Analysis of the Limitations and Future Trends of Loss Aversion

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Abstract: Existing research has shown that loss aversion has a certain influence on human decision-making, but many influencing factors have not been taken into account. Based on the existing theoretical studies, this paper summarizes and analyses the limitations of the current loss aversion theory from the perspectives of both experimental design and practical application. At the same time, in view of these existing limitations, this paper summarizes and analyses the innovations of the loss aversion theory research in the fields of neurology, social science, artificial intelligence and other fields in recent years, and makes a reasonable extension based on this, to provide a possible way to overcome the limitations of the current loss aversion theory. Through interdisciplinary development, research technology development, and experimental process improvement, future researchers can obtain more accurate and realistic theories related to loss aversion. The application fields of these theories will also be extended from the original fields of finance and politics to other fields with far-reaching effects.

Keywords: Loss aversion, neurology, social science, investment consumption, experimental design

1.   Introduction

Loss aversion is an important concept in behavioral economics that refers to the fact that when people are faced with losses and gains, the negative emotions associated with losses are much greater than the positive emotions associated with gains of the same amount. This theory has been widely used in our real life. However, as of now, loss aversion still has some limitations. This paper studies the shortcomings of the current loss aversion theory research from three aspects: the inadequacy of experimental design and measurement techniques, the influence of individual differences, and the limitations in the field of neurology. At the same time, in order to overcome these limitations, verify the universality and specificity of the loss aversion theory, and improve the practical value of the loss aversion theory, this paper will also explore possible ways to overcome these limitations in the future development of the loss aversion theory from the perspective of cross-disciplinary development, improvement of experimental design, and expansion of the field of application.

2.   Limitations of Loss Aversion

2.1.   Experimental Design and Measurement Bias

2.1.1. Behavioral Performance in Small-amount Loss Situations

Individuals may exhibit loss-gain neutrality, and even gain seeking in some situations, when the amount of loss is relatively small. for example, in an incentive experiment, 68.5% of participants faced with symmetric gains and losses of small amounts (e.g., $6) chose the risky option, significantly higher than the 50% random choice level [1]. This experimental result suggests that people exhibit gain seeking tendencies rather than loss aversion when the loss amount is small.

Further research found that when the loss amount increased to $40, individuals showed weaker loss aversion with an average loss aversion coefficient (λ) of 1.16 and only 51% of the participants showed loss aversion [1]. This suggests that loss aversion is not significant when the loss amount is small, and that loss aversion only becomes more pronounced when the loss amount increases to a certain level.

2.1.2. Effects of Experimental Design

There were biases in the measurement of loss aversion in earlier studies. For example, the methodology of Mrkva et al.'s study may have led to an overestimation of loss aversion [2]. The list method they used suffers from asymmetry between gains and losses, and this design may have led participants to exhibit stronger loss aversion. For example, in one experiment, participants were asked to choose between a series of lotteries and investments in which the amount of loss gradually increased. This experimental design of increasing losses would constantly remind participants that they are facing losses, thus making them more sensitive to losses.

2.2.   Complexity of Individual Differences

2.2.1. Psychological Factors

Differences in people's preference for risk and emotional responses may lead to differences in the emergence of loss aversion among individuals. Risk preference directly affects a person's sensitivity to loss, with risk-averse people being more sensitive to loss than risk-loving people. Risk-loving people tend to take risks and face potential risks, whereas conservative people will be more willing to make decisions that will avoid losses. Loss aversion is also related to emotional reactions, as some individuals may show stronger emotional reactions when faced with a loss, which may increase their sensitivity to loss. Individuals who are emotionally vulnerable to external influences are more sensitive to loss.

2.2.2. Differences in Individual Characteristics

Individual characteristics that can affect loss aversion include gender, age, education level, financial literacy, and social class. Gender can lead to differences in loss aversion, where women are more sensitive to monetary losses than men. Exploiting large-scale panel data from the United Kingdom, we find that gender differences in financial optimism and financial loss aversion the stronger psychological response to monetary losses than monetary gains. This result prevails even after controlling for the Big Five personality traits, suggesting that the Big Five are more likely to be willing to take risks. This result prevails even after controlling for the Big Five personality traits, suggesting that the prominent psychological characteristics capture different aspects of behaviour than the Big Five [3], but loss aversion differences due to gender differences are only called out when

the amount of loss is large. Social status and wealth level also affect the manifestation of loss aversion among individuals, with those of lower social status being more sensitive to losses because they lack the social resources to make up for the losses they have suffered; and wealth level, with wealthier individuals tending to be less sensitive to losses than relatively poorer individuals, partly because the same losses are less represented in the wealth of better-off individuals, and partly because the money mindset of the better-off makes them more accepting of losses.

2.2.3. Cultural Differences

Loss aversion arising from cultural differences manifests itself in two main ways: individualism and collectivism differences, power differences and social status differences. Individualism and collectivism differences, in the United States, some European countries emphasize individualism culture, which means that people will pay more attention to their own interests and risks. In such an anthropocentric culture, people tend to show higher levels of risk aversion because they are more sensitive to negative outcomes. In some Asian countries, collectivism is emphasized, which means that people are more concerned with the interests and harmony of the group, and individuals make decisions with the interests of the group in mind rather than themselves. In a collectivist culture, people are less averse to individual loss because they will mitigate individual loss through group support, which makes them much less sensitive to loss as well. In terms of power disparity and social status differences, power gap refers to the degree of inequality in the distribution of power and resources between different classes in a society. In societies with large power gaps, resources are distributed unequally and individuals face greater economic stress and uncertainty. The average person in a society with a large power gap is more pessimistic about the consequences of loss and therefore shows greater loss aversion. This is because the power gap leads to an unequal distribution of resources and the average person lacks sufficient resources to cope with losses. On the contrary, in societies with smaller power gaps, individuals are more tolerant of loss because they have more resources and opportunities to cope with loss [4].

2.2.4. Challenges in Neuroscience

Despite the fact that neuroscience provides a biological basis for research related to loss aversion, current research still struggles to explain the differences in loss aversion manifestations that exist between different individuals. The main reasons for this can be categorized into two: the limitations of current neurology-related techniques and the complexity of the human brain such as emotional responses. On the technical side, there are certain limitations of neurological research techniques such as brain imaging, which can only reveal the correlation between behavioral preferences and specific brain regions, rather than directly proving a causal relationship [5]. For example, although certain brain regions show higher levels of activation when the body is faced with loss, this does not mean that the activation of these brain regions causes the body to develop loss aversion, and a causal relationship between the two cannot be inferred reciprocally. Existing brain imaging techniques are still deficient in spatial and temporal resolution, leading to less precise characterization of neural mechanisms. In addition, descriptions of the neural mechanisms of loss aversion vary and even contradict each other between different studies [5]. With regard to the complexity of emotions, because the interactions of emotions in the brain are extremely complex, it is also difficult for researchers to study the specific manifestations of emotions in the brain. The neural mechanism of aversion, as a basic negative emotion, involves the interaction of multiple brain regions. Although event-related potential (ERP) analyses have advantages in extracting emotional information processing processes, they have limitations in revealing the interactions between brain regions [6].

3.   Future Development Trends

3.1.   Deepening of Interdisciplinary Research

3.1.1. The Integration of Neuroscience and Loss Aversion

As neuroimaging technology continues to evolve and researchers continue to improve the precision and accuracy of their neural observations, future researchers will be more focused on exploring the neural mechanisms behind loss aversion. Through the development of neurological techniques such as functional magnetic resonance imaging (MRI), researchers can be more precise in finding the brain regions that are related to loss aversion, solving the problem of unclear causality at the present time. In the present day, there are already relevant researchers who have found that the activities of brain regions such as the prefrontal cortex and amygdala are closely related to the emotion of loss aversion. Meanwhile, there is also a research team that revealed the inner mechanism of loss aversion from a brain science perspective by decoding investors' brainwave signals. Specifically, we found valuation bias manifested as larger sensitivity of P3 to losses than gains, which was localizable to reward-related brain regions. By contrast, response bias manifested as a larger P3 preceding gamble acceptance than rejection and was localizable to the motor cortex. This study reveals the dissociable neural biomarkers of response bias and valuation bias underpinning [7]. It decomposes loss aversion into "valuation bias" and "response bias", which correspond to different neural biases. These two biases correspond to different neurophysiological mechanisms. These neurological developments will help researchers to observe the specific manifestation of loss aversion in human brain regions in the future, so as to better study the specific mechanisms and influencing factors of loss aversion, and intervene in loss aversion by means of neurological techniques, so that loss aversion will become an intervenable emotional factor in the future.

3.1.2. Integration of Social Science Perspectives and Loss Aversion

The combination of loss aversion and social science in the future is divided into two main aspects, one is culture and gender differences, and the other is social motivation and decision-making aspects. In terms of culture and gender differences, at present we have already recognized that the embodiment of loss aversion varies in different cultural contexts and in different gender groups, and the direction of future development should be to expand the scale of experiments, such as conducting large-scale experiments such as large-scale cross-cultural research, so as to further validate the universality of the existing research results. Further research on what dimensions of cultural context influence loss aversion, such as uncertainty avoidance, power distance and other loss aversion-influencing factors in culture. In terms of social motivation and decision-making, more attention should be paid to the influence of social motivation on loss aversion, such as kinship and social status. For example, in social issues related to children's safety, individuals' decision-making mechanisms may change and need to be analyzed specifically. Similarly, in daily life, there are various social factors that affect the specific manifestation of loss aversion, and there are two types of achievement motivation in loss aversion research in the context of achievement: approach and avoidance motivations. The former and the latter orient individuals to approach positive loss aversion. The former and latter orient individuals to approach positive and to avoid negative possibilities/events, respectively. Avoidance motivation operate simultaneously, and students struggle to avoid failure rather than work toward success in the achievement context. This suggests that the psychological forces linked to approach motivation (driven by a gain in points) and avoidance motivation (oriented by loss in points) may be asymmetric. points) may be asymmetric. It was hypothesized that the resulting loss aversion ratio would be approximately 2:1 [8]. By examining the different manifestations of loss aversion in

different scenarios, the researcher can make loss aversion-related research results to satisfy more realistic scenarios and derive more realistic loss aversion-related theories.

3.2. Improvements in Experimental Design

In future experiments, it is necessary to further improve the experimental process to reduce potential errors in the experimental process. For example, the symmetrical gain and loss design can avoid the influence of other psychological factors except loss aversion. The purpose of the research can become more diversified so that the results of the experiment can be more in line with the reality. For example, in the present time, some researchers are studying whether the embodiment of loss aversion in decision-making changes with time and experience. Through a more reasonable experimental design, researchers can not only reduce experimental errors, but also improve the relevance of experimental results.

3.3. Expansion of Application Areas

3.3.1. Finance and Consumer Behaviour

At the heart of finance theory is the study of the behaviour of economic agents in allocating and utilizing resources in an environment of uncertainty, both across space and across time. Time and uncertainty are therefore central factors influencing financial behaviour. The rise of behavioral economics has led to the recognition that, in addition to time and uncertainty, people's behavioral preferences play an important role in economic decision-making. Therefore, the introduction of investors' behavioral preferences in asset allocation is an inevitable trend [9]. In the present time, for investors and consumers, it has been realized that loss aversion may influence people to make irrational decisions in the process of investment and consumption. Therefore investors and consumers need to reduce the adverse effects of loss aversion in their decision making process to produce irrationality through learning and other means.

3.3.2. Policy Area

Through the effective use of loss aversion, governments can make many effective guiding policies. For example, behavioral financiers pioneered the use of irrational cognitive bias in the study of securities markets, suggesting that irrational investor behaviour is one of the factors leading to market failure [10]. And the government can intervene in consumers' irrationality thus achieving the purpose of market management. Therefore, the core research direction in the future should be how to control the effect of loss aversion and intervene in loss aversion. This requires the continuous development of technology, so as to make it less difficult for people to carry out the intervention behaviour of loss aversion.

3.3.3. Big Data Technology and Artificial Intelligence Technology

The integration of loss aversion research and information technology is an inevitable trend. Big data technology can greatly increase the amount of data available for research, making analyses easier and results more generalizable. Artificial intelligence and machine learning can learn loss-aversion related theories and build predictive models to assist enterprises and policy makers to make more reasonable decisions. The future direction of the combination of loss aversion and AI technology should be to build more accurate predictive models with longer lead times. For example, researchers have found that Random Forest was superior to other algorithms, and when the positive spread ratio (between gain and loss) converged to default loss aversion level, decision-makers minimized the risk of loss

aversion [11]. The accuracy of the prediction model can be greatly improved by the optimization of the algorithm.

4. Conclusion

Currently, there are still many limitations in the research of loss aversion: the experimental design of loss aversion is not reasonable, which leads to the results being affected by other factors and thus generating errors; there are differences in loss aversion among individuals, which makes it impossible to consider all scenarios in a general way when building predictive models and other interventions. The neurological limitations of loss aversion mean that it is difficult to observe brain activity during the development of loss aversion and to establish a causal relationship between the intensity of brain activity and loss aversion, which makes it difficult to intervene with loss aversion. In the future, in order to overcome these limitations of loss aversion, researchers should develop in these directions: by developing neurological techniques to make the study of loss aversion more convenient and to make it possible to intervene in loss aversion through neurological techniques; by strengthening cross-disciplinary research on loss aversion, not only can it increase the real-life scenarios of applying loss aversion theories, but it can also be used in the integration of disciplines. Through the optimization of loss aversion experiments, the experimental results of loss aversion-related research will be more accurate and reliable, and will have higher practical significance. Limitations in the development of loss aversion theory are unavoidable, and new limitations will appear in the future development, but researchers need to develop the loss aversion theory with the trend of the times, so that loss aversion theory is in the process of development and improvement, and has a higher practical significance.

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