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PERCEIVED RISK AND EXTENDED WARRANTY

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PERCEIVED RISK AND EXTENDED WARRANTY

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ABSTRACT

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This study examined how income and mathematical skills influence one's perception of risk. The study particularly focused on overestimation as the main cognitive phenomenon that influences one's decision-making process when thinking about purchasing an extended warranty. Two questions this study tried to shed light on 1) - Why do people buy extended warranties? 2) - How much is the risk overestimated when considering the damage and loss of common products? A total of 67 St John's undergraduate students participated, 18 males and 49 females $M_{(age)} = 19.5$ were recruited through the university research platform. Finally, I hypothesized that income and mathematical skills were correlated with an individual's perceived risk. However, this hypothesis was not supported by the data.

Keywords: perceived risk, extended warranty, numeracy, decision-making.

DEDICATION

To my mother, *Miguelina*.

ACKNOWLEDGEMENTS

I would like to acknowledge the helpful pieces of advice from my mentor Dr. Dana Chesney. She helped me from the beginning all the way to the end of this thesis. I am glad that I was able to receive her guidance while working on it. I would also like to acknowledge my reader, Dr. Wilson McDermut who was always willing to read through my drafts and offered important pieces of advice. Without them, this thesis would not be possible. I appreciate all their contributions to this work.

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INTRODUCTION

The purpose of this study was to understand some of the cognitive phenomena that influence an individual's perception of risks, and to identify the ways in which an individual's socio-economic status (i.e., income) and numeracy (i.e., mathematical skills) affect his or her perceived risk. Throughout this study, I examine *overestimation*, which pertains to an individual's tendency to overestimate small risks. Moreover, to operationalize perceived risk among participants, I used extended warranty as a gauge.

Overestimation is a cognitive bias that refers to the likelihood that an event will occur in the future, with the caveat that individuals tend to inflate or overestimate the probability that such event will occur. Thus, overestimation primes individuals to hedge themselves against potential losses by purchasing protection plans for their purchases. As it has been shown by research on loss aversion (Kahneman & Tversky, 1991), individuals are more susceptible to losses than gains in a 2:1 ratio. Moreover, individuals showed a skewed preference for events that are certain to occur. Thus, it is conceivable that overestimation makes individuals more proactive to seek safety. As noted by Kahneman & Tversky (1979), the overweighing of low probabilities makes insurance and gambling seem more attractive than they are. In short, individuals tend to be overly pessimistic about potential risks and overly optimistic about potential rewards.

Individuals are most likely to choose certainty over risk, even when that risk is relatively small (Kahneman & Tversky, 1991; Schmidt & Zank, 2005). Thus, individuals tend to overestimate the risk of some of the choices they make. To reinforce this false sense of security, low-cost insurance has permeated the market (e.g., you can now insure

your $50 backpack or a $10 video game). Because of the popularity of these types of insurance, I was intrigued to learn more about how individuals evaluate them.

The present study

The present study sought to gauge participants' perceived risk by looking at income, mathematical skills and how they evaluate extended warranties. An extended warranty is an upfront premium insurance protection against loss and damage of a product over a fixed period of time (Chen, Kalra & Sun, 2009). Due to their low return on investment, extended warranties offer a unique opportunity to shed light on an individual's perceived risk versus actual risk.

I hypothesized that participants living in households with a higher income would find extended warranties to be less valuable than those living in households with a lower income. I expected similar results for participants with a higher personal income. Furthermore, individuals with higher mathematical skills, which I measured using the Berlin Numeracy Test (Cokely et al., 2012) and the Subjective Numeracy Scale (Fagerlin et al., 2007), would also find extended warranties to be less valuable compared to those less numerate. In short, an individual's income and mathematical skills may alter his or her perceived risk.

In the first question, I tried to understand the correlation between income and perceived risk. I underlined two rationales based on previous research by Cicchetti & Dubin (1994) that showed that "relatively affluent and well educated" individuals were less likely to see value in extended warranties. 1) - Individuals with higher income tend to have more experience with monetary transactions and buying insurance policies. 2) - That individuals with a higher income would be less worried about the damage or loss of

their electronic gadgets. Therefore, I predicted that if an individual were not going to be affected financially by the damage or loss of his or her purchase (e.g., iPhone), then, that individual would not put much effort into insuring that iPhone. On the contrary, for those individuals in the lower income bracket, the psychological impact of losing something that they cannot replace in a timely fashion may cause emotional distress. Therefore, those individuals may be more susceptible to insuring their electronic devices.

In the second question, I also underlined two rationales: 1) - Highly numerate individuals would show a lower perceived risk because they do not see extended warranties as a cost-effective instrument. Also, they may be more likely to inquire about the policy about reimbursement in case of loss or damage to their devices. Most importantly, these individuals should have a better understanding of probabilities in general, and thus better estimate the likelihood that certain items (e.g., iPhone, laptop, or camera) may break down in the future. 2) - An individual's ability to make a split-second calculation of converting the dollar amount cost of an extended warranty to its equivalent into percentage can alter that individual's likelihood of purchasing one, and thus his or her perceived risk (e.g., a $2 insurance may sound attractive for most buyers. However, if someone spends $2 insuring an $8 video game, that $2 would represent (25%) of the value of the video game). In this example, $ 2 may seem like a small amount, but (25 %) seems like a larger amount. This simple technique of converting the dollar amount to percentage allows an individual to assess the risk-reward dynamic associated with purchasing insurance more accurately.

Furthermore, as reported by Chen, Kalra & Sun (2009), prior experience showed to be an indicator of the likelihood that someone was going to purchase an extended warranty. This finding may suggest that insurance may serve as a reinforcer to an individual's risk aversion, and thus, offers emotional comfort. Kahneman & Tversky (1979) offered a simple explanation of loss aversion that also works for defining a risk averse individual, someone "who dislikes symmetric 50-50 bets". Furthermore, a heightened perception of risk can motivate an individual to seek a faulty sense of security. For example, it had been estimated that up to 75% of electronics and up to 50% of new car buyers, purchase extended warranties (Desai & Padmanabhan, 2004; Plotkin, 1985). Besides overestimation being a mathematical function, it also provides a sense of security.

Overall, I expected that social economic status and math skills would have been good indicators of the likelihood that an individual would be willing to purchase an extended warranty.

METHODS

Participants

Undergraduate students at St Johns' University in New York City completed the survey. N = 67, 18 males and 49 females, $M_{(age)}$ =19.50, SD=1.79, range [18, 30], $M_{(household\ income)}$ = $122,151, $M_{(personal\ income)}$ =4,007. Racial breakdown was reported as 29 White, 8 Asian, 17 Black, 11 other and 2 unreported.

Measures

Participants completed an online survey. To assess perceived risk, a 10- question questionnaire about extended warranty fee was administered. To assess numeracy, the Subjective Numeracy Scale (SNS) divided into two sub-scales: ability and preference and the multiple-choice format of the Berlin Numeracy Test was used. Finally, I asked a few demographic questions at the end of the survey.

Procedures

Participants were invited to participate in an online survey via the university research platform. After signing up, each participant took the survey online either on their smartphone or computer through the Qualtrics website. There was no in-person participation.

While completing the survey, participants were asked to evaluate the insurance premium or fee for 10 items using a 7-point Likert scale. After which, each participant would get a fee average score from 1 to 7. An average score of 1 meant that the participant found the premium "too expensive and a score of 7 meant that the participant found the premium to be "a great deal" (See appendix C). These items were picked for their low likelihood of being damaged, or their relatively low cost. The premium for the

10 items were capped at 15% of the price of the product for a one-year protection. The use of a fixed amount was due to unreliable data obtained from a previous survey where participants were asked to enter how much they were willing to pay for a one-year extended warranty.

To assess mathematical skills, the Berlin Numeracy Test was given. It consisted of four multiple choice questions with possible scores ranging from 0 to 4. In this case, a score of 0 meant no correct answers, and 4 meant all four questions were answered correctly by the participants. Additionally, the Subjective Numeracy Scale (SNS) was given, which consisted of an 8-item questionnaire: 4 questions about ability and 4 question about preference. However, only the ability sub-scale was reported in the data due to errors in questions 6, 7 and 8.

Last, participants self-reported their income. There was not a verification process to determine the accuracy of the information provided. Thus, I assumed that participants offered their best estimate of their actual income. Although the consent form explained that the information was being collected anonymously, many participants did not declare their income.

RESULTS

Table 1.

Descriptive Statistics of Main Variables

Variables	N	Mean	S.E. Mean	Std Dev
Age	64	19.5	0.22	1.79
Household income	53	122150.9	14950.65	108842.4
Personal income	57	4006.65	719.65	5433.21
Berlin Numeracy Test	67	1.19	0.11	0.94
Fee avg	67	3.51	0.13	1.09
SNS ability	67	3.43	0.16	1.29

Note. The average age of the sample was 19.5, which is reflected on the discrepancy between personal and household income.

First, household income was not correlated with fee, r(51) =.11, p =.449; nor was personal income, r(55) =-.02, p =.881.These results showed that participants were not likely to think that the warranties were more or less valuable based on their income. Furthermore, this sample consisted of individuals whose household median income was $100,000. Conversely, personal median income was $2,000. This discrepancy between household and personal incomes may indicate that while most participants live in households with high incomes, at the personal level, financial resources are modest and limited. Thus, income alone may not be a strong predictor of an individual's perceived risk.

Second, mathematical skills did not alter the participant's perceived risk. Thus, fee and mathematical skills were not correlated as measured by the Berlin Numeracy Test r(55)= -.02, p=*.896* and, the SNS r(65)=.04, p=*.75.* As shown in table 2 most of the

participants, 48 or (71.64 %) only answered up to one of the four questions correct. Because in this study I used the multiple-choice version of the Berlin Numeracy Test, I assumed that some of the participants were able to guess the right answer to one of the four questions. Therefore, this result should be examined carefully.

Table 2

Frequency of the Berlin Numeracy Test multiple choice format

Label	Value	Frequency	Percent
	0	14	20.9
	1	34	50.75
	2	13	19.4
	3	4	5.97
	4	2	2.99
Total		67	100

Note. Table 2 shows the number of participants in each of the possible score 0-4. Half of the participants or (50.75 %) answered one question correctly, which may have been influenced by the guessing the right answer on the test.

Table 3 below shows how the participants evaluated the warranties for each item. The higher the score was, the more valuable they found the warranty to be; while the lower the score was, the less valuable they found the warranty to be. Most electronic items ranked at the top of the list while most fashion items ranked at the bottom.

Table 3

Descriptive Statistics by item from the Extended Warranty Questionnaire

Variable	N	Mean	S.E. Mean	Std Dev
Rolex watch	67	2.49	0.17	1.41
Diamond ring	67	3.31	0.17	1.35
Dress shoes	67	3.36	0.19	1.58
Bicycle	67	3.51	0.19	1.56
Gold chain	67	3.52	0.17	1.4
Apple laptop	67	3.54	0.18	1.48
Acoustic guitar	67	3.55	0.16	1.34
Smart tv	67	3.87	0.18	1.49
Camera	67	3.9	0.17	1.36
Nintendo Switch	67	4.03	0.19	1.59

Note. This table shows the results for the 10 items used in the Extended Warranty Questionnaire. The least valuable extended warranty was the Rolex watch while the most valuable was the Nintendo Switch.

DISCUSSION

The first question of the hypothesis was not supported by the data: income did not influence how participants evaluated the warranties. Therefore, a robust link between income and perceived risk was not established. Assuming that the previous statement is true, we should think about perceived risks as a qualitative variable rather than categorical. For this reason, it is important to understand the emotional sentiment elicit by marketing campaigns.

The second question of the hypothesis was not supported by the data. Regardless of their mathematical skills, participants did not significantly differ on how they value the extended warranties. Consequently, I found no robust evidence to support that perceived risk was altered by one's numeracy. In other words, being good with numbers may not give an individual an advantage in terms of risk aversion. This finding was supported by Huysentruyt & Read, (2010) who stated that cognitive skill cannot explain why some people choose to purchase extended warranties. This discrepancy between mathematical knowledge and one's inability to accurately assess risk could explain the tendency of many individuals to overestimate small risks (Kahneman & Tversky, 1979). Furthermore, this study highlighted the importance of emotions on an individual's everyday decision-making process. Whether the risk is real or perceived, emotions can play a significant role in our decision making.

Therefore, another interesting aspect to research is *peace of mind*, which pertains to our desire to protect ourselves against future risks and have a safety net. Huysentruyt & Read (2010) found in a survey that peace of mind was the most common reason respondents cited for purchasing extended warranties. Marketeers often advertise

protection insurance as a synonym to live worry free from potential damage or loss to one's products.

While this study did not find a significant correlation between numeracy and perceived risk, I believe that teaching applied math skills to school children is still important. Besides having a theoretical significance for academic purposes, mathematical skills play a significant role in bridging the economic gap in society. Numerical literacy may help some individuals to be more proactive consumers and be aware of their financial decision-making.

Limitations and Future Directions

This study should be viewed by taking into consideration a series of limitations. First, the survey did not include any descriptive questions (e.g., participants did not have to describe their experience with the subjects being investigated). Thus, I could not obtain qualitative data regarding the participants' choices. Although all the fees were capped at 15%, I did not ask the participants to say why they found any of the fees to be fair. In short, this survey did not provide any content behind the participants' rationale for their choices. Thus, other studies should consider adding an extra open-ended question to investigate this issue.

Second, participants were not pre-screened for basic mathematical skills. Most of the participants 48 or (71.64 %) only answered one or none of the four questions correctly in the Berlin Numeracy Test. Furthermore, participants were not screened for prior experience with extended warranties. Research had shown that prior experience with extended warranties increased the likelihood of purchasing one (Chen, Kalra & Sun, 2009). Even at the most basic level, participants were not asked to confirm if they knew

what an extended warranty policy was. Thus, future studies should pre-screen participants to separate them into distinct groups.

Third, the sample consisted of only 67 participants, which may have affected the ability to find any significant correlations. Thus, I believe that with a larger sample size certain trends in the data could become clearer. However, it is also possible that future research with a much larger sample may yield similar results. Furthermore, this was a correlation study, which meant that I did not control for any of the variables.

Fourth, 14 and 10 of the participants did not report their household and personal incomes, respectively. They did not feel comfortable sharing this information, even when the survey was anonymous. This may have skewed the results of the correlations between income and fee. Therefore, future studies should consider collecting a larger income dataset.

Fifth, the sample in the survey consisted of undergraduate students that may have little or no work experience. Also, many of the participants may depend on their parent's income. This in fact may have influenced the participants' perception of risk. Furthermore, the average age was 19.5 years old, which does not account for older individuals with a higher personal income. Overall, the sample for this survey was not representative of the general population and could be skewed due to the fact that most of the participants were younger individuals living with their parents. Therefore, future studies should recruit older participants and individuals with greater personal income.

Sixth, I used the multiple-choice version of the Berlin Numeracy Test. However, this test may allow for random guesses being correct. Therefore, for future replication of

this or similar studies, the fill in the blank version should be administered in lieu of the multiple-choice version of the Berlin Numeracy Test.

CONCLUSION

In conclusion, the present study did not support my hypothesis. Income at the household and personal level did not significantly affect the participant's perceived risk. Moreover, mathematical skills did not affect one's perceived risk, either. Therefore, I concluded that income and mathematical skills were not robust factors correlated with perceived risk as assessed by the extended warranty fee questionnaire in the survey, the Berlin Numeracy Test and Subjective Numeracy Scale.

APPENDIX A:

Berlin Numeracy Test Multiple Choice Format

Instructions: Please answer the questions below. Do not use a calculator but feel free to use the space available for notes (i.e., scratch paper).

1. Imagine we are throwing a five-sided die 50 times. On average, out of these 50 throws how many times would this five-sided die show an odd number (1, 3 or 5)?

a) 5 out of 50 throws

b) 25 out of 50 throws

c) 30 out of 50 throws

d) None of the above

2. Out of 1,000 people in a small town 500 are members of a choir. Out of these 500 members in the choir 100 are men. Out of the 500 inhabitants that are not in the choir 300 are men. What is the probability that a randomly drawn man is a member of the choir? Please indicate the

a) 10%

b) 25%

c) 40%

d) None of the above

3. Imagine we are throwing a loaded die (6 sides). The probability that the die shows a 6 is twice as high as the probability of each of the other numbers. On average, out of these 70 throws, about how many times would the die show the number 6?

a) 20 out of 70 throws

b) 23 out of 70 throws

c) 35 out of 70 throws

d) None of the above

4. In a forest 20% of mushrooms are red, 50% brown and 30% white. A red mushroom is poisonous with a probability of 20%. A mushroom that is not red is poisonous with a probability of 5%. What is the probability that a poisonous mushroom in the forest is red?

a) 4%

b) 20%

c) 50%

d) None of the above

APPENDIX B:

Subjective Numeracy Scale

For each of the following questions, please check the box that best reflects **how good you are at doing the following things:**

1. How good are you at working with fractions?

1	2	3	4	5	6
Not at all good					**Extremely good**

2. How good are you at working with percentages?

1	2	3	4	5	6
Not at all good					**Extremely good**

3. How good are you at calculating 15% tip?

1	2	3	4	5	6
Not at all good					**Extremely good**

4. How good are you at figuring out how much a shirt will cost if it is 25% off?

1	2	3	4	5	6
Not at all good					**Extremely good**

For each of the following questions, please check the box that **best reflects your answer.**

5. When reading the newspaper, how helpful do you find tables and graphs that are parts of a story?

1	2	3	4	5	6
Not at all helpful					**Extremely helpful**

6. When people tell you the chance of something happening, do you prefer that they use words ("it rarely happens") or numbers ("there's a 1% chance")?

1	2	3	4	5	6
Always Prefers Words					**Always Prefers Numbers**

7. When you hear a weather forecast, do you prefer predictions using percentages (e.g., “there will be a 20 % chance of rain today”) or predictions using only words (e.g., “there is a small chance of rain today”)?

1	2	3	4	5	6
Always Prefers Percentages					**Always Prefers Words**

8. How often do you find numerical information to be useful?

1	2	3	4	5	6
Never					**Very Often**

APPENDIX C:

Extended Warranty Questionnaire

Rolex Watch Price =$ 10,015

Fee=$ 1502.25

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Apple Laptop Price =$1,525

Fee= $ 228.75

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Diamond Ring Price = $ 3015

Fee = $ 452.25

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Gold Chain Price = $ 1025

Fee = $ 153.75

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Bicycle Price = $ 515

Fee = $ 77.25

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Acoustic Guitar Price = $ 725

Fee = $ 108.75

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Smart TV Price= $ 825

Fee = $ 123.75

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Nintendo Switch Price = $ 315

Fee = $ 47.25

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Camera Price = $ 915

Fee = $ 137.25

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

Dress Shoes Price = $ 525

Fee = $ 78.75

How fair do you think is this one-year loss and damage insurance fee?

Too expensive	a little expensive	Fair	a little inexpensive	inexpensive	A great deal
☐	☐	☐	☐	☐	☐	☐

APPENDIX D:

Rate of repair for a few common products

Product	Repair rate (%)
Desktop	37
Laptop	33
Lawn tractor and riding mower	29
Refrigerator: side-by-side (with icemaker and dispenser)	28
Self-propelled mower	26
Washing machine	22
Gas range	19
Refrigerator: top-and-bottom-freezer (with icemaker)	17
Projection TV	16
Push mower	15
Vacuum cleaner (excluding belt repair)	13
Dishwasher	13
Clothes dryer	13
Microwave oven (over-the-range)	12
Electric range	11
Camcorder	8
Digital camera	8

Refrigerator: side-by-side (without icemaker)	8
TV: 30-to 36-inch	7
TV: 25- to 27-inch	5

Note. Source: *Consumer Reports* 2004 Annual Questionnaire, based on three-year-old products.

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