DEFINING CONSTRAINTS ON THE EFFECTS OF FRAMING ON RISKY DECISIONS

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An experiment was conducted to study whether there are limits to the effects of framing on risk-taking decisions. The perceived weight of the decision (consequential or inconsequential), framing of the decision outcomes (positive or negative), and expected value of outcomes (low, moderate, or high) were manipulated to determine the effects on risk preference. The results show that with moderate expected values, the effects of framing were diminished if the decision problem was perceived to be consequential. With low and high expected values, the effects of explicit framing are modified by the effects of the extreme expected values of the outcomes. The findings suggest that the mode in which people perceive or frame decision outcomes are not rigid. When carefully scrutinizing outcomes, people may frame decision outcomes both positively and negatively. Extremely good or extremely bad outcomes might also weaken the tendency to perceive decisions in the corresponding opposite frame.

When do people decide to take risks? When do they choose to adopt decision alternatives that involve uncertain outcomes? Traditional psychological theories of decision making (e.g., expected utility model by Raiffa, 1968; von Neumann & Morgenstern, 1944) have assumed that the answer to these questions is: as infrequently as is possible. Traditional theories have assumed that people are averse to taking risks and that this risk preference is unchanging. *Risk aversion* is defined as the preference of outcomes that have 100% chance of occurrence over outcomes that have less than 100% chance of occurrence, even if the latter outcome has equal or even greater expected value compared to the former. In other words, people prefer certain outcomes over risky or probabilistic outcomes.

A typical demonstration of risk aversion was done by Tversky and Kahneman (1981). Subjects were given the following problem:

Problem 1: Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the program are as follows:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

Which of the two programs would you favor?

Although, both programs have equal expected values, a good majority of the subjects (72%) were averse to risk and preferred Program A in which the outcome was a certainty.

Recent psychological theories of decision making, however, have challenged the assumption that people's risk preferences are unchanging. According to prospect theory (Kahneman & Tversky, 1979), for example, risk preferences are affected by the manner in which decision outcomes are framed (see also Fischhoff, Slovic & Lichtenstein, 1980; Kahneman & Tversky, 1984; Slovic, Fischhoff & Lichtenstein, 1982). In prospect theory, outcomes are expressed in terms of positive or negative changes (i.e., gains or losses) relative to a neutral reference outcome. In other words, people perceive the decision problem either as a choice among options that lead to gains or as a choice among options that lead to losses.

The framing of outcomes as either gains or losses turns out to have an important effect on risk preferences. Consider, for example, the same cover story as Problem 1 with a different formulation of the alternative programs:

Problem 2: If Program C is adopted, 400 people will die. If Program D is adopted, there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Which of the two programs would you favor?

For problem 2, a majority of the subjects (78%) chose the risk-taking option, Program D. This result showed a clear reversal of the subject's risk preferences given exactly the same outcomes framed differently. The result has been referred to as the *reflection effect* because the preference between negatively framed outcomes is the mirror image of the preference between positively framed outcomes.

Prospect theory explains the reflection effect in terms of different value functions people associate with gains and losses. The value function associated with gains is concave, that is, differences in values associated with higher gains are smaller than differences associated with lesser gains. For example, the difference in subjective value between gains of P10 and P20 is greater than the subjective difference between gains of P1010 and P1020.

The same relations between subjective value differences holds for corresponding losses. Hence, the value function associated with losses is convex. This convex function, however, has a steeper slope compared to the concave function, which implies that people's response to losses is more extreme than their response to gains. That people are risk seeking in the domain of losses has been verified in several studies (see e.g., Fischhoff, 1983; Hershey & Schoemaker, 1980; Rachlin, 1990; Slovic et al., 1982).

One critical assumption of prospect theory that accounts for framing effects on risk taking is that people express outcomes only either as gains or losses. The assumption is certainly tenable for decision situations in which the outcomes differ from the neutral reference point only in terms of one dimension. In the earlier examples, the certain and probabilistic outcomes deviate from the neutral reference point in terms of the number of people that will be saved or that will die. There are decision situations, however, in which outcomes are evaluated using several dimensions. For example, outcome A might lead to a substantial gain in dimension X, but a loss in dimension Y, and a small gain in dimension Z. Outcome B, on the other hand, might lead to a small gain in dimensions X and Y, but a sizable loss in dimension Z. Therefore, in evaluating the overall values of different outcomes, people might be expressing the outcomes in terms of both losses and gains.

People might even express outcomes in terms of cases where there is just one dimension in which outcomes are evaluated. That is, people are probably not very rigid in how they view decision outcomes, especially when they try to examine very critically the different decision alternatives. It would not be hard to imagine that a person who becomes strongly involved with the earlier decision problem would realize that the outcome "200 out of 600 people will be saved" also indicates that "400 out of 600 people will die." These arguments suggest that the effects of framing the problem might not always be as straightforward as is currently depicted. People's perception of a decision problem's outcomes might not be as static and unchanging as one would like to assume.

THE EXPERIMENT

In this experiment, variations in perceptions of decision outcomes and their effects on risk-taking behavior were investigated. The basic design involved looking at the effects of framing on individual's preference for either a certain outcome or a probabilistic outcome with the same expected value. Aside from framing, two other independent variables were manipulated.

The first variable is the decision maker's perception of how weighty the decision is. The weight of the decision refers to whether the consequences of a decision will have a great impact on a person's goals or whether the decision will have trivial consequences.[1] For example, the decision on which movie to see has less weight than the decision on which university to attend. It would be reasonable to expect that in

more weighty decisions, a person will try to scrutinize more carefully the outcomes of each decision option. This scrutiny should result in evaluating the outcomes more intensively, possibly expressing the outcomes both in terms of the corresponding losses and gains. If so, the ambiguity in framing the decision outcomes should lead to a similar ambiguity in whether a person would be risk averse or risk taking.

The second variable is the expected value of the decision outcomes. Recall that certain and probabilistic outcomes have equal expected values. The variable of expected value refers to the amount of gain (or loss) described in both the certain and probabilistic outcomes. This was manipulated on three levels: low, moderate, and high expected value. In the low expected value condition, the certain outcome involved small gains or substantial losses. The probabilistic outcome involved low probabilities for substantial gain or high probabilities for substantial losses. In the moderate expected value condition, the certain outcome involved moderate gains or losses, and the probabilistic outcome involved moderate probabilities for both gains or losses. In the high expected value condition, the certain outcome involved substantial gains or small losses, while the probabilistic outcome involved high probabilities for gains or low probabilities for losses.[2]

It is expected that with high and low expected values for both certain and probabilistic outcomes, people's perception of the outcomes would be strongly influenced by the direction of the expected value. If both certain and probabilistic options would lead to low expected values, the effect of negative framing should be enhanced, while the effect of positive framing should be diminished. That is, for negatively framed decisions, people should take risks, but for positively framed decisions, they should be ambivalent about being risk taking or risk averse. For high expected values, the reverse effect would be true. The fact that both outcomes would lead to high expected values should enhance the effect of positive framing. It should also diminish the effect of negative framing. People should be more risk averse for positively framed options, but they should be ambivalent about risk taking or risk aversion for negatively framed options. For the moderately framed options, the effects of framing should be intact.

It is also expected that the perceived weight of the decision and the expected value would have interactive effects. That is, the effects of the perceived weight should be more marked when the expected values are moderate. When the expected values are extreme, it is possible that the decision would be perceived as being not very consequential, since whichever outcome is chosen, the consequence will be similarly good or similarly bad. Therefore, it is only when the expected values of the outcomes are moderate that the weight of the decision would make a difference.

To summarize, the experiment was designed to study the effects of (1) framing of outcomes, (2) weight of decision, and (3) expected value of outcomes on risk taking. The following predictions were tested:

(1) For outcomes with low expected value, subjects would take risks when outcomes are negatively framed, but would not be clear about their risk preference when outcomes are positively framed. The weight of a decision should have minimal effect.

(2) For outcomes with moderate expected value, subjects would be risk taking when outcomes are negatively framed and risk averse when outcomes are positively framed, but only if the decision is not perceived to be consequential. If the decision is perceived to be consequential, the subjects would not be clear about their risk preference.

(3) For outcomes with high expected value, subjects would be risk averse when outcomes are positively framed, but would not be clear about their risk preference when outcomes are negatively framed. The weight of a decision should have minimal effect.

METHOD

Subjects

Fifty-eight Introductory Psychology students at the University of the Philippines, Diliman, participated in this experiment as part of a class requirement.

Materials

Two decision problems were developed to determine when subjects would choose risky outcomes. The decision problems involved situations that students might confront in a university: deciding which class to enroll in and deciding which exam to take. Each decision problem had two versions that varied in terms of the weight of the decision. The first version implied that the decision would have great consequences, and the second version implied that the decision would be inconsequential (see Table 1 for examples).

Each decision problem was followed by three pairs of alternatives. Each pair of alternatives consisted of one option that specified certain outcomes and one option that specified probabilistic outcomes. The subjects were required to select one option. However, both options have equal expected values or utilities. For example, options A and B for the first problem in Table 1 have equal expected values (that 60% will pass); but in option A this outcome is a

Table 1. Examples of decision problems used in experiment

Consequential decision—positively framed outcomes:

In one of your classes this semester, your final grade will be based on only one comprehensive final exam. Your professor uses various standardized tests he has used over the last 15 years. He picks two standardized tests and lets the class vote and decide on which one will be given to the class.

Consider the following information about tests A and B (based on previous administrations of the test):

A. If test A is given, 24 out of 40 students in a class will definitely pass.

B. If test B is given, there is a 60% chance that all 40 students will pass, and a 40% chance that all 40 will not pass.

Knowing that your final grade completely depends on this one exam, which option do you prefer?

Inconsequential decision — positively framed outcomes:

In one of your classes this semester, 5% of your final grade will be based on one comprehensive final exam. Your professor uses various standardized tests he has used over the last 15 years. He picks two standardized tests and lets the class vote and decide on which one will be given to the class.

Consider the following information about tests A and B (based on previous administrations of the test):

A. If test A is given, 24 out of 40 students in a class will definitely pass.

B. If test B is given, there is a 60% chance that all 40 students will pass, and a 40% chance that all 40 will not pass.

Knowing that 5% of your final grade depends on this one exam, which option do you prefer?

Consequential decision—negatively framed outcomes:

After your last semester in the university you are informed by the registrar that you lack 3 units of the required number to graduate. Since you have no other choice, you have to take and pass a 3-unit summer course. Unfortunately, there are only 2 classes that would fit your degree program, and you can only take 1 of them.

Consider the following information about classes A and B (based on the track record or history of the classes):

A. In class A, taught by Prof M, 20 of 50 students will definitely fail.

B. In class B, taught by Prof N, there is a 40% chance that all 50 students will fail, and a 60% chance that all 50 will not fail.

Knowing that your graduation depends on passing this one class, which option do you prefer?

Inconsequential decision—negatively framed outcomes:

During your last semester in the university you decide to take an extra 3-unit course. This course may or may not be reflected in your records, since it is already in excess of what is required in your degree program. Unfortunately, there are only 2 classes that would fit your schedule, and you can only take 1 of them.

Consider the following information about classes A and B (based on the track record or history of the classes):

A. In class A, taught by Prof M, 20 of 50 students will definitely fail.

B. In class B, taught by Prof N, there is a 40% chance that all 50 students will fail, and a 60% chance that all 50 will not fail.

Knowing that this class may or may not be reflected on your records, which option do you prefer?

certainty, while in option B this outcome is probabilistic.

The three pairs of alternatives that followed each decision problem were varied in terms of overall expected value. One option involved low expected values (10% gain/90% loss), another involved moderate expected values (60% gain/40% loss), and the last involved high expected values (90% gain/10% loss). The order in which the three pairs of outcomes followed the decision problem was counterbalanced (low-moderate-high or high-moderate-low) across problem versions.

Each of the two decision problem, therefore, had four versions: (1) a consequential version followed by three pairs of positively framed outcomes, (2) a consequential version followed by three pairs of negatively framed outcomes, (3) an inconsequential version followed by three pairs of positively framed outcomes, and (4) an inconsequential version followed by three pairs of negatively framed outcomes. From these different versions, the experimental questionnaires were prepared. Each questionnaire contained two decision problems. For half of the questionnaires both problems were in the consequential versions, and for the other half both were in the inconsequential versions. For all these questionnaires, the outcomes of one problem were framed positively, and the outcomes of the other were framed negatively. The selection of which problem would be followed by either positively framed or negatively framed outcomes was counterbalanced. The sequence of presenting problems with positively or negatively framed outcomes was also counterbalanced.

Procedure

The experimental questionnaires were administered in groups of two to ten subjects. Subjects were told that they would be given descriptions of two hypothetical decision problems. They were instructed to try their best to approach the decision problem as if they were actually confronted with the situation. It was also stated that for each decision problem they would be given different pairs of decision alternatives, and that they would have to choose which of the pair they prefer. They were then asked to indicate their choice by checking the line following the appropriate option.[3]

The subjects were instructed to think about their answers very carefully before responding. They were also informed that there would be instances when the two outcomes seemed to be equally attractive or equally unattractive. In these cases, they could not abstain from making a decision; they still had to check one of the options. Subjects were told not to go back and change a decision they had already completed. They completed the task within five to fifteen minutes.

RESULTS

The number of subjects who chose the probabilistic option was determined to indicate the proportion of risk-taking decision made. The proportion of risk-taking decisions for the different decision situations are summarized in Table 2.

The overall proportion of risk-taking decisions for positively framed and for negatively framed outcomes across all levels of decision weight and expected value was determined and

Table 2. Proportion of risk-taking decisions as a function of weight of decision, expected value, and framing of options

Expected Value	Low		Moderate		High	
Frame	pos	neg	pos	neg	pos	neg
Consequential (N=28)	.61	.79	.43	.61	.32	.61
Inconsequential (N=30)	.60	.83	.30	.67	.27	.53

analyzed using a chi-square test for independence. The results indicate that there is a strong relationship betweeen framing and risk preference ($\chi^2 = 5.564, p < .02$). When decision outcomes were framed negatively, subjects chose the probabilistic outcome 67% of the time. But when the same outcomes were framed positively, they chose the probabilistic outcome only 42% of the time. This result replicates the findings of Tversky and Kahneman (1981).

The overall proportion of risk-taking decisions for consequential and inconsequential decisions across all levels of framing and expected value was also determined and analyzed using a chi-square test for independence. The results indicate that there is no relationship between risk preference and the weight of the decision ($\chi^2 = 0.240$, n.s.). In both conditions, risk taking was at the level of chance, 56% for consequential decisions and 53% for inconsequential decisions.

The overall proportion of risk-taking decisions for each level of expected value across all levels of framing and decision weight were also analyzed using a chi-square test. The results show a significant relationship between risk preference and the expected value of the outcomes ($\chi^2 = 19.290, p < .001$). Subjects chose the risky option 71% of the time when the expected value of the outcomes was low, but only 50% and 43% of the time when the expected values of the outcomes were moderate and high, respectively.

To test directly for the specific predictions the proportion of risk-taking decisions for each level of expected value was analyzed using chi-square tests on the appropriate proportions. For the low expected value conditions, it was predicted that weight of decision will have minimal effects. More importantly, it was predicted that subjects would be risk taking when the outcomes are negatively framed, but they would be unclear about their risk preference when the outcomes are positively framed. The results support these hypotheses. For low expected value outcomes, risk preference was not related to decision weight when the outcomes were framed positively ($\chi^2 = 0.003$, n.s.) nor when the options were framed negatively ($\chi^2 = 0.215$, n.s.). However, there was a significant relationship between risk preference and framing ($\chi^2 = 5.992$, $p < .02$). As predicted when the outcomes were negatively framed, the subjects were risk taking 81% of the time. This result shows a strong effect of negative framing. However, when the outcomes were positively framed, the subjects were not clear about their risk preference; subjects chose the probabilistic outcome only 60% of the time, which is at about chance levels.

For the moderate expected value conditions, it was predicted that subjects would be risk takers with negatively framed outcomes and risk averse with positively framed outcome, but only when the decision is perceived to be inconsequential. When decisions are perceived to be consequential, the subjects should be unclear about their preference. The results verify these hypotheses. In the inconsequential decision condition, there was a significant relationship between framing and risk preference ($\chi^2 = 8.076$, $p < .01$). Subjects chose the risky outcome 67% of the time when the outcomes were negatively framed, but chose the certain outcome 70% of the time when the outcomes were positively framed. However, in the consequential decision condition, there was no significant relationship between framing and risk preference ($\chi^2 = 1.788$, n.s.). Subjects chose the risky outcome 43% of the time with positively framed outcomes, and 61% of the time with negatively framed outcomes. Both proportions are at about chance levels.

For high expected value conditions, it was predicted that there would be a minimal effect of decision weight, that subjects would be risk averse for positively framed outcomes, and would be unclear about their risk preference for negatively framed outcomes. Again, the results support these hypotheses. Risk preference was not related to decision weight when the outcomes were framed positively ($\chi^2 = 0.208$, n.s.) nor when the outcomes were framed negatively ($\chi^2 = 0.323$, n.s.). However, there was a significant relationship between risk preference and framing ($\chi^2 = 9.000, p < .01$). As predicted when the outcomes were positively framed, the sub-

jects were risk averse 71% of the time. This result shows a strong effect of positive framing. However, when the outcomes were negatively framed, the subjects were not clear about their risk preference; subjects chose the probabilistic outcome only 57% of the time, which is at about chance levels.

DISCUSSION

An experiment was designed to determine whether perceived weight of decision and expected value of outcomes constrain the effects of framing outcomes on risky decisions. The results of the experiment indicate that extreme (low or high) expected values override the effects of explicit framing on people's perceptions of decision frames. When the expected values were very low, the effect of negative framing was enhanced. However, the effect of positive framing was overwhelmed, so to speak, by the low value of the expected outcomes. A corresponding pattern was observed when the expected values were very high: the effect of positive framing was enhanced, but the effect of negative framing was attenuated. When expected values are at a moderate range, the effects of framing were likewise attenuated when the decision problem was perceived to be consequential.

The modified effects of framing, found across different levels of expected value and perceived weight of the decision, suggest that people are not rigid in the mode they perceive or frame decision outcomes presented to them. Take for example the effect of perceived decision weight on moderate expected values. The standard effects of positive and negative framing were observed when the subjects perceived the decision as being an inconsequential one. However, when the decision was perceived to be a consequential one, the subject became unclear about their risk preferences. This result is consistent with the view that when people scrutinize decisions carefully, as when the decision has great implications, the outcomes are not framed solely in positive or negative terms. People avoid looking at only the good or only the bad side of each decision alternative. Decision makers become mindful of both the costs and benefits associated with all outcomes. Therefore, risk preference, as determined by how the outcomes are perceived, becomes unclear.

This finding has important implications regarding the apparent vulnerability of people's decisions to such a seemingly trivial factor as the framing of decision outcomes. The results suggest that people are able to consider more carefully and judiciously their options in a decision problem when it counts. People are able to grasp and evaluate both the positive and the negative elements of their choices when they know that decision has important consequences.

The modified effects of framing in cases of extreme high expected outcomes also show some constraints on the effect of explicit framing of outcomes. In these cases both the certain outcome and the risky outcome lead to substantial gains for the decision maker. Hence, even if these outcomes are framed negatively, the fact that the outcomes are on the whole quite excellent does not go unnoticed by the decision maker. The tendency to evaluate the outcomes in terms of losses is then weaker. For example, if a person wins a lottery and has to choose between receiving a brand new car or P500,000 in treasury bills, she will probably not worry too much about maintenance costs or fluctuating interest rates. When a person is counting her blessings, so to speak, she tries not to let anything get in the way.

The same reasoning applies to the conditions when both the certain and the risky option lead to insignificant gains or substantial losses. Even if the outcomes are framed positively, the substantial loss should be very salient to the decision maker. Because the outcomes clearly disadvantage the decision maker, the tendency to evaluate the outcomes in terms of gains is then weaker. This is similar to making a choice between having either one's right or left leg cut off. In this case, it is unlikely that a person will be able to look at the bright side of either alternative. The choice becomes one of "the lesser evil", not of the greater good.

That the standard framing effects were not replicated with high and low expected values, however, is not inconsistent with Kahneman and Tversky's (1979) prospect theory. When subjects were unclear about their risk preferences

for positively framed outcomes with low expected values and for negatively framed outcomes with high expected values, they were still basing their decisions on their evaluations of these outcomes as they are framed in terms of gains or losses. However, it is no longer the case that the outcomes are framed solely in terms of the explicit frame used in describing the outcomes. Instead, the extreme expected values also influence the subjects' perception of whether the outcome indicate losses or gains. In the subjects' point of view, therefore, the outcomes are described in terms of both losses and gains. So while the risky outcome would seem more attractive when framed negatively, it would be less attractive when framed positively. Hence, the ambivalence in the overall risk preference was observed.

In terms of the prospect theory, the preceding arguments indicate the need to study the different factors that might influence or determine how people frame decision outcomes that they confront. Clearly, the results of the experiment indicate that people do not simply frame the decision outcomes on the basis of how the information of these outcomes is presented to them. The range of the expected value of the outcomes seems to be one factor that influences how people frame or perceive decision outcomes. Research should be directed to investigating other factors like perception of the status quo relative to the decision outcomes, or changes and trends in the status quo immediately prior to making the decision (Hsee & Abelson, 1991), the types of behaviors involved in decision, (Hsee, Abelson & Salovey, 1991).

Finally, it could be noted that the subjects in this experiment were most risk taking when asked to choose between a certain outcome indicating a substantial loss, and a risky outcome involving high probabilities for substantial loss and low probabilities for avoiding substantial loss. As indicated earlier, there is significant evidence for the idea that people tend to take risks when dealing with losses. This particular result of the experiment is a rather dramatic demonstration of this position. It shows not only that people tend to take more risks when dealing with greater losses, but also that people are willing to take the greatest risk in situations where the chances of their alleviating their plight is at best small. It is somewhat ironic that it is when people do not really have a choice that they are most likely to decide to take risks. This observation alone should finally put to rest any notion that human beings are risk averse.

AUTHOR'S NOTES

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NOTES

1. The term 'decision weights' is used in a very different sense in prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1981). In prospect theory, decision weights refer to the impact of the outcomes on the desirability of the different alternatives. The value of the outcomes and the decision weight associated with this outcome determine the overall value of an alternative.
2. In prospect theory, it assumed that low probabilities are overweighted (see first footnote) while moderate and high probabilities are underweighted. However, the low, moderate, and high probability levels used in the current experiment fall under the moderate range that is defined

in prospect theory. Therefore, there should be no extreme differences in decision weights (in the prospect-theory sense) associated with the probabilities used in this experiment that could systematically affect the pattern of risk-taking decisions.

3. The subjects were also asked to indicate how strongly they preferred the option of their choice relative to the alternative. They were supposed to indicate this by putting a slash at the appropriate point in a bipolar scale. However, a significant number of subjects were not able to do this task properly. Hence, these data were not analyzed.

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