Introduction to Neuroeconomics - Project

Framing zero: Why losing nothing is better than gaining nothing by Marcus Wardley and Max Alberhasky

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***Abstract*—The framing of zero has a significant impact on judgement and decision-making, although many writers frequently overlook or fail to realise this. Although earlier studies have demonstrated that zero has a unique meaning, no other studies have particularly looked at how zero is framed. The current research examines the underlying mechanisms and shows how the framing of zero affects judgement and decision-making across four investigations. In the context of a straightforward wager, suffering a tiny loss is preferable to winning nothing, while suffering the same small loss is preferable to losing nothing. Moreover, we introduce a variation in these experiments by adding questions to our questionnaire which tests these claims, in academic sense. We introduce questions based in academic paradigm and obtain observations from the responses obtained.**

***Index Terms*—Risk, Loss, Reward, Zero**

I. Introduction

The present studies test and support an explanation of these findings based on the concept of reference points and the affect heuristic. The framing of zero in these decision problems acts as a point of comparison, or reference point, affecting how evaluators feel about the bet. An explanation of these results based on the idea of reference points and the impact heuristic is tested and supported by the current investigations given in the paper. The way in which zero is framed in these decision-making situations serves as a benchmark or reference point, influencing how assessors see the wager. These findings demonstrate the value of framing zero in judgement and decision-making and give light on the mechanisms that underlie this impact.

The present research seeks to fill this gap by examining the framing of zero across four studies. First, we replicate problem 3 and problem 4 from Tversky and Kahneman (1986) and study 1 from Bateman, Dent, Peters, Slovic, and Starmer (2007) and vary the framing of zero. In both cases we find that changing the framing of zero substantially affects the results of these studies.

Second, we show in a simple gamble that while a small loss is more attractive than gaining nothing, the same small loss is less attractive than losing nothing.

Third, we find that the differences between gaining nothing, losing nothing, and a small loss are mediated by positive affect, thus supporting previous research on the role of affect in framing (Kahneman Frederick, 2007). Further, we demonstrate the differences between gaining nothing, losing nothing, and a small loss are explained by a combination of reference points and the affect heuristic (Slovic, Finucane, Peters, MacGregor, 2002).

In these decision problems the framing of zero acts as a reference point which affects the valence and salience of other parts of the bet in evaluating overall bet attractiveness. In other words, the framing of zero acts as a point of comparison affecting how evaluators feel about the probabilities and amounts which make up the other parts of the bet, and how much weight they are given in evaluating the overall bet.

We introduce an academic paradigm to this discussion by adding more questions to our questionnaire. These questions help us understand how different participants evaluate losing nothing and gaining nothing in academic terms, following this we try to analyse risk-aversive and risk-seeking behavior in academic paradigm.

II. Demographics

Normal volunteers will be recruited from college and other neighbouring places through various methods with inclusion criteria, any adult age range between 18 – 60 years/ staff/student/trainee belonging to India will be recruited to perform the experiment for the study and will be asked to fill the consent form.

III. Hypothesis

We anticipate that, in regard to the wager employed by Bateman et al. (2007), when zero is framed as win nothing, it will be less appealing than a tiny loss, but when zero is framed as lose nothing, it will be more appealing than the same small loss. We also hypothesized that positive affect will act as a mediator in these interactions and that reference point and the affect heuristic will work together to explain them. In particular, we argue that lose nothing, win nothing, and a modest loss all have an emotive valence that influences the prominence and valence of other bet components (dollar amounts and probabilities).

In both Tversky and Kahneman (1986) and Bateman et al., (2007), we contend that the framing of zero is partially responsible for the observed results. We predict that in the context of these decision problems gain nothing has a negative effect whereas lose nothing has a positive effect. Thus, in problem 3 from Tversky and Kahneman (1986) if the framing of zero is changed to lose nothing a greater proportion of participants will select the risk-seeking option whereas in problem 4 if the framing of zero is changed to gain nothing a greater proportion of participants will select the risk-averse option.

Table 1
Stimulus Wording and Number Participants Selecting Each Option

Stimulus Wording	Percentage of Participants
Condition 1: Tversky and Kahneman (1986) (N = 128)	
Problem 3: Original	
A. A sure gain of $100	83%
B. A 50% chance to gain $200 and a 50% chance to **gain** nothing	17%
Problem 4: Original	
A. A sure loss of $100	29%
B. A 50% chance to **lose** nothing and a 50% chance to lose $200	71%
Condition 2: Modified Framing of Zero (N = 135)	
Problem 3: Modified	
A. A sure gain of $100	66%
B. A 50% chance to gain $200 and a 50% chance to **lose** nothing	44%
Problem 4: Modified	
A. A sure loss of $100	50%
B. A 50% chance to **gain** nothing and a 50% chance to lose $200	50%

Fig. 1.

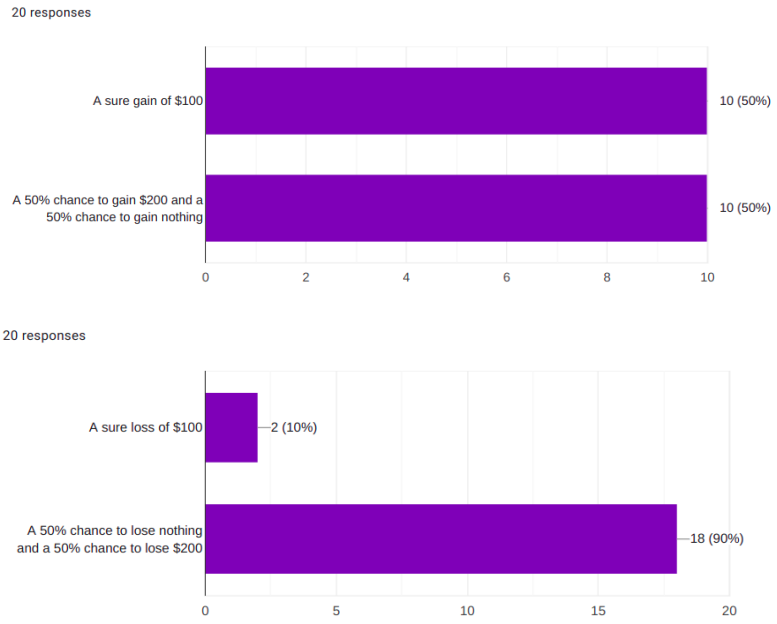

Fig. 2.

In relation to the bet used by Bateman et al., (2007) we predict that when zero is framed as gain nothing this will be less attractive than a small loss, but when zero is framed as lose nothing this will be more attractive than the same small loss. Further, we hypothesized that these relationships will be mediated by positive affect and explained by a combination of reference point and the affect heuristic. Specifically, we contend that lose nothing, gain nothing, and a small loss carries a certain affective valence and acts as a reference point affecting the valence and salience of other parts of the bet (dollar amounts and probabilities). Reciprocally, the other parts of the bet also act as reference points affecting how participants feel about the downside of the bet. More specifically, when zero is framed as gain nothing this induces negative affect and draws attention to the potential downside of the bet, which is not winning $9. Due to the increased focus on not winning, this makes the other parts of the bet seem more negative. Since gain nothing focuses attention on losing the bet, and thus not gaining $9, this actually makes the bet seem worse than losing $.05. When zero is framed as lose nothing, this induces positive affect and draws attention to the potential upside of the bet, which is being no worse off than before playing the bet and potentially winning $9. This makes the other parts of the bet seem more positive. In the realm of losses, lose $.05 is a fairly paltry loss, and thus represents an intermediate value between gain nothing and lose nothing. Lastly, in relation to salience, a focus on the potential downside of the bet (gain nothing) or the potential upside of the bet (lose nothing) causes different parts of the bet to be differentially weighted in evalu- ating overall bet attractiveness.

IV. Study 1A Replication and Extension of Tversky and Kahneman (1986)

In study 1A, we replicate problem 3 and 4 from Tversky and Kah- neman (1986) and . Since variations in initial wealth appear to be ignored, we replicate problems 3 and 4 without any variations in initial wealth. Thus, problem 3 has an expected value of +$100 and problem 4 has an expected value of -$100. We predict that by in problem 3 a greater number of partic- ipants will select the risk-aversive option and in problem 4 we predict that a greater number of participants will select the risk-seeking option.

A. Design and Procedure

The study will employ a two condition between-subjects design. Participants will be randomly assigned to conditions and in each condition, participants will face two sets of dichotomous choices presented in random order. In condition 1 the original stimulus from Tversky and Kahneman (1986) problems 3(Hospital Problem) and 4(Monty-Hall Problem) will be utilized. Participants will be given the following instructions: “Imagine that you face the following pair of con- current decisions. First examine both decisions, then indicate the options you prefer.”

The participants were also asked to answer some basic arithmetic questions, this was done for two main reasons. Firstly, this would help us filter out participants which are not filling the form seriously and are just picking random values. Secondly, this would help us generate a change in context before we make the transition between ”gain” and ”lose”.

B. Results

The results were similar to what was observed in the origina paper. We were able to obtain responses from 21 candidates out of which we had to filter out a response because o irregular and spam entries. We had 20 proper responses or which our observations are based.

We observed risk-aversive behavior in case of gains, anc risk-seeking behavior in realm of losses. This can be verifiec by the data be observed in the responses, in case of gains 50% of the participants chose the risk-aversive option, tha is they preffered sure gain of $100 over 50% chance to gair $200 and 50% chance to gain nothing. Whereas, 90% of the participants chose the risk-seeking optin in case of losses, tha is they preferred to bet over 50% chance to lose $200 anc 50% chance to lose nothing over a sure loss of $100. The same behavior was observed in the original experiments.

C. Discussion

The findings of study 1A replicate those of Tversky anc Kahneman. As the majority of participants choose the risk-averse option in issue 3 and the risk-seeking option in problem 4, we duplicate Tversky and Kahneman's first findings in condition 1. Issue 3 shows risk aversion in the area of gains and risk-seeking in the realm of losses because problem 3 has an expected value of +$100 and problem 4 has an expected value of -$100.

V. Study 1B Extension of Tversky and Kahneman (1986)

In study 1B, we replicate problem 3 and 4 from Tversky and Kah- neman (1986) and vary the framing of zero. Since variations in initial wealth appear to be ignored, we replicate problems 3 and 4 without any variations in initial wealth. Thus, problem 3 has an expected value of +$100 and problem 4 has an expected value of -$100. We predict that by changing the framing of zero in problem 3 a greater number of participants will select the risk-seeking option (in comparison to the original) and by changing the framing of zero in problem 4 we predict that a greater number of participants will select the risk-averse option (in comparison to the original).

A. Design and Procedure

The study will employ a two condition between-subjects design. Participants will be randomly assigned to conditions and in each condition, participants will face two sets of dichotomous choices presented in random order. A modified version of the original stimulus will be utilized by reversing the framing of zero. See Table 2 for stimulus wording. Participants will be given the following instructions: "Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer."

The participants were also asked to answer some basic arithmetic questions, this was done for two main reasons. Firstly, this would help us filter out participants which are not filling the form seriously and are just picking random values. Secondly, this would help us generate a change in context before we make the transition between "gain" and "lose".

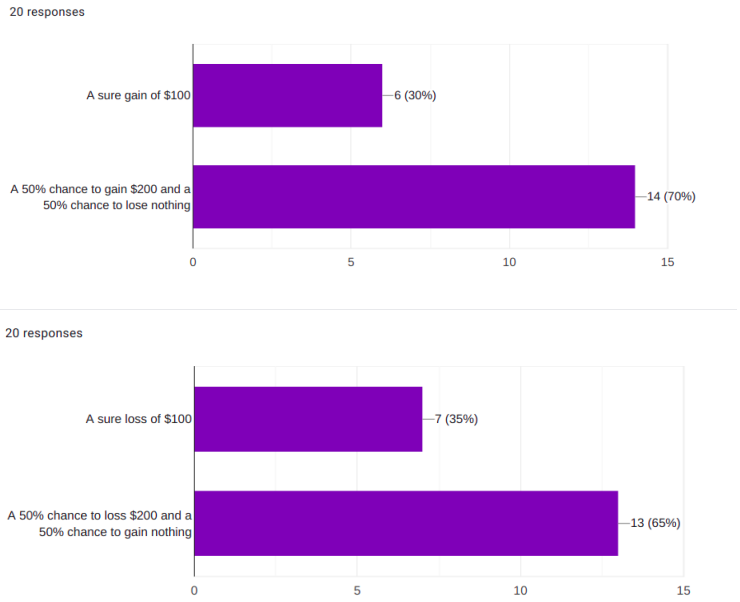

Fig. 3.

Problem 1A	
Condition 1	
sure gain of $100	50%
50% chance to gain $200 and 50% chance to gain nothing	50%
Condition 2	
sure loss of $100	10%
50% chance to lose $200 and 50% chance to lose nothing	90%
Problem 1B	
Condition 1	
sure gain of $100	30%
50% chance to gain $200 and 50% chance to lose nothing	70%
Condition 2	
sure loss of $100	35%
50% chance to lose $200 and 50% chance to gain nothing	65%

B. Results

The results were similar to what was observed in the original paper. We were able to obtain responses from 21 candidates, out of which we had to filter out a response because of irregular and spam entries. We had 20 proper responses on which our observations are based.

It was observed that when we change **gain nothing** by **lose nothing** in the first condition, more number of participants display risk-seeking behavior as compared to the original condition. Whereas, In the second condition it was observed that by changing **lose nothing** to **gain nothing** more number of participants displayed risk-aversive behavior. These observations are contradictory to what was observed in the original experiment.

The table provided displays the change in betting patterns of the participants observed just by changing framing of zero. It can be observed that more people prefer to bet on the **lose nothing** condition than on the **gain nothing** condition.

C. Discussion

The findings of study 1A extend and replicate those of Tversky and Kahneman and show the significance of how zero is framed in the context of a situation involving risky choices. As the majority of participants choose the risk-averse option in issue 3 and the risk-seeking option in problem 4, we duplicate Tversky and Kahneman's first findings in condition 1. Issue 3 shows risk aversion in the area of gains and risk-seeking in the realm of losses because problem 3 has an expected value of +$100 and problem 4 has an expected value of -$100.

In contrast to the original, significantly more participants chose the risk-seeking option in problem 3 after changing the way zero was framed, and similarly, significantly more participants chose the risk-averse option in problem 4. However, by modifying the framing of zero in problem 3 significantly more participants selected the risk-seeking option, and in problem 4 significantly more participants selected the risk-averse option in com parison to the original. Interestingly, in problem 4 there is no evidence of loss aversion as the number of participants selecting either option is essentially identical. This demonstrates that these decision problems are heavily dependent on how zero is framed. Next, we test problem 3 with real instead of hypothetical payoffs.

We predict that when zero is framed as gain nothing this will be less attractive than a small loss, but when zero is framed as lose nothing this will be more attractive than the same small loss.

VI. Study 2: Replication and Extension of Bateman et al., (2007) AND Study 3: Affective Mechanism

Since study 2 and study 3 required actual money we were not able to conduct the experiments. However, we tried to replicated the scale of bet attractiveness in our study.

The scale had a range of -50 to 50, and participants were asked to rate how likely are they to bet in certain scenarios. However we were not able to find any concrete pattern or observation from such scale. The two possible reason, we are assuming for this failure are, firstly the complexity of the question, rating a bet is a complex process and require critical thinking. Secondly, since most of the answers we found were 50, we are assuming participants didn't pay enough attention to answer these questions seriously and filled the first reponse they could think of.

VII. Study 4: Framing of Zero in a Non-Financial Condition

We have extended the conditions in Study 1A by replacing financial gains by gain in marks and other areas to see whether the study only holds for money related problems. This test will again be divided into two sections one to find the coherence of results with study 1 and the other will be adding the third condition to check if the findings of third condition holds true.

Additionally, we have conducted this study in two scenarios, one where the amount of marks involved in conditions are only a small percentage of total marks, and the other scenario being the one one marks involved in conditions are a big percentage of total marks. We have considered two such scenarios to understand the concept of initial utility in academic terms, and its impact of decision making.

Problem 4A	
Condition 1	
Question 1 (10 marks)	90%
Question 2 (50% chance to gain 20 marks and 50% chance to gain nothing)	10%
Condition 2	
sure loss of 10 marks	15%
viva(50% chance to lose 20 marks and 50% chance to lose nothing)	85%
Problem 4B	
Condition 1	
Question 1 (10 marks)	75%
Question 2 (50% chance to gain 20 marks and 50% chance to lose nothing)	25%
Condition 2	
sure loss of 10 marks	45%
viva(50% chance to lose 20 marks and 50% chance to gain nothing)	55%

The conditions provided here are very similar to problem 3 and 4 of Tversky and Kahneman, We have replaced money with marks to create an academic paradigm and provided according context to make the conditions relatable and real-like.

A. Design and Procedure

Design is very similar to the design of Study 1A, but we have changed the condition and the new conditions are given below. The exam has a total of 20 marks and 80 marks (two scenarios) to be obtained and we offer students with few wagers.

In the first scenario the question is framed in the following way

Lets say you have an exam with two questions, each carrying 20 marks, and you need to solve any one out of them

Question 1 : you know half the answer to question 1, so you would surely score 10 marks

Question 2: question 2 is a MCQ with 2 choices, you still don't know the answer to this question. So you have a 50% chance to score 20 marks and 50% chance to gain nothing

Which question would you attempt

The second question asked was

In the first scenario the question is framed in the following way

option1: A sure loss of 10

option2: An option for viva, where you hold a 50% chance to lose all 20 marks and 50% chance to lose

Which option would you choose

Another scenario was framed where the participant had already scored 60 marks and the condition was framed for the rest of the 20 marks.

Later the framing of zero was changed in these conditions and the questions were asked again to the participants, to understand the role of framing zero in academic sense.

B. Results

As it can be observed from the table, that when it comes to marks, participants chose more secure options. This can be observed by condition 1, where risk-aversing behavior is observed in 90% cases in problem 4A, even in problem 4B when zero is framed in a way to encourage risk-seeking behavior, then too 75% participants chose the risk-aversing behavior, However a rise in risk-seeking behavior was observed as predicted.

Similarly, in condition 2 it can be observed that just by changing the framing of zero, participants were encouraged to choose risk-aversive behavior over risk-seeking behavior.

Even in marks it was observed that participants exhibit more risk-seeking behaviour in areas of loss and risk-aversive behavior in case of profits. This coincides with the observations over financial conditions.

Moreover, it was observed that having 60 more intital marks doesnt make any significant difference in the decision making process, thus the utility theory which hold for financial conditions doesnt hold for academic conditions.

C. Discussion

It was observed that students prefer to choose more risk-aversive behavior when dealing with marks than with money. They tend to choose more secure choices and their decision making is more safe.

Apart from this all the observations made in experiment 1A and 1B were also observed here, how the percentage of participants choosing risk-seeking behavior were low in this case.

The interesting observation, that we made here is having extra initial 60 marks, doesn't change the decision making. This makes us believe that the utility theory doesn't stand true in academic sense.

VIII. Variations

We are planning on conducting some variations of the experiments stated above and also variations of other Tversky and Kahneman's problems. We are yet to design the variation of the experiment.

IX. References

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