Appendix 16: Need to Find Cash in Crises

Reasons	Need to find cash	Saw others do it	Team	Family fund size	Role of Mgmt. Company	Age	Gender	Supporting Quotes
N/A	No	N/A	Yes	Small	IMC	Older	Male	"I have never had liquidity problems in crises. My motto: the worst case must not kill you." – Inv. 1
Sold to buy another position	No	N/A	No	Large	IMC	Younger	Male	"I never had liquidity problems. Once I had to sell because I wanted another position. But here I sold winners and losers equally." – Inv. 2
N/A	No	**Yes**	Yes	Small	IMC	Older	Male	"I have not had any liquidity problems so far. […] I think others sell shares when they need money and are more likely to go for winners." – Inv. 3
Question of Liquidity	No	N/A	No	Small	IMC	Older	Male	"You sell what you can sell. It's more a question of the liquidity of the stock." – Inv. 4
Question of Liquidity	No	N/A	No	Large	IMC	Younger	Male	"In case of a sudden need of cash, I have very large liquid companies in my portfolio that I can sell in a matter of seconds. I would rather go for the liquid companies than looking at winners or losers." – Inv. 5
Question of Liquidity Sold liquid winners	**Yes**	N/A	Yes	Small	IMC	Older	Male	"We sold the ones where we thought they would be the most unfortunate in the crisis. We sold Gazprom at a profit. We sold gold at a profit. However, we sold winners rather than losers in the crisis. We could have sold WHC. In some cases, however, stocks are too small and illiquid to sell." – Inv. 6
Fund structure	No	N/A	No	Large	IMC	Older	Male	"No, I have never had liquidity problems. That is because of the structure of the fund. It is only open 4 times a year, so someone can get out or in. Also, 4 weeks' notice is required, and the money is not to be

								given out until 6 weeks later." – Inv. 7
N/A	No	**Yes**	Yes	Large	BAF	Younger	Male	"I did not have liquidity problems in the Corona crisis, but I observed with others that winners were cashed in and losers less." – Inv. 8
N/A	**Yes**	N/A	No	Large	IMC	Younger	Male	"I didn't have liquidity problems, but I think one is going to end up selling the winners, if you have to sell." – Inv. 9
Diversification reasons Cash in profits Buy other positions	**Yes**	N/A	Yes	Large	BAF	Younger	Female	"Yes, we had the situation that we would have liked to buy shares that had corrected, but then of course we didn't have the cash, and then we didn't want to sell anything. Or rather, we started to sell small mini portions of some shares instead of selling a share completely. Those were rather the winners. That's when we took winners." "This profit realization occurs on the one hand in crises, but on the other hand also at the end of the year, after things have gone so great. At that point, you have extreme appreciation in some stocks. That leads to having too large positions in a stock, where we sold for diversification reasons." "Gains on paper are nice, but you haven't made it until you realize it." – Inv. 10

Source: Interviews

Appendix 17: Investors Holding on to Extreme Degree of Losses

Reasons	Self-control in crises	Relying on gut feeling	Age	Supporting Quotes
Stayed with loss because of good relationship with management	Same	Yes	56	"With COVID-19, things went even worse. The loss has been there before and intensified in and after the crisis. The company denied for too long that the market had changed until the balance sheet was eaten up, then they hoped that their growth strategy would work and then came the economic downturn and then came Corona. We stayed with it because of the board chairman and the good relationship with the management." – Inv. 1 "Purely from the gut, one would say 'I'll throw out the winner', because that just gives a good feeling." – Inv. 1
Stubbornness	Same	N/A	62	"Psychologically, it is much easier to sit on a catastrophe, because then such a stubbornness develops. This of course increases in crisis." – Inv. 4
Stubbornness	Lower	Yes	62	"I decide a lot of things on the basis of my gut feeling, which is something you can't say among men in this industry." – Inv. 3 "One stock was down 50%, but I still held it. My bank ETF was down -38% at times, I held that one too. I should have sold it, but at that time I figured I do not need to sell the ETF in that area now either. I was too stubborn." – Inv. 3

Appendix 18: Grouped by Team

Team	**Yes**					**No**				
Environment	**No C.**		**Crises**		**Diff.**	**No C.**		**Crises**		**Diff**
1: Existence 2: Increase -1: Decrease	**1**	**2**	**-1**	**1**	Δ	**1**	**2**	**-1**	**1**	Δ
# Investors per group			**5**					**5**		
Mental Accounting	0	0	2	0	-4	0	0	1	0	-2
Prospect Theory*	4	2	0	2	2	4	2	0	2	2
Lack of Self-Control	1	1	3	0	-5	0	0	1	0	-2
Regret Aversion	3	3	0	1	4	2	1	0	2	2
Overconfidence	3	1	4	0	-9	5	4	0	1	4
Mean Reversion	1	0	0	5	4	1	0	0	3	2
Need to find cash				2	2				1	1
Extreme degree of loss				2	2				1	1
Total	12	7	9	12	-4	12	7	2	10	8

Source: Interviews

Notes: 1) 1 indicates that the factor was found; 2) 2 indicates that the factor aggravated in crises; 3) -1 indicates that the factor diminished in crises; 4) 'Diff.' is derived by calculating: 'Found in crisis' + ('Increase in crisis' * 2) – 'Found in non-crisis' – ('Decrease in crisis'*2). 'Increase in crisis' and 'decrease in crisis' are multiplied by two, as the factors are found as well as aggravated / diminished.

*Example: Among the 5 team investors, 4 show prospect theory in non-crises [No C. | 1]. In crises 2 show an increase in prospect theory [Crises | 2], none show a decrease [Crises | -1] and it was found among 2 team investors [Crises | 1]. The difference calculated (see notes) is 2 [Diff | Δ], hence prospect theory is more prevalent in crises than non-crises among team investors.

Appendix 19: Grouped by Team - Level of Confidence and Reason in Crises

Level of Confidence	Reason		Team	Supporting Quote
High	Fonds structure	Structure	No	"I consider my own fund family to be slightly above average (…) because of its structure." – Inv. 2
High	Fonds structure	Structure	No	"Problems in committees can intensify in crisis, so I do better in crisis then institutionalised funds." – Inv. 5
High	Good performance	Performance	No	"I am part of a circle of very good investors (…) I would prefer to base the answer on fund performance." – Inv. 4
High	Good performance	Performance	No	"If you gain moneys in the crisis, you think more highly of yourself." – Inv. 9
High	Investment style and structure	Structure	No	"In crises, my fund is even better due to its investment style and structure." - Inv. 7
Low	Bad investment decisions	Compares to historic self	Yes	"Over time, my investment decisions used to be far better." – Inv. 1
High	Experience	Compares to historic self	Yes	"We managed this crisis much better than the one in 2007." – Inv. 6
Low	Lack of Experience	Compares to team	Yes	"I (…) have me still braked by more experienced and older investors." – Inv. 10
Low	Level of self-reflection	Compares to historic self	Yes	"I think that I am very critical of myself. And after a crisis, I also find many mistakes that I made." – Inv. 8
Low	Missing courage	Compares to historic self	Yes	"I wish I had more courage in times of crisis." – Inv. 3

Source: Interviews

Appendix 20: Grouped by Team - Reasons for Regret Aversion

Reasons	Aggravating in Crises	Team	Supporting Quotes
Lack of agility of team' managed funds	Increased amount of uncertainty	No	"Problems in committees can intensify in crisis, so I do better in crisis then institutionalised funds." – Inv. 5
		Yes	"We talked too long about switching from Growth to Value. In the end we were annoyed that we held on to Growth too long." – Inv. 10
Justification in front of team	Increased losses	Yes	"I hope the stock publishes good figures, otherwise I have to justify the loss to my teammate." – Inv. 10

Source: Interviews

Appendix 21: Grouped by Family Fund Size

Family Fund Size	**Smaller (<= €200m)**					**Larger (> €200m)**				
Environment	**No C.**	**Crises**			**Diff.**	**No C.**	**Crises**			**Diff**
1: Existence 2: Increase -1: Decrease	**1**	**2**	**-1**	**1**	**Δ**	**1**	**2**	**-1**	**1**	**Δ**
# Investors per group			**4**					**6**		
Mental Accounting	0	0	2	0	-4	0	0	1	0	-2
Prospect Theory	4	2	0	2	2	4	2	0	2	2
Lack of Self-Control	1	1	1	0	-1	0	0	3	0	-6
Regret Aversion*	3	3	0	0	3	2	1	0	3	3
Overconfidence	3	1	2	1	-4	5	4	2	0	-1
Mean Reversion	2	0	0	4	2	0	0	0	4	4
Need to find cash				1	1				2	2
Extreme degree of loss				3	3				0	0
Total	13	7	5	11	2	11	7	6	11	2

Source: Interviews

Notes: 1) 1 indicates that the factor was found; 2) 2 indicates that the factor aggravated in crises; 3) -1 indicates that the factor diminished in crises; 4) 'Diff.' is derived by calculating: 'Found in crisis' + ('Increase in crisis' * 2) – 'Found in non-crisis' – ('Decrease in crisis'*2). 'Increase in crisis' and 'decrease in crisis' are multiplied by two, as the factors are found as well as aggravated / diminished.

*Example: Among the 6 investors, belonging to smaller family funds, 3 show regret aversion in non-crises [No C. | 1]. In crises 3 show an increase in regret aversion [Crises | 2], none show a decrease [Crises | -1]. The difference calculated (see notes) is 3 [Diff | **Δ**], hence regret aversion is more prevalent in crises than non-crises among smaller family funds.

Appendix 22: Investors not Influenced by Extreme Degree of Loss

Reasons	Family fund size	Supporting Quotes
Underlying business model	Large	"During the last crisis I held my most loss-making positions, because I believed that the business model is surviving or even benefitting from the crisis." – Inv. 2
Underlying business model	Large	"I only held the losing positions, where the fundamentals were not affected by the crises." – Inv. 5
Underlying business model	Small	"We held many of the losers. Just because the share price is going down does not mean the company is bad. We basically sold everything that suffers in the medium term because of Corona." – Inv. 6
Underlying business model	Large	"We held them through the crisis. But only after we made a quick analysis of all our individual positions at the beginning of the crisis to see if they will survive." – Inv. 7
Underlying business model	Large	"It's always important to evaluate if you still believe in the business model or not. If the overall market falls by 40%, this often has nothing to do with the company. Then it's simply sold because that's what the boss says, or the customer puts pressure on you." "If you see the structural problem you have to divest even if it's at -30%." – Inv. 8
N/A	Large	"During the corona downturn I was short VIX and S&P 500, but I sold the loss position eventually." – Inv. 9
Underlying business model	Large	"We have held the extreme losers because we actually only buy the positions that we are also convinced of in the long term." – Inv. 10

Appendix 23: Grouped by Type of Management Company

Type of Mgmt. Company	**IMC**					**BAF**				
Environment	**No C.**		**Crises**		**Diff.**	**No C.**		**Crises**		**Diff**
1: Existence 2: Increase -1: Decrease	**1**	**2**	**-1**	**1**	**Δ**	**1**	**2**	**-1**	**1**	**Δ**
# Investors per group			**8**					**2**		
Mental Accounting	0	0	3	0	-6	0	0	0	0	0
Prospect Theory	7	4	0	3	4	1	0	0	1	0
Lack of Self-Control	1	1	2	0	-3	0	0	2	0	-4
Regret Aversion*	4	3	0	2	4	1	1	0	1	2
Overconfidence	7	5	2	1	0	1	0	2	0	-5
Mean Reversion	2	0	0	6	4	0	0	0	2	2
Need to find cash				2	2				1	1
Extreme degree of loss				3	3				0	0
Total	21	13	7	17	8	3	1	4	5	-4

Source: Interviews

Notes: 1) 1 indicates that the factor was found; 2) 2 indicates that the factor aggravated in crises; 3) -1 indicates that the factor diminished in crises; 4) 'Diff.' is derived by calculating: 'Found in crisis' + ('Increase in crisis' * 2) – 'Found in non-crisis' – ('Decrease in crisis'*2). 'Increase in crisis' and 'decrease in crisis' are multiplied by two, as the factors are found as well as aggravated / diminished.

*Example: Among the 8 IMC investors, 4 show regret aversion in non-crises [No C. | 1]. In crises 3 show an increase in regret aversion [Crises | 2], none show a decrease [Crises | -1] and it was found among 2 IMC investors [Crises | 1]. The difference calculated (see notes) is 4 [Diff | Δ**]**, hence regret aversion is more prevalent in crises than non-crises among IMC investors.

Appendix 24: Reasons for Regret Aversion among BAFs in Crises

Reasons	Supporting Quotes
Pressure from clients	"The client especially asks when things are going badly, which increases the pressure to act. Then he has us to blame. If it goes up, it was him. If it goes down, it was us." – Inv. 8 "If you manage a fund like this for other people, you have to be accountable to them. (..) In most cases, the clients do not only have us as asset manager, but also others. If you then observe what the others are doing and then see that the others have been in value stocks for a long time and they are doing great, you are of course forced to follow their lead." – Inv. 10 "You can already defend the buy and hold, but then the client doesn't like to see that you are 5% behind the benchmark." – Inv. 10
Pressure from boss	"In a crisis your boss says: 'do something', client advisory sends you E-mails: 'lower the share quota'. You are employed, you are not self-employed, you could lose your job." – Inv. 8
Monetary / lifestyle motivation	"Also, you get variable compensation based on how your fund performs against the benchmark." – Inv. 10 "(…) you could lose your job. You are well paid, have a family, a nice house, drive a nice car, want to continue to live well. You are influenced by it; you are not free in your decisions." – Inv. 8

Appendix 25: Grouped by Age

Age	**>50**					**<=50**				
Environment	**No C.**		**Crises**		**Diff.**	**No C.**		**Crises**		**Diff**
1: Existence 2: Increase -1: Decrease	**1**	**2**	**-1**	**1**	**Δ**	**1**	**2**	**-1**	**1**	**Δ**
# Investors per group			**5**					**5**		
Mental Accounting	0	0	2	0	-4	0	0	1	0	-2
Prospect Theory	5	3	0	2	3	3	1	0	2	1
Lack of Self-Control	1	1	1	0	-1	0	0	3	0	-6
Regret Aversion*	4	3	0	1	3	1	1	0	2	3
Overconfidence	4	2	2	1	-3	4	3	2	0	-2
Mean Reversion	2	0	0	4	2	0	0	0	4	4
Need to find cash				1	1				2	2
Extreme degree of loss				3	3				0	0
Total	16	9	5	12	4	8	5	6	10	0

Source: Interviews

Notes: 1) 1 indicates that the factor was found; 2) 2 indicates that the factor aggravated in crises; 3) -1 indicates that the factor diminished in crises; 4) 'Diff.' is derived by calculating: 'Found in crisis' + ('Increase in crisis' * 2) – 'Found in non-crisis' – ('Decrease in crisis'*2). 'Increase in crisis' and 'decrease in crisis' are multiplied by two, as the factors are found as well as aggravated / diminished.

*Example: Among the 5 older investors, 4 show regret aversion in non-crises [No C. | 1]. In crises, 3 show an increase in regret aversion [Crises | 2], none show a decrease [Crises | -1] and it was found among 1 older investor [Crises | 1]. The difference calculated (see notes) is 3 [Diff | Δ], hence regret aversion is more prevalent in crises than non-crises among older investors.

Appendix 26: Grouped by Age – Statements Concerning Gut Feeling

Reasons	Relying on gut feeling	Self-control in crises	Age	Age group	Supporting Quotes
Has not developed yet	No	Higher	25	Younger	"Compared to the older people in the team, I definitely make decisions less based on gut feeling than the others, because it simply hasn't developed for me yet." – Inv. 10
Need to control emotions	No	Higher	42	Younger	"The closer you are to your feelings and know why you are in a good mood or a bad mood, the more you can take control of it. With most people, emotions take control – they call it gut feeling." – Inv. 8
Good feeling	Yes	Same	56	Older	"Purely from the gut, one would say 'I'll throw out the winner', because that just gives a good feeling." – Inv. 1
N/A	Yes	Lower	62	Older	"I decide a lot of things on the basis of my gut feeling, which is something you can't say among men in this industry." – Inv. 3

Appendix 27: Institutional Investors Opinion on Disposition Effect in Crises

Reason	Supporting Quote
Gives good feeling, which you need more in a crisis	"Yes, I think the effect is amplified in crises. Purely from the gut, one would say 'I'll throw out the winner, because that just gives a good feeling'. One think to himself: 'It's a crisis, I've lost a lot of money, but I've won something else, you can take that gain and let the other stocks go their way'. – Inv. 1
Not knowing the company behind the share	I think that is crystal clear. Because the investors who suffer from that, usually don't know what's behind the individual shares." – Inv. 1
Increased uncertainty in crises	"I think the effect is amplified because of the prevailing uncertainty." – Inv. 2
Increased risk aversion towards gains	"Yes, I think so, in crises everyone checks where they still have profits on and then kick the stuff out." – Inv. 3
Everything intensifies in crises	"Yes, I think the effect is amplified because everything is amplified in a crisis. It is a self-reinforcing mechanism." – Inv. 4 "Yes, I think the effect is amplified because everything is intensifying in a crisis." – Inv. 5
Shorter time to make decisions, gather information and form an opinion	"The disposition effect is certainly more virulent in the crisis because everything happens in a much shorter time. Everything that happened in a year in the Lehman crisis happened in 3 weeks in this crisis. You have already less time in crises, and in this crisis it was extreme. The amount of time to make decisions, to gather information, to form an opinion was terrible." – Inv. 6
No increase in crises shown by their analytic tool	"We measure two things with the Analytics tool. One is the fund performance, and the other is the entrepreneurial performance, where often the presumed price performance precedes. It doesn't show that we sell winners and hold losers in crises." – Inv. 7
Fear, Emotionality, Pressure	"I think the effect is amplified in crises because people are afraid. Because emotionality takes over. The closer you are to your feelings and know why you are in a good mood or a bad mood, the more you can take control of it. With most people, emotions take control - They call it gut feeling." "In these times of crisis, you are also influenced. The more you can lose, the more you will act emotionally. The customer advisors send you e-mails every day 'reduce your share quota' and you go home, and you feel really bad because you have to endure all this pressure. When it goes up again, everybody says: Well, that was obvious." – Inv. 8
Decrease of evaluating reasons for losses	"Yes, I think the disposition effect aggravates in crisis. It is different when you are losing money and no one else is or when everyone is losing money. When only you are losing money, you evaluate the reasons more than in the other case. On the other hand, when only you are losing there is a bit more pressure on you to realize the wins."

Hope	"Also, hope is intensified in crisis and more factors influence your investment decision in crisis. Valuation traps occur more in crisis." – Inv. 9
Clinging on old investment theses	"I do think that the effect is amplified in crises because you believe in business models, and you really have a bias. You only read and hear what you want to read. I think it's extremely difficult to admit to yourself that you really have to sell." – Inv. 10
Increase in belief in mean reversion	"Plus, you think to yourself, that this is now a general downturn and that you'll just hold the stock until it goes up again." – Inv. 10

Appendix 28: SAFE(R) Measures and Disposition Effect

Investor	Total SAFE(R)	Aggravating Factors Total in Non-Crises	Aggravating Factors Total in Crises	Change in Number of Aggravating Factors
3*	1	4	6	2
4	2	4	6	2
9	2	2	6	4
1	3	2	4	2
6	4	3	4	1
7	4	3	5	2
10	4	2	3	1
8	4	1	0	-1
2	5	2	3	1
5	5	1	2	1

Source: Interviews

Note: Based on the quotes from Appendix 10, 11 and 12, the table above was constructed, counting which investor uses how many of the five major measures.

Change is calculated by "Total crisis" – "Total non-crises".

*Example: Investor 3 used one of the SAFE(R) measures. In non-crises he showed 4 aggravating factors. In crises he showed 6. This results in 2 additional factors in crises (change).