ROLE OF MAGNITUDE IN LOSS AVERSION UNDER RISK

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By

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CERTIFICATE

This is to certify that the thesis titled “Role of Magnitude in Loss Aversion under Risk”, being submitted by Ms. Ouroz Khan to the Indian Institute of Technology Delhi, for the award of the degree of Doctor of Philosophy, is a record of original bona fide research carried out by her under my supervision. In my opinion, the thesis has reached the standards fulfilling the requirements for submission relating to the degree.

As far as I am aware, the results contained in the thesis have not been submitted, in part or full, to any other institute or university for award of any degree or diploma.

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DECLARATION BY AUTHOR

I certify that the thesis titled “Role of Magnitude in Loss Aversion under Risk” submitted to the Indian Institute of Technology Delhi for the award of the degree of Doctor of Philosophy is a bonafide record of my research work done under the supervision of Dr. Sumitava Mukherjee, at the Department of Humanities and Social Sciences, Indian Institute of Technology Delhi. The content of this thesis, in full or in parts, has not been submitted to any other institute or University for the award of any degree or diploma.

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Abstract

Prospect Theory (Kahneman & Tversky, 1979) is arguably one of the most influential descriptive theories of choice, which consists of a value function that predicts the overweighting of losses compared to gains. Building upon the general notion of bad being stronger than good and Prospect Theoretic loss aversion, the statement 'losses loom larger than gains' became accepted as a fundamental principle of human behavior. However, Mukherjee et al. (2017) proposed that loss aversion could be magnitude dependent, as some studies reported that loss aversion as measured using affective judgments disappears for small magnitudes, leading one to speculate about the generalizability of loss aversion (Gal & Rucker, 2018) or its empirical evidence at the origin (Yechiam, 2019). This has given rise to three positions in the field: the classic version in favor of loss aversion, the evidence against the existence of loss aversion, and a magnitude-dependent version that suggests loss aversion exists for large magnitudes but not for small magnitudes. However, there has been no systematic study to test the hypothesis for choices under risk. In this thesis, a comprehensive investigation of magnitude in risky choices has been done to test if loss aversion is indeed magnitude dependent for choices. Furthermore, as elicitation modes might impact choices and preferences (Slovic, 1995), three dominant methods have been used to measure loss aversion for risky choices involving equiprobable gambles in studies 1, 2, and 3, respectively. Further, the comprehensive analysis of secondary data is done in Study 4 to investigate the role of magnitudes within existing datasets, as it has often been overlooked or misinterpreted. The focus of the thesis is to underscore that magnitude is not a mere boundary condition but rather central to the concept of loss aversion under risk.

The first study involves testing a magnitude-dependent hypothesis for judgments and choices using equiprobable symmetrical gambles conducted on student population (Experiment1A; n = 146), with a subsequent replication on a job aspirant (Experiment 1B; n = 114). The second study (Experiment 2A; n = 183 & 2B; n = 187) employs the list method, where a fixed gain is presented along with a sequentially increasing list of losses, to test magnitude-dependent loss aversion. In the third study, an experiment was conducted in which participants (n = 208) engaged in binary choices by playing a sequence of 200 hypothetical gambles within a sample space consisting of low magnitudes versus high magnitudes. In the fourth study, a detailed analysis of secondary datasets from previously published papers, specifically Zhao et al. (2020) and Sheng et al. (2020), was performed. Both datasets used a similar paradigm to Study 3, involving 200 binary choices across a range of magnitudes conducted in other countries.

The findings across the studies consistently support a magnitude-dependent hypothesis. The results from Study 1 revealed that magnitude levels predicted affective judgments and choices. Study 2 demonstrated a lower value of the loss aversion coefficient in the low-magnitude group compared to the high-magnitude group using the list methods. Study 3 further supported the magnitude-dependent hypothesis by demonstrating significant differences in median loss aversion coefficients between the low and high magnitude groups. In Study 4, the examination of symmetric gambles in the decision space consistently revealed that magnitudes significantly impacted choices, with higher rejection rates observed at larger magnitudes within the sample space. These cumulative results affirm magnitude-dependent loss aversion across diverse populations and experimental paradigms, underscoring the pivotal role of magnitude in shaping our understanding of loss aversion under risk.

Keywords: Loss Aversion, Magnitude-dependent Loss Aversion, Judgment, Choice, Risky Decision making.

सार

प्रॉस्पेक्ट सिद्धांत (कह्नमैन और टवर्स्की, 1979) को विकल्पों के चयन से संबंधित सबसे प्रभावशाली वर्णनात्मक सिद्धांतों में से एक माना जाता है। यह सिद्धांत एक मूल्य फलन पर आधारित है, जो यह भविष्यवाणी करता है कि लोग लाभ की तुलना में हानियों को अधिक महत्त्व देते हैं। इसी सिद्धांत के आधार पर यह व्यापक रूप से स्वीकार कर लिया गया कि "हानियाँ लाभों की तुलना में अधिक प्रभाव छोड़ती हैं", और यह कथन मानव व्यवहार की एक मूल प्रवृत्ति के रूप में स्थापित हो गया।

हालाँकि, मुखर्जी और सहयोगियों (2017) ने यह प्रस्तावित किया कि हानि-विकर्षण परिमाण पर निर्भर हो सकता है। उन्होंने यह दिखाया कि जब हानि-विकर्षण को भावनात्मक मूल्यांकन के आधार पर मापा गया, तो छोटे परिमाणों के संदर्भ में यह प्रभाव गायब हो गया। इससे यह सवाल खड़ा हुआ कि क्या हानि-विकर्षण की धारणा वास्तव में सार्वभौमिक है, जैसा कि गाल और रकर (2018) ने तर्क दिया, या फिर इसका मूल साक्ष्य ही संदिग्ध है, जैसा कि येचियाम (2019) ने इंगित किया। इस बहस ने क्षेत्र में तीन भिन्न दृष्टिकोणों को जन्म दिया — एक पक्ष जो पारंपरिक रूप से हानि-विकर्षण के पक्ष में है; दूसरा, जो इसके अस्तित्व पर ही सवाल उठाता है; और तीसरा, जो यह मानता है कि हानि-विकर्षण केवल बड़े परिमाणों में ही प्रकट होता है, जबकि छोटे परिमाणों में यह प्रभाव मौजूद नहीं होता।

हालाँकि, अब तक जोखिम की स्थिति में इस परिकल्पना की कोई व्यवस्थित और ठोस परीक्षा नहीं की गई थी। प्रस्तुत शोध में इसी कमी को ध्यान में रखते हुए यह जाँचने का प्रयास किया गया है कि क्या जोखिमपूर्ण विकल्पों में हानि-विकर्षण वास्तव में परिमाण पर निर्भर करता है। इसके लिए तीन प्रमुख प्रयोगात्मक विधियों का उपयोग किया गया — हर विधि का उपयोग एक-एक अध्ययन (अध्ययन एक, दो और तीन) में किया गया। ये सभी अध्ययन समान संभावनाओं वाले काल्पनिक जुए पर आधारित थे। इसके अतिरिक्त, एक चौथे अध्ययन में ज़ाओ और सहयोगियों (2020) तथा शेंग और सहयोगियों (2020) द्वारा पूर्व में प्रकाशित आंकड़ों का गहराई से विश्लेषण किया गया, ताकि यह समझा जा सके कि पूर्ववर्ती अध्ययनों में परिमाण की भूमिका को किस तरह समझा या उपेक्षित किया गया।

इस शोध-प्रबंध का मुख्य उद्देश्य यह रेखांकित करना है कि परिमाण केवल एक सीमित परिस्थिति नहीं है, बल्कि जोखिम की स्थितियों में हानि-विकर्षण को समझने का एक केंद्रीय आयाम है। अध्ययन एक में विद्यार्थियों और नौकरी के इच्छुक प्रतिभागियों पर समान-संभावनाओं वाले सममित जुए के माध्यम से यह जाँचा गया कि क्या परिमाण का स्तर उनके निर्णय और भावनात्मक मूल्यांकन को प्रभावित करता है। अध्ययन दो में सूची विधि का प्रयोग करते हुए यह परीक्षण किया गया कि एक निश्चित लाभ के साथ प्रस्तुत की गई बढ़ती हुई हानियों की सूची पर प्रतिभागी कैसे प्रतिक्रिया करते हैं — जिसमें यह पाया गया कि छोटे परिमाणों में हानि-विकर्षण गुणांक अपेक्षाकृत कम था। अध्ययन तीन में प्रतिभागियों ने दो सौ काल्पनिक द्वैध विकल्प खेले, जहाँ छोटे और बड़े परिमाणों के बीच उनके निर्णयों में अंतर देखा गया। अंततः, अध्ययन चार में अंतरराष्ट्रीय आंकड़ों का विश्लेषण करते हुए यह पाया गया कि जैसे-जैसे परिमाण बढ़ा, निर्णयों में अस्वीकृति दर भी अधिक हुई।

इन चारों अध्ययनों के परिणाम एक स्वर में इस बात का समर्थन करते हैं कि हानि-विकर्षण परिमाण पर निर्भर करता है। यह प्रभाव विभिन्न जनसंख्याओं, संदर्भों और प्रयोगात्मक विधियों में समान रूप से पाया गया। इस शोध के निष्कर्ष यह दर्शाते हैं कि जोखिम से जुड़े निर्णयों को समझने में परिमाण की भूमिका सतही नहीं, बल्कि अत्यंत महत्वपूर्ण और निर्णायक है।

कुंजीशब्द: हानि-विकर्षण, परिमाण-निर्भर हानि-विकर्षण, मूल्यांकन, निर्णय, जोखिमपूर्ण निर्णय-निर्माण।

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PT	Prospect Theory
MLE	Maximum Likelihood Estimate
HDDM	Hierarchical Drift Diffusion Model
DbS	Decision by Sampling
hBayes	Hierarchical Bayesian Modeling