# PERSONALITY TYPE, GENDER AND RISK: A FRAMING ANALYSIS 

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#### Abstract

Recent literature has explored the effect of personality type on economic education. This paper extends that literature by tying personality types and gender to individual decision making for issues involving risk and uncertainty. This study replicates findings that the framing of uncertain decisions, although a violation of strict expected utility theory, is a widespread phenomenon. Through reported personality measures, framing, gender, and personality types are linked. These finding demonstrate that both personality types and gender are important when considering the evaluation of decisions involving risk and uncertainty. Personality types, as well as gender, are found to yield significant differences in decision making both in terms of risk preference and framing. Since behavior is influenced by personality type and gender, then the concern for economic educators is that learning is also influenced.


## INTRODUCTION

Risk preference and preference reversal, also known as framing, are significant factors for evaluating decisions involving risk and uncertainty. Behavioral studies have explored issues where the framing of questions involving insurance, gambling, and medical decisions influences perceptions. Experimental studies have documented that decision-makers react differently to the same proposition depending upon the manner in which it is presented. This phenomenon is known as preference reversal and violates a strict expected utility analysis of decision-making (Machina, 1987). A related question is which individuals are more likely than others to be prone to either risk avoidance or preference reversal? We explore this question by incorporating personality types and gender into an analysis of risk preference and preference reversal. It is the

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purpose of this paper to explore the link between personality, gender, risk, and framing.

## GENDER, PERSONALITY TYPE, AND DECISION MAKING

Gender is one of the most important independent variables that should be investigated when looking at risk and decision making (King \& Hinson, 1994). Women communicate and make decision differently than men. Brown (1996) states that "gender begets gender roles" (p 243) and in decision making and risk situations, behaviors consistent with gender roles are most likely to be affected. One of the most evident manifestations of gender roles is in the risk women are willing to take in making decision. Recent Literature concludes that women have a lower preference for risk than men (Hyde, 1990; Powell \& Ansic, 1997; Sonfield, Lussier, Corman, \& KcKinney, 2001) but no differences in decision making values or styles (Powell, 1990). Women are, in general, more likely to choose the certain outcome.

Personality also plays a part in how decisions are made. Personality types have been linked to management and decision-making and are correlated with managerial responsibilities and occupations (Keirsey, 1998). One of the more common approaches to measure personality is the development of Myers-Briggs Type Indicators: Extravert or Introvert, Sensor or Intuitive, Thinker or Feeler, and Judger and Perceiver. Myers-Briggs Type Indicators, based on Jungian psychology type theory, is used as a framework to discuss personality types and their potential to influence decision making under risk and uncertainty. Myers and McCaulley (1989) explain each:

- Extravert-Introvert index (E or I) reflects how an individual relates to the world of people and things
- Sensor-Intuitive index (S or N) reflects how a person chooses to gather information or perceives the world Thinker-Feeler index (T or F) reflects how a person prefers to make judgments or decisions
- Judger-Perceiver index ( J or P ) reflects how a person prefers to deal with the world.

These eight letters and the traits they represent can be combined into sixteen possible combinations to further explain why people are different from each other.

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Myers (1962) then partitions the sixteen types into four groups - SP, SJ, NF, and NT, suggesting that those in each grouping are very much alike in their attitudes and actions whereas those in other groups are very different. Keirsey (1998) describes the four groups:

- $\quad$ PPs are adaptable, artistic and athletic as well as very much aware of reality
- $\quad$ Js are conservative, stable, patient, dependable and hardworking
$\checkmark \quad N F$ s are humane, sympathetic, enthusiastic, creative and intuitive
$\bullet \quad N T \mathrm{~s}$ are analytical, systematic, intellectual and inventive.

Being able to determine an individual's personality type gives some insight to how they will react in certain situations, how their temperament, character, and personality are configured, and how they are predisposed to certain actions and attitudes.

Personality types are related to learning and teaching styles. Borg and Shapiro (1996) extend the analysis into economic education and show that personality types also influence the success of individuals in the study and understanding of economic decision-making. A particular emphasis of their study asks not only which personality types may be best suited for studying economics, but considers the impact when the student and teacher personality types clash.

We extend the analysis to consider the influence of personality type on the underlying decision making practices that are covered as economic content. If the decision-making behavior under risk and uncertainty differs by personality type, then we should not be surprised to find that specific examples or pedagogical treatments of uncertainty are more easily understood and learned by some students than other. This paper specifically tests the hypothesis that risk preference and framing decisions are influenced by personality type.

## THE USE OF FRAMING AND PREFERENCE REVERSAL

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When the emotional context rather than the outcome influences managerial decisions, the issue of framing arises. For example, a reference point may influence the manager. The choice of reference point determines whether an uncertain choice is perceived as a gamble, (with a chance to win) or as insurance (where the certain choice limits loss) and influences the subject's decisions (Schoemaker \& Kunreuther, 1979; Hershey \& Schoemaker, 1980; McNail, Sox \& Tversky, 1982; Slovic, Fischoff \& Lichtenstein, 1983). To demonstrate this concept, alternate scenarios are presented with the same expected value outcomes. Tversky and Kahneman $(1981,1986)$ present the following classic decision for a life or death scenario:

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 estimates of the consequences of the programs 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.

Versus

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.

The outcome described as Program A is identical to that described as Program C. In each program there are 200 people who live and 400 people who die. Similarly the outcome described as Program B is identical to the outcome described as Program D. In each case with $1 / 3$ probability 600 people live and with $2 / 3$ probability 600 people die. If presented with saving lives through choices A and B, $72 \%$ choose the certain outcome A, however when phrased in terms of deaths $84 \%$ were willing to gamble on Program D.

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## METHODOLOGY FOR FRAMING AND PERSONALITY TYPE

Measuring the individual's personal preferences and disposition, a self-reporting instrument was used with dimensions that classify people using Myers-Briggs Type Indicator terminology. In addition, the survey instrument captured framing and relative risk preferences based on alternate scenarios of four uncertain decisions.

Four different questions were asked of each respondent to capture alternate framing environments. One question is presented as a straight monetary gamble; alternatively another question presents the same type of decision as an investment in the stock market. The life and death choice involving disease prevention strategies presented above was included as well as a final scenario where a decision on corporate restructuring involving job loss was presented. The questions alternated the frame of loss and gain so no respondent was asked solely questions framed as a loss or framed as a gain. The questions with each variation of answer are presented in Appendix 3.

Consistent with the methodology employed by Parker and Spears [8], the study was administered to a population of 249 students in business and economics courses. The respondents were administered one version of each of the four questions. The responses can be divided in groups to capture the set of questions administered In addition information was gathered for each respondent on their gender and reported personality type based upon the four Myers-Briggs types. Student surveys have traditionally been used in the framing literature with the results successfully replicated for other populations.

From the survey responses discrete measures were created for the variables. The dependent variables include: MONEY, with value equal 1 if the respondent chose the uncertain option for the money question; DEATH, with value equal 1 if the respondent chose the certain option for the life and death question; JOBS, with value equal 1 if the respondent chose the certain option for the corporate restructuring question; and STOCKS, with value equal 1 if the respondent chose the uncertain option for the stock question. In addition for each respondent, discreet personality variables were created identifying the four self reported personality indices, the Keirsey personality type, and GENDER. To capture the influence of the framing of the question another 0 or 1 variable, FRAME, was created identifying the form used. Cross variables were then created between FRAME and the personality and GENDER variables.

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For each discrete dependent variable, MONEY, DEATH, JOBS, and STOCKS, the logistic probit procedure estimation technique is used to analyze the relationships. The probit procedure estimates the probability of the dependent variable by estimating the value of Z under a normal curve. The probability associated with an independent variable is calculated by evaluating the change in the Z statistic as the dependent variable is added.

The responses are coded as either 0 or 1 . Similarly the variable FRAME is defined by coding the form with a 0 or 1 value identifies the version of the question posed. The constant term can be used to determine the probability that a respondent chooses the decision coded with a 1. The coefficient on FRAME can be used to identify whether a significant difference in answers is associated with using the alternate statement. When the coefficient on FRAME is significantly different from 0 framing has occurred.

The primary attributes to consider are the personality type indicators and gender. When the attribute is incorporated directly into the model the coefficient captures any difference in risk preference displayed. In order to illustrate differences in framing behavior the attribute is entered as a cross term with the form used. Since no a priori expectations were expressed as to which of the four personality type indices would be the most significant categorization, the attributes were included both directly to capture risk preferences and as cross terms to capture framing behavior using a stepwise regression procedure. The stepwise regression process adds variables in sequentially, including only those variables above a stated significance level.

## RESULTS

The results from the series of estimations show that personality type and gender do play an important role in the forming of risk preferences and the framing of uncertain decisions. For three of the four questions posed at least one personality type index was significant either for framing or for revealing different degrees of risk preferences. In addition, there is a significant difference by gender in the risk preference for each question.

The results from the stepwise regression including the personality indices for each question are reported in Table 1. The intercept term captures the basic tendency to choose either the certain outcome or the gamble for each question; hence it is a measure of risk preference. The variable FRAME identifies the extent that the decision is altered by the manner in which the question is phrased.

For example in the first column, for the monetary question the estimate of the z statistic from the intercept term is -0.5444 . Thus the probability of choosing to gamble by selecting the uncertain outcome is $\mathrm{pr}(\mathrm{z}<-0.5444)=29.31 \%$. However when phrased in terms of a monetary loss the estimate of the z statistic is increased by a statistically significant 0.6065 . Thus raises the probability that a respondent will select the uncertain outcome to $52.48 \%$. Full calculations of the probabilities represented by the significant attributes in Table 1 are presented in Appendix 1. The only attribute that enters significantly in the money equation is GENDER. Females are significantly more risk averse than males and less likely to choose to gamble. In the absence of framing the probability for choosing the uncertain outcome is $29.31 \%$ for males compared to $18.72 \%$ for females. Given the framed question the probabilities rise to $52.48 \%$ for males versus $38.90 \%$ for females. For the money question, no significant difference is found for framing by gender, just the level of risk aversion. The question MONEY is the only example where none of the personality attributes entered as significant.

In column 2 of Table 1 the results for the estimation of the life and death scenario are presented. In this estimation GENDER not only reveals a difference in the risk preferences, but also is significant in the framing behavior. Females are significantly more likely to choose the certain outcome than males, but are significantly less susceptible to framing. The probability that a male will choose the certain outcome rises from $12.25 \%$ to $70.16 \%$ when framed as saving lives. However the probability that a female will choose the certain outcome starts at $37.66 \%$ and rises to $78.40 \%$. This represents a significantly smaller shift in the z statistic. For the life and death question there is also a significant difference in the framing behavior captured by the judger perceiver index. A male perceiver is significantly less likely to choose the certain outcome based upon the frame. The probability of a male Perceiver choosing the certain outcome is $51.83 \%$ compared to the male Judger at $70.16 \%$.

The results for the organizational behavior frame of job loss reported in column 3 gives results similar in direction to that of the life and death decision. Again GENDER captures the greater risk aversion of females and Perceivers are less likely to frame than Judgers. In this equation the only significant framing behavior is that identified on the Perceiver Judger index. The probability that a female Perceiver will choose the certain outcome is $72.51 \%$ but falls to $56.66 \%$ when framed as losing jobs. By comparison the male Judger only selects the certain outcome $39.95 \%$ of the time.

In the last column of Table 1 the monetary gamble is repeated within the context of the stock market. Here the coding of gain and loss are reversed. The intercept term identifies the probability of choosing to gamble as $63.34 \%$. However when framed as a gain the likelihood of choosing to gamble declines to $27.91 \%$. Females are again more risk averse choosing the uncertain outcome with a probability of only $49.32 \%$. There is no significant difference in framing by GENDER. Two personality indices reveal differences in framing behavior. When the question is framed as a gain in the stock market, Intuitives are more likely to choose the uncertain outcome than Sensors, and Thinkers are more likely to choose the uncertain outcome than Feelers.

The results from the stepwise regression using the Keirsey Personality types are reported in Table 2. The personality types included were SP, NF, and NT with SJ as the excluded variable. As columns 1 and 3 reveal this categorization does not always reveal significant differences in risk preferences or framing behavior. For the MONEY equation the personality attributes were not selected and the results are identical to that in Table 1. For the jobs equation no significant framing is identified. The only significant variable is the relative risk aversion of females to males. The computations of the relevant probabilities are presented in Appendix 2.

| TABLE 1 |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Probit Analysis of Framing by Personality Indicator |  |  |  |  |
|  | Money | Death | Jobs | Stock |
| Intercept | -0.5444 | -1.1628 | -0.2547 | 0.4223 |
| Standard Error | 0.1575 | 0.2308 | 0.1604 | 0.1558 |
| Wald Chi-Square | 11.9435 | 25.3851 | 2.5212 | 7.3487 |
| Pr> Chi-Square | 0.0005 | 0.0001 | 0.1123 | 0.0067 |
| Frame | 0.6065 | 1.6919 |  | -1.2288 |
| Standard Error | 0.1680 | 0.3290 |  | 0.2557 |
| Wald Chi-Square | 13.0240 | 26.4384 |  | 23.1023 |
| Pr> Chi-Square | 0.0003 | 0.0001 |  | 0.0001 |
| Gender | -0.3440 | 0.8485 | 0.3445 | -0.3247 |

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| TABLE 1 <br> Probit Analysis of Framing by Personality Indicator |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Money | Death | Jobs | Stock |
| Standard Error | 0.1705 | 0.2728 | 0.1668 | 0.1711 |
| Wald Chi-Square | 4.0703 | 9.6742 | 4.2643 | 3.6001 |
| Pr> Chi-Square | 0.0403 | 0.0019 | 0.0389 | 0.0578 |
| Gender Frame |  | -0.5919 |  |  |
| Standard Error |  | 0.3640 |  |  |
| Wald Chi-Square |  | 2.6439 |  |  |
| Pr> Chi-Square |  | 0.1040 |  |  |
| Perceiver |  |  | 0.5082 |  |
| Standard Error |  |  | 0.2015 |  |
| Wald Chi-Square |  |  | 6.3606 |  |
| Pr> Chi-Square |  |  | 0.0117 |  |
| Perceiver Frame |  | -0.5751 | -0.4303 |  |
| Standard Error |  | 0.2368 | 0.2287 |  |
| Wald Chi-Square |  | 5.8997 | 3.5398 |  |
| Pr> Chi-Square |  | 0.0151 | 0.0599 |  |
| Intuitive Frame |  |  |  | 0.5897 |
| Standard Error |  |  |  | 0.2480 |
| Wald Chi-Square |  |  |  | 5.6513 |
| Pr> Chi-Square |  |  |  | 0.0174 |
| Thinker Frame |  |  |  | 0.3685 |
| Standard Error |  |  |  | 0.2466 |
| Wald Chi-Square |  |  |  | 2.2337 |
| Pr> Chi-Square |  |  |  | 0.1350 |
| n | 252 | 251 | 250 | 251 |

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The life and death question continues to exhibit the greatest differences in response. The probability of choosing the certain outcome increases from $12.25 \%$ to $65.27 \%$ when the question is framed in terms of saving lives. For females risk aversion increases the probability of choosing the certain outcome to $37.66 \%$, but a lesser degree of framing means that when framed in terms of saving lives this probability increases to $72.68 \%$. The respondent most likely to choose the certain outcome is a female with the question framed as saving lives. However, the increase in the z statistic is attributable to a greater degree of risk aversion with a lesser degree of framing. The Sensor Perceiver personality type is much less likely to choose the certain outcome relative to the omitted category (Sensor Judgers). The probability of a female Sensor Perceiver choosing the certain outcome drops to $42.68 \%$.

The last column of Table 2 shows the impact of personality on the choice selected for the stock market example. Like the examples with MONEY and DEATH this scenario reveals framing behavior for the population as a whole. The GENDER variable shows differences in risk preference with females more likely to choose the certain outcome. Two of the personality types show significant differences from the omitted category. Individuals who are Intuitive Feelers (NF) demonstrate a greater degree of risk taking behavior and are significantly more likely to prefer the uncertain outcome to the certain. When framed as a gain, individuals who are Intuitive Thinkers (NT) are significantly more likely to choose the uncertain solution. This contrasts with the rest of the population that tends to choose certainty when framed as a gain and uncertainty when framed as a loss.

| TABLE 2 |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Probit Analysis of Framing by Personality Type |  |  |  |  |  |  |
|  | Money | Death | Jobs | Stock |  |  |
| Intercept | -0.5444 | -1.1628 | -0.0784 | 0.3410 |  |  |
| Standard Error | 0.1575 | 0.2308 | 0.1281 | 0.1588 |  |  |
| Wald Chi-Square | 11.9435 | 25.3851 | 0.3749 | 4.6108 |  |  |
| Pr> Chi-Square | 0.0005 | 0.0001 | 0.5403 | 0.0318 |  |  |
| Frame | 0.6065 | 1.5554 |  | -0.9264 |  |  |

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| TABLE 2 <br> Probit Analysis of Framing by Personality Type |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Money | Death | Jobs | Stock |
| Standard Error | 0.1680 | 0.3081 |  | 0.1803 |
| Wald Chi-Square | 13.0240 | 25.4809 |  | 26.3933 |
| Pr> Chi-Square | 0.0003 | 0.0001 |  | 0.0001 |
| Gender | -0.3440 | 0.8485 | 0.2916 | -0.3580 |
| Standard Error | 0.1705 | 0.2728 | 0.1636 | 0.1725 |
| Wald Chi-Square | 4.0703 | 9.6742 | 3.1768 | 4.3052 |
| Pr> Chi-Square | 0.0436 | 0.0019 | 0.0747 | 0.0380 |
| Gender Frame |  | -0.6378 |  |  |
| Standard Error |  | 0.3661 |  |  |
| Wald Chi-Square |  | 3.0350 |  |  |
| Pr> Chi-Square |  | 0.0815 |  |  |
| SP Frame |  | -0.7878 |  |  |
| Standard Error |  | 0.3115 |  |  |
| Wald Chi-Square |  | 6.3969 |  |  |
| Pr> Chi-Square |  | 0.0114 |  |  |
| NF |  |  |  | 0.3695 |
| Standard Error |  |  |  | 0.1899 |
| Wald Chi-Square |  |  |  | 3.7876 |
| Pr> Chi-Square |  |  |  | 0.0516 |
| NT Frame |  |  |  | 0.7796 |
| Standard Error |  |  |  | 0.3026 |
| Wald Chi-Square |  |  |  | 6.6377 |
| Pr> Chi-Square |  |  |  | 0.0100 |
| n | 252 | 251 | 250 | 251 |

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## CONCLUSION

This paper replicates findings that the framing of uncertain decisions is a widespread phenomenon and through reported personality measures provides linkages of framing and personality types. These results measure the importance of personality types when considering the evaluation of decisions involving risk and uncertainty. Personality types and gender are found to yield significant differences in decision making in terms of risk preference and framing.

The differences in decision making by personality type demonstrates the difficulties for the economic educator posed by the content examples when teaching decision making under uncertainty. A stock market example might seem like a current application that would be easily understood by most students. However for female students the perception may be colored by their increased risk aversion, for NF students the perception may be influenced by their risk loving choice. The NT students are less likely to frame in the direction of the rest of the class so may miss the example entirely. Alternatively if the instructor is a Perceiver, then an example using job loss may be appealing as a current example that would induce framing behavior. Unfortunately, that example does not connect with the decision making process of the other personality types. The traditional examples of a straight monetary decision or a life or death decision are the most universally understood across personality types and gender, but the economic educator needs to be aware that even here differences in risk preference and framing tendencies can influence the understanding of the content.

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|  | APPENDIX 1 |
| :---: | :---: |
| Money: | Probability of choosing to gamble: $\operatorname{pr}(\mathrm{z}<-0.5444)=29.31 \%$, Probability of choosing to gamble when framed as a loss: $\operatorname{pr}(\mathrm{z}<-0.5444+0.6065)=\operatorname{pr}(\mathrm{z}<0.0621)=52.48 \%$, <br> Probability of choosing to gamble for a female: $\operatorname{pr}(\mathrm{z}<-0.5444-0.3440)=\mathrm{pr}(\mathrm{z}$ $<-0.8884)=18.72 \%$, <br> Probability of choosing to gamble for a female when framed as a loss: pr $(\mathrm{z}<-0.5444-0.3440+0.6065)=\operatorname{pr}(\mathrm{z}<-0.2819)=38.90 \%$. |
| Death: | Probability of choosing the certain outcome: $\mathrm{pr}(\mathrm{z}<-1.1628)=12.25 \%$, Probability of choosing the certain outcome when framed as saving lives: $\operatorname{pr}(\mathrm{z}<-1.1628+1.6919)=\operatorname{pr}(\mathrm{z}<0.5291)=70.16 \%$, |


| Probability of choosing the certain outcome for a female: |
| :--- |
| $\operatorname{pr}(\mathrm{z}<-1.1628+0.8485)=\operatorname{pr}(\mathrm{z}<-0.3143)=37.66 \%$, |
| Probability of choosing the certain outcome for a female when framed as saving lives: |
| $\operatorname{pr}(\mathrm{z}<-1.1628+0.8485+1.6919-0.5919)=\operatorname{pr}(\mathrm{z}<0.7857)=78.40 \%$, |
| Probability of choosing the certain outcome for a Perceiver when framed as saving |
| lives: |
| $\operatorname{pr}(\mathrm{z}<-1.1628+1.6919-0.5751)=\operatorname{pr}(\mathrm{z}<0.0460)=51.83 \%$, |
| Probability of choosing the certain outcome for a female Perceiver when framed as |
| saving lives: |
| $\operatorname{pr}(\mathrm{z}<-1.1628+0.8485+1.6919-0.5919-0.5751)=\operatorname{pr}(\mathrm{z}<0.2106)=58.34 \%$. |

## Jobs:

Probability of choosing the certain outcome: $\operatorname{pr}(\mathrm{z}<-0.2547)=39.95 \%$,
Probability of choosing the certain outcome for a female:
$\operatorname{pr}(\mathrm{z}<-0.2547+0.3445)=\operatorname{pr}(\mathrm{z}<0.0898)=53.58 \%$,
Probability of choosing the certain outcome for a Perceiver:
$\operatorname{pr}(\mathrm{z}<-0.2547+0.5082)=\operatorname{pr}(\mathrm{z}<0.2535)=60.01 \%$,
Probability of choosing the certain outcome for a female Perceiver: pr (z<-0.2547
$+0.3445+0.5082)=\operatorname{pr}(\mathrm{z}<0.5980)=72.51 \%$,
Probability of choosing the certain outcome for a Perceiver when framed as losing jobs:
$\operatorname{pr}(\mathrm{z}<-0.2547+0.5082-0.4303)=\operatorname{pr}(\mathrm{z}<-0.1768)=42.98 \%$,
Probability of choosing the certain outcome for a female Perceiver when framed as losing jobs:
$\operatorname{pr}(\mathrm{z}<-0.2547+0.3445+0.5082-0.4303)=\operatorname{pr}(\mathrm{z}<0.1677)=56.66 \%$.
Stock:
Probability of choosing to gamble: $\operatorname{pr}(\mathrm{z}<0.4223)=66.36 \%$,
Probability of choosing to gamble for a female: $\operatorname{pr}(\mathrm{z}<0.4223-0.3247)=\mathrm{pr}(\mathrm{z}<$
0.0976 ) $=53.89 \%$,

Probability of choosing to gamble when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.4223-1.2288)=\operatorname{pr}(\mathrm{z}<-0.8065)=21.00 \%$,
Probability of choosing to gamble for a female when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.4223-0.3247-1.2288)=\operatorname{pr}(\mathrm{z}<-1.1312)=12.90 \%$,
Probability of choosing to gamble for an Intuitive when framed as a gain: $\operatorname{pr}(\mathrm{z}<0.4223-1.2288+0.5897)=\operatorname{pr}(\mathrm{z}<-0.2168)=41.42 \%$,
Probability of choosing to gamble for a female Intuitive when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.4223-0.3247-1.2288+0.5897)=\operatorname{pr}(\mathrm{z}<-0.5415)=29.41 \%$,
Probability of choosing to gamble for a Thinker when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.4223-1.2288+0.3685)=\operatorname{pr}(\mathrm{z}<-0.4380)=33.07 \%$,
Probability of choosing to gamble for a female Thinker when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.4223-0.3247-1.2288+0.3685)=\operatorname{pr}(\mathrm{z}<-0.7627)=22.28 \%$,
Probability of choosing to gamble for an Intuitive Thinker when framed as a gain: $\operatorname{pr}(\mathrm{z}<0.4223-1.2288+0.5897+0.3685)=\operatorname{pr}(\mathrm{z}<0.1517)=56.03 \%$,
Probability of choosing to gamble for a female Intuitive Thinker when framed as a

```
gain:
pr (z<0.4223-0.3247-1.2288+0.5897+0.3685) = pr (z<-0.1730) = 43.13%.
```

| APPENDIX 2 |  |
| :---: | :---: |
| Money: |  |
|  | Probability of choosing to gamble: <br> pr (z<-0.5444) $=29.31 \%$, |
|  | Probability of choosing to gamble when framed as a loss: $\operatorname{pr}(\mathrm{z}<-0.5444+0.6065)=\operatorname{pr}(\mathrm{z}<0.0621)=52.48 \%$, |
|  | Probability of choosing to gamble for a female: $\operatorname{pr}(\mathrm{z}<-0.5444-0.3440)=\operatorname{pr}(\mathrm{z}<-0.8884)=18.72 \%$, |
|  | Probability of choosing to gamble for a female when framed as a loss: $\operatorname{pr}(\mathrm{z}<-0.5444-0.3440+0.6065)=\operatorname{pr}(\mathrm{z}<-0.2819)=38.90 \%$. |
| Death: |  |
|  | Probability of choosing the certain outcome: pr $(z<-1.1628)=12.25 \%$, |
|  | Probability of choosing the certain outcome when framed as saving lives: $\operatorname{pr}(\mathrm{z}<-1.1628+1.5554)=\operatorname{pr}(\mathrm{z}<0.3926)=65.27 \%$, |
|  | Probability of choosing the certain outcome for a female: $\operatorname{pr}(\mathrm{z}<-1.1628+0.8485)=\operatorname{pr}(\mathrm{z}<-0.3143)=37.66 \%$, |
|  | Probability of choosing the certain outcome for a female when framed as saving lives: $\operatorname{pr}(\mathrm{z}<-1.1628+0.8485+1.5554-0.6378)=\operatorname{pr}(\mathrm{z}<0.6033)=72.68 \%$, |
|  | Probability of choosing the certain outcome for an SP when framed as saving lives: $\operatorname{pr}(\mathrm{z}<-1.1628+1.5554-0.7878)=\operatorname{pr}(\mathrm{z}<-0.3952)=34.63 \%$, |
|  | Probability of choosing the certain outcome for a female SP when framed as saving lives: <br> $\operatorname{pr}(\mathrm{z}<-1.1628+0.8485+1.5554-0.6378-0.7878)=\operatorname{pr}(\mathrm{z}<-0.1845)=42.68 \%$. |
| Jobs: |  |
|  | Probability of choosing the certain outcome: pr $(\mathrm{z}<-0.0784)=46.88 \%$, |
|  | Probability of choosing the certain outcome for a female: $\operatorname{pr}(\mathrm{z}<-0.0784+0.2916)=\operatorname{pr}(\mathrm{z}<0.2132)=58.44 \%$. |
| Stock: |  |
|  | Probability of choosing to gamble: <br> pr $(z<0.3410)=63.34 \%$, |
|  | Probability of choosing to gamble when framed as a gain: $\operatorname{pr}(\mathrm{z}<0.3410-0.9264)=\operatorname{pr}(\mathrm{z}<-0.5854)=27.91 \%$, <br> Probability of choosing to gamble for a female: |

$\operatorname{pr}(\mathrm{z}<0.3410-0.3580)=\operatorname{pr}(\mathrm{z}<-0.0170)=49.32 \%$,
Probability of choosing to gamble for a female when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.3410-0.3580-0.9264)=\operatorname{pr}(\mathrm{z}<-0.9434)=17.27 \%$.
Probability of choosing to gamble for a NF:
$\operatorname{pr}(\mathrm{z}<0.3410+0.3695)=\operatorname{pr}(\mathrm{z}<0.7105)=76.13 \%$,
Probability of choosing to gamble for a female NF:
$\operatorname{pr}(\mathrm{z}<0.3410-0.3580=.3695)=\operatorname{pr}(\mathrm{z}<0.3525)=63.78 \%$,
Probability of choosing to gamble for an NT when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.3410-0.9264+0.7796)=\operatorname{pr}(\mathrm{z}<0.1942)=57.70 \%$,
Probability of choosing to gamble for a female NT when framed as a gain:
$\operatorname{pr}(\mathrm{z}<0.3410-0.3580-0.9264+0.7796)=\operatorname{pr}(\mathrm{z}<-0.1638)=43.49 \%$.

## APPENDIX 3

## Form A

1. In addition to whatever you own, you have been given $\$ 1,000$. You are now asked to choose between:
a. $1 / 2: 1 / 2$ chance of a gain of $\$ 1,000$ or $\$ 0$
b. a sure gain of $\$ 500$
2. 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 programs are as follows:
a. If program A is adopted 400 people will die.
b. If program B is adopted, there is $1 / 3$ probability that nobody will die, and $2 / 3$ probability that 600 people will die.
3. The manufacturing division of a US company is having problems competing in the global market. The company must decide how to reorganize this division of 12,000 U.S. workers. Two strategies have been proposed.
a. If some operations are contracted overseas 4,000 jobs will be saved.
b. With an internal reorganization of U.S. operations there is a $1 / 3$ probability
that all 12,000 jobs will be saved and a $2 / 3$ probability that no jobs will be saved.
4. In addition to whatever you own, you have been given stock worth $\$ 10,000$. Based on today's market value, you are now asked to choose between:
a. $\quad 1 / 2: 1 / 2$ chance of a loss of $\$ 5,000$ or $\$ 0$
b. a sure loss of $\$ 2,500$

## FORM B

1. In addition to whatever you own, you have been given $\$ 2,000$. You are now asked to choose between:
a. $\quad 1 / 2: 1 / 2$ chance of a loss of $\$ 1,000$ or $\$ 0$
b. a sure loss of $\$ 500$
2. 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 programs are as follows:
a. If program A is adopted 200 people will be saved.
b. If program B is adopted, there is $1 / 3$ probability that 600 people will be
saved, and $2 / 3$ probability that no one will be saved.
3. The manufacturing division of a US company is having problems competing in the global market. The company must decide how to reorganize this division of 12,000 U.S. workers. Two strategies have been proposed.
a. If some operations are contracted overseas 8,000 jobs will be eliminated.
b. With an internal reorganization of U.S. operations there is a $1 / 3$ probability nobody will lose their jobs and a $2 / 3$ probability that all 12,000 will be unemployed.
4. In addition to whatever you own, you have been given stock worth $\$ 5,000$. Based on today's market value, you are now asked to choose between:
a. $\quad 1 / 2: 1 / 2$ chance of a gain of $\$ 5,000$ or $\$ 0$
b. a sure gain of $\$ 2,500$
