Master’s degree thesis

BØK950 Economics and Business Administration

Replicating Prospect Theory at Molde University College with focus on Gender and Field of study

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Abstract

This thesis presents a replication study of prospect theory with a focus on gender and field of study, conducted in a classroom setting. The study examines whether the basic predictions of prospect theory hold across gender and field of study, specifically among 30 business students and 90 nursing students. The study aims to investigate whether individuals exhibit risk-averse behavior in the domain of gains and risk-seeking behavior in the domain of losses, and whether this pattern varies based on gender and field of study. The data will be collected through an in-class questionnaire, copied form Kahneman and Tversky's original study in 1979 and converted to Norwegian. The results are analyzed using statistical methods, including regression analysis and two-sample test of proportions. The results of this study show that gender and field of study have significant impact on the recipient's preferences. Overall, this study contributes to a better understanding of the role that individual differences and contextual factors play in shaping decision-making under risk and uncertainty in different fields of study.

Preface

This thesis is an essential part of my path towards obtaining an MSc in Economic and Business Administration. My long interest in understanding the motivations behind human behavior has led me to focus on the field of behavioral economics, specifically on the concept of prospect theory as introduced in 1979 by Kahneman and Tversky. There has been a considerable amount of research on the topic of weighted probabilities and how they relate to prospect theory, and many scholars have relied on this theory to better understand economic decision-making. However, despite this progress, there remains a lack of practical applications of prospect theory in economics. While exploring the literature the I have found a substantial focus on business students as participants in prospect theory experiment.

My research aims to address this gap by exploring how students in different fields of study at Molde university college experience monetary decisions under risk and whether their behavior aligns with the predictions of prospect theory. By conducting a replication study, I hope to advance our understanding of behavioral economics and provide valuable insights into the practical applications of prospect theory. While many previous studies have focused on business students since they are the one taking the future financial decisions, I believe that the theory should be applicable to all individuals and not just those in the field of economics. My study will provide insight into the generalizability of prospect theory and its relevance to a wider population.

Contents

1.0 Theoretical framework

The concept of rationality is central to the field of economics, where it is often assumed that individuals are rational decision makers who make choices that maximize their utility or self-interest. In the field of behavioral economics, the concept of rationality has been challenged, as research has shown that people's behavior is often influenced by a variety of cognitive biases and emotional factors that lead them to make decisions that deviate from the predictions of traditional economic models. This was documented with the paper published in 1979 called “Prospect theory: an analysis of decision under risk” by Kahneman and Tversky. It challenged the inconsistencies in expected utility theory, which was the dominant descriptive theory at the time.

1.1 Expected Utility Theory

Expected Utility Theory (EUT) is a normative theory of decision-making that provides a framework for analyzing how rational agents should make choices under uncertainty. The theory was first proposed by John von Neumann and Oskar Morgenstern in their book "Theory of Games and Economic Behavior" in 1944. EUT prescribes that the best decision is the one that maximizes expected utility

1.1.1 Axioms

To agree that an individual is acting reasonable. The following axioms, which are assumptions that serve as a foundation for a system of thought (Gigerenzer, 2021). The axioms are:

1. Completeness: Assume that the universe is defined by the set X. A relation R is complete if ∀ x ∈ X (where ∀ means “for all") and ∀ y ∈ X either $x \geq y$ or $y \geq x$ or both ($x \geq y$ & $y \geq x$). This means that it is always possible to say whether you would prefer one choice to another.
2. Transitivity: ∀ x ∈ X, ∀ y ∈ X and ∀ z ∈ X, If $x \geq y$ and $y \geq z$, then $x \geq z$. The implication of transitivity is that you can order your choices from best to worst, allowing for ties.
3. Continuity : Let A, B and C be lotteries with $A \geq B \geq C$; then there exists a probability p such that B is equally good as pA + $(1 - p)C$.

4. Independence: If option C is chosen from some set X of options, then C should be chosen from any set of options that (a) includes C and (b) only includes choices in X.

1.1.2 Risk aversion

A concept that was adopted early was the term "risk-aversion" which explain individuals' attitude towards risk. In situations where the probability of outcome A is significantly higher than that of outcome B, individuals could choose for outcome A despite its lower expected utility. Such a choice, while suboptimal in maximizing overall benefit, can still be considered rational and reasonable. In other words, if an individual is given the choice between a guaranteed payout of $100 or a 50% chance of winning $200 and a 50% chance of winning nothing, a risk-averse individual would likely choose the guaranteed payout of $100 over the uncertain option with a higher expected value (50% chance of $200 versus $100 guaranteed).

1.2 Prospect theory

Prospect Theory (PT) challenges EUT as a descriptive theory on multiple fronts.
Firstly, PT argues that individuals tend to overestimate small probabilities and underestimate large probabilities. This means that individuals are more likely to choose the outcome with the highest likelihood when both outcomes have the same expected value. The weighting function w(p) explains why individuals tend to have preferences when EUT says they should be indifferent. In Kahneman and Tversky's study, we observe that participants had a large preference in problems where they could choose between a likelihood of .02 and .01 with the expected value being the same. w(p) also explains that some probabilities are treated as certain. (Kahneman & Tversky, 1979).

1.2.1 Non-linear

EUT says that outcomes should be calculated as probability times the value (p * v) which also mean that the individuals interpret the probability as a linear, PT contradicts this by arguing that individuals do not interpret probabilities as linear, but as an «S-curve». Raising the probability of an outcome from 90% to 100% has a bigger impact on the outcome than raising the probability from 40% to 50%.

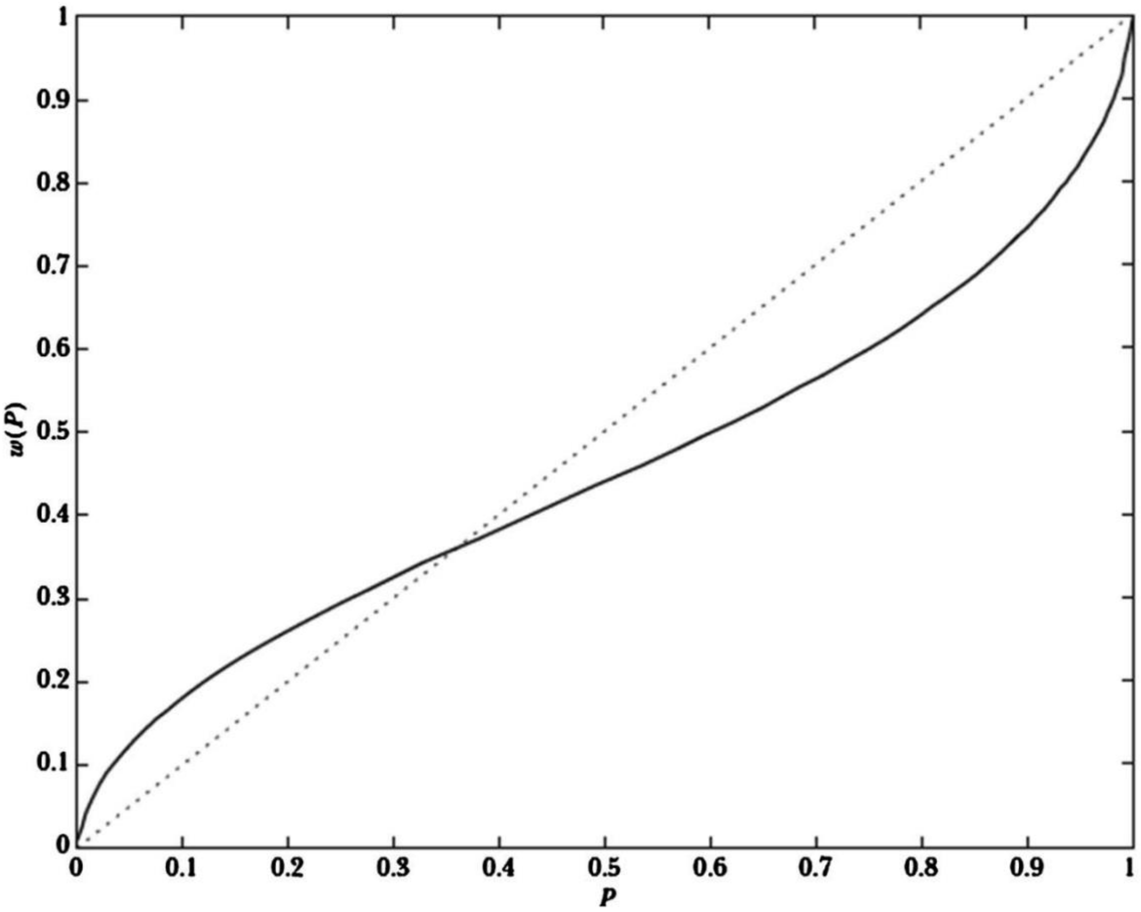

Figure 1 Weighting function - (Pan, 2019)

1.2.2 Over and under weighting of probabilities

Kahneman and Tversky argued that individuals faced with a choice between 10% chance of 50 or 0.001% chance of gaining 5000 are more likely to choose the latter even though the expected value is the same and the outcome is very unlikely. Furthermore, they also argue that probabilities near zero are neglected making the weighting function deceitful at that point.

1.3 Value function

1.3.1 Refence point

PT argues when faced with prospects all individuals have their reference points. If asked if a cup of coffee is hot, you would give different answers depending on how warm you are. A cup that feels hot in the artic might feel cold in the Saharan desert. The same can be argued with brightness and wealth. The outcomes of monetary decisions will do depend a lot on the individuals wealth.

1.3.2 Concave & convex

Gains do diminish in value the more you gain. Gaining 1000 compared to 2000 has a higher difference than gaining 11000 compared to 12000. This is also related to the individuals reference point as 1000 might be a dinner for a wealthy individual and 1 month rent for a less wealthy individual. The same phenomenon is true for losses. Making the function concave for gains and convex for losses (Kahneman & Tversky, 1979). The contradicts EUT's linear gains and losses line.

1.3.3 Steeper for losses

PT argues that individuals are loss-averse, i.e., the pain of losing 1000 is worse than the excitement of winning 1000. This also means that individuals are risk seeking in the loss domain. The implication is that the line beneath the reference point steeper then line above.

2.0 Literature review

Kahneman and Tversky won the Nobel prize in 2002 for their work with prospect theory which was referred to as the most influential theoretical framework in all of the social science (Ruggeri et al., 2020). Prospect theory has found its way around the world of science including policy making, management, financial services, government, finance, investment, insurance and political science (McDermott, 2004). These are only a small part of the areas influenced by prospect theory. The paper is considered a cornerstone of behavioral economics and is one of the most frequently cited works in the field.

2.1.1 Empirical findings in prospect theory

In 1948, Friedman and Savage published an influential paper that introduced the concept of a utility function and risk aversion. They challenged the traditional assumption that rational individuals always choose the option with the highest expected value and instead proposed that individuals make decisions based on the expected utility, which considers both the probability of different outcomes and the utility assigned to each outcome. They argued that the inclusion of a utility function allows individuals to choose outcomes that are not necessarily the highest expected value yet are still considered reasonable.

Moreover, Friedman and Savage contended that individuals may choose an option with a lower expected value if it has a higher probability than another option with a higher expected value. They argued that when the utility is very high, individuals prefer the safest choice (i.e., the option with the highest probability) because the outcome's occurrence is critical for assessed utility. Conversely, when the utility is very low, individuals do not care much about the outcome, such that a lottery ticket with the same utility as a cup of coffee may not deter individuals from taking the chance to win the lottery.

Modern research has found that prospect theory mainly works the first time a subject is exposed to a prospect. Say your friend challenges you to a one-on-one match in basketball for $10 dollars and you lose, then the next day the same friend challenges you to the same game for the same amount you are less likely to accept the challenge. With experience you will gradually make choices based more on the highest possible outcome. In the literature this is often referred to as “Diminishing sensitivity” (Trautmann & van de Kuilen, 2012).

2.1.2 Applications of prospect theory

As a theoretical model that is over 40 years old you would think that the importance of prospect theory would have been verified. However, since 1979 the only two areas that have been able to make use of the theory are finance and insurance. This might seem obvious since prospect theory is a model which focuses on making decisions under risk, but nevertheless its impact has made its mark.

Finance: A model called Capital Asset Pricing Model (CAPM) is dominant when explaining what the returns on investments should be based on the volatility/beta of a stock. This is a logical way of looking at the problem of risk and return, the higher the risk the higher the return must be for individuals to invest in the stock. However, the empirical data does not give much support for CAPM. Therefor finance researchers try to use other ways of explaining risk and return. Here prospect theory has had some success. One famous problem termed the “equity premium puzzle” by Mehra and Prescott (1985). In this explanation, the authors used prospect theory as a tool to help explain that there is a significant disparity between returns produced by stocks compared to returns produced by U.S. Treasury Bills.

Insurance: The most common consumer insurances are property insurance, casualty insurance and mortality insurance. Prospect theory have shed some light in the first two (Barberis, 2013). The study by Sydnor (2009) investigated the insurance choices made by 50,000 households. These households had to select a deductible from four options, which were 100, 250, 500, and 1,000. The research found that households that chose a 500 deductible paid an average premium of 715 per year, whereas those who chose for a 1,000 deductible paid an average premium of 615 per year. Even though the annual claim rate was 5%, households agreed to pay an additional 100 a year to insure against a 5% chance of paying an extra 500 in the event of a claim. However, this decision can only be explained by an unreasonably high level of risk aversion, according to EUT. Sydnor (2009) said that households had extra focus on the unlikely outcome of a scenario in which the deductible amount would be used and overweighted the probability. Sydnor used the overweighting component in prospect theory to explain why the household would act in such an extremely loss averse way. Furthermore, she said that the reference point of the household’s wealth at the time of signing the insurance would have an impact on the amount chosen, also adding that prospect theory could explain a lot but not go all the way. Kőszegi and Rabin (2007) wrote that the if the reference point is used to measure future outcomes, then the prospect theory would be able to explain the behavior since a premium payment is something the household expects to make, and the deductible would only matter if an accident would occur .

2.1.3 Similar studies

Related to my research Spanish study by Jorge Harry Harzer (2016), which aimed to investigate the potential effects of years of education and gender on the outcome of prospects. The study replicated the original questionnaire developed by Kahneman and Tversky and administered it to 396 students and 31 professors in Business Administration classes in Santa Catarina, Brazil. The study found that years of education did not influence risk and loss aversion, but gender did influence risk, with women exhibiting higher levels of risk aversion.

2.1.4 Replications of prospect theory

Rieger et al. (2017) conducted a large-scale study comparing the parameters of prospect theory across 53 countries using a sample of 6912 university students. To account for cultural differences, the questionnaire was translated into local languages and monetary values were converted with respect of the median net income for a family and rounded for simplicity. The results showed significant gender differences and variations between countries, indicating that the factors influencing decision-making under uncertainty may vary across populations. According to Nelson (2012) it should be noted that studies focusing on gender differences and showing that women are more risk averse than men cannot be generalized and further cannot be solely determined by behavioral economics.

Multiple replication studies have been conducted to test and build upon the foundations of prospect theory. Abdellaoui et al. (2013) compared the responses to risk among financial professionals and university students, finding that the latter group was more loss-averse. Seth and Chowdary (2017) replicated prospect theory to evaluate whether trained professionals exhibit the same kind of risk behavior as university students. They found that while trained professionals do exhibit similar risk behavior, it was not as pronounced as in the original study. They also expressed interest in studying the risk behavior of senior management, as these individuals are often responsible for making final investment decisions.

A critical cumulative study by Glenn Harrioson (2016) argued for a reconsideration of the existing research on prospect theory, suggesting that the cumulative data is built on subsets of other data and that the cumulative prospect theory model exists "because the data says it should." In this study, subjects were given real incentives to choose from and, like much of the existing literature, the subjects were undergraduate business students or MBA students. The conclusion of the study was that the model did not adequately explain the results obtained.

2.1.5 Prospect theory in high-risk environments

Haerem et al. (2011) conducted a study comparing the decision-making processes of military leaders with the principles of prospect theory. The study included participants who had received at least three years of military training and were tasked with making high-risk choices in simulated battlefield scenarios. The researchers looked to determine whether the military participants, who are trained to make quick decisions with potentially fatal consequences, would behave similarly to the "ordinary people" as predicted in the original prospect theory study. The results showed that the military leaders did not follow the principles of prospect theory, instead consistently choosing the riskiest option with the highest expected value. This research suggests that the factors influencing decision-making in high-stakes situations may differ from those in more mundane scenarios.

Fiegenbaum and Thomas (1988) tried to find explanations for the bowman's risk-return paradox. They found that companies that don't meet their return on equity (ROE) are more risk seeking to reach their goal than when they are above ROE. When companies reach their goals (is over their ROE) they show risk aversion. Showing credibility to prospects theory's function curve.

2.1.6 Prospect theory as a descriptive tool in politics

With climate change being on the world stage for a years, scientists have tried to use prospect theory as a way to explain the behavior of individuals energy efficiency. Linde and Vis (2017) tested if politicians follow prospect theory the same way as regular people do, the sample size was 46 Dutch member of the parliament. Surprisingly, the study found that the politicians do conform to expected utility theory to a greater extent than most people. This could give some insight to way policies are not as efficient as politicians believe them to be. The plans to challenge climate change mentions the words "energy efficiency (EE) gap", which refers to the energy humans produce and uses in a suboptimal way, especially in the car industry. Häckel et al. (2017) found that the higher the EE investment, the higher the EE gap was, explaining that individuals can upgrade to EE lightbulbs but need higher compensation to upgrade to EE vehicles. They also found that cumulative prospect theory (CPT) explains the effect of policies better than EUT. Lastly, they found the framing effect corresponding how the EE prospects where framed, either amplifying or reducing the EE gap.

Heutel (2019) used prospect theory to find how people behave toward energy-saving investment. He developed a questionnaire where he asked if people would buy energy saving light bulbs (lower investment) and energy saving cars (higher investment) and gathered 2 045 responses from the US population. He concluded that loss averse individuals are less likely to invest in energy-saving investments since there is a risk that the investment could end up not saving them any money, even when the expected value of the investment indicated that it would.

Hu et al. (2019) used cumulative prospect theory to explain the decision-making patterns of electric vehicle drivers. Showing that drivers have range anxiety and are likely to charge the batteries from high or medium to full capacity even if there is only a miniscule change of running out of battery before reaching the desired destination.

2.1.7 Criticisms of prospect theory

Despite its status as the most cited paper in psychology, prospect theory has had limited practical application in the realm of behavioral economics. While it has been a foundational theory in this field, its impact on commercial decision-making has been limited. One reason for this may be the theory's limited relevance to real-world decisions, which are typically single-prospect in nature. Although prospect theory's value function is a useful tool for understanding individual preferences, it has little practical applicability since prospects. By their very nature. Involve predictions of future outcomes, which are inherently uncertain. Real-world decisions often involve complex and uncertain outcomes that may not fit neatly into the framework of prospect theory. As a result, the theory's findings, which are based on idealized decision-making scenarios with two possible outcomes, may not be directly applicable to real-world decision-making contexts. While prospect theory remains a seminal work in the field of behavioral economics, its practical value for guiding commercial decision-making has yet to be fully realized.

2.2 Replication crisis

As I am doing a replication of another study, I find it important explain the importance of accountability and trustworthiness in any field of science. To be able to believe the findings of any report, the report must be detail enough for others to be able to reproduce the findings. In recent years, scientists have increasingly raised concerns about the replicability of scientific papers, leading to what has been termed the "replication crisis." To publish a paper, a researcher must report a finding, but this finding may be a false positive, and papers with no significant findings may have false negatives. Psychologists have found that there is an overabundance of false positives in research papers. Simmons et al. (2011) wrote that "in many cases, a researcher is more likely to falsely find evidence that an effect exists than to correctly find evidence that it does not." It is therefore important to replicate findings to rule out false positives. Simons (2014) argued “Reproducibility is the cornerstone of science. The idea that direct replication undergirds science has a simple premise: If an effect is real and robust, any competent researcher should be able to obtain it when using the same procedures with adequate statistical power.”. In his paper, he concluded that the only way to verify a significant effect is by multiple replications in a controlled environment. In 2016, the journal Nature published a survey which asked 1,576 researchers if there was a replication crisis. 52% answered that they believed it to be a significant crisis and 38% answered that there is a slight crisis, with only 3% stating that there is no crisis. To conclude, nearly 90% of the surveyed scientists agreed to some extent that there was a crisis.

Brian A. Nosek (2015) and a group of over 270 researchers published an article in the journal *Science* where they conducted replications of 100 experimental and correlational studies published in three psychology journals using high-powered designs and original materials. There findings showed that the majority of the papers had weak or no significant results, and that only 39 of the papers could be replicated. This means that 61 of the papers reported higher effects than could be replicated. Overall, the study found evidence for lack of trust among the scientific community.

2.3 Culture differences

Rieger et al. (2011) was examining in risk preferences and cultures, arguing that there are much research stating that there exist differences in how different cultures perceive risks. The study showed that countries with collective cultural traditions are less risk averse, a phenomenon called the “cushion effect”. When a member is under a financial catastrophe the other members would act as a social cushion when they fall, stopping them from financial and social crisis (Ye et al., 2013). The results found significant relationships between different cultural and risk preference, backing the findings of Bontempo et al. (1997), Hsee and Weber (1999) and Wang and Fischbeck (2008).

Rieger et al. (2015) criticized the findings of last three aforementioned sources, stating that there are a lot of studies on cultural perceptions of risk, but these usually have less then 5 countries as their sample size and that there is more than one factor that is different between these cultures. Rieger cited two papers with a sample size of 22 and 30 countries Statman (2008) and Vieider et al. (2012) in both of these studies, the wealth of the countries had an significant effect, with wealthier countries being more risk averse.

2.4 Gender differences

A highly cited paper called “Gender Differences in Preferences” by Rachel Croson and Uri Gneezy (2009) questioned previous studies on differences between men and women as it relates to preferences under risk. Croson and Gneezy handed out surveys that asked the participants to rate their level of agreement on a scale. The questions the ultimatum and dictator games. They found main factors that differentiate the genders were emotions, overconfidence, and framing. When women are faced with high-risk decisions, they tended to experience emotions more strongly than men, especially nervousness and fear of the worst outcome. Since worse outcomes are experienced harder by women, they are more risk averse when faced with a high-risk situation. Women’s perceptions of probability algo gets affected by this. If women are afraid of losing, they will believe that the gamble is higher than probability of losing and act accordingly.

As it concerns overconfidence, as presented in the Financial illiteracy chapter, this study again found that men are more overconfident in financial situations, e.g., that men are more confident in winning a 50/50 gamble compared to women.

As it concerns framing and prospect theory, individuals’ perception had a significant effect on how they interpret the risk.

Some interesting findings were that men tend to view risk as a challenge, rather than a threat. Thus, increases men’s risk tolerance. They also found that both men and women act similarly when placed as managers, entrepreneurs etc. Lastly, they found that women’s preferences in purely competitive situations were not as strict as men’s, meaning that men were more willing to take risks to increase their chance of winning. Note that they could not find out if this is something that is natural to women or is taught.

2.4.1 The “white man” effect

Finucane et al. (2000) wanted to find out if there are racial discrepancies in men’s preferences. They asked men of all colors on how much risk they associated each activity with. This ranged from activities such as using street drugs, drinking tap water, or support for governmental activities as nuclear power plants. Compared to men of all other races, white males consistently rated each activity as less risky across all categories. They found that if they excluded white men from the study, there would be no significant differences, meaning all men would have had the same risk attitude.

2.5 Financial illiteracy

The concept of illiteracy has undergone significant changes over the years. Historically, it was defined as a lack of proficiency in reading and writing, which was often associated with limited education and low socioeconomic status. However, the rapid pace of technological advancement has led to a redefinition of the term, with illiteracy now encompassing a broader range of skills and competencies necessary for active participation in modern society. For example, digital literacy has become increasingly important as technology has become more important in everyday life, and individuals must have the skills to use digital devices and online platforms to function.

Financial literacy is a specific form of literacy that is essential for financial stability and security. It has knowledge and skills related to financial planning, wealth accumulation, pension management, and debt management. In addition to knowledge, individuals must also have the confidence and ability to use this knowledge to make informed decisions about their finances. This can be challenging, as financial decision-making often involves complex information and trade-offs between short-term and long-term goals (OECD/INFE, 2020).

Despite the importance of financial literacy, many individuals struggle with it. Research has shown that there are significant differences in financial literacy levels across demographic groups, with women being consistently found to have lower levels of financial literacy than men. This gender gap persists even in countries with generally equal access to education and the labor market, such as Norway and the Netherlands (Furrebøe et al., 2022).

2.5.1 Financial self-efficacy

Financial self-efficacy refers to an individual’s belief to manage their personal finances, in other words, it is a measure of confidence. An individual with high financial self-efficacy will believe that they are good with money, therefore be more likely to execute activities like saving, investing, setting financial goals, and manage their spending. Interestingly, a study by HanNa Lim (2014) found a tendency for students to have high financial self-efficacy also are more likely to seek financial help, because they understand their financial shortcoming to a higher degree.

A closely related topic to self-efficacy is “locus of control” which refers to an individual’s understanding of consequences of their actions. There are two types of locus of control: internal and external. Individuals with an internal locus of control believe that they have control over their life outcomes, and that their actions and decisions have a direct impact on their success or failure. On the other hand, individuals with an external locus of control believe that external factors such as luck, chance, or other people have a greater influence on their life outcomes than their own actions and decisions.

The degree to which an individual has an internal or external locus of control can have significant impacts on their behavior, attitudes, and overall well-being. For example, individuals with an internal locus of control are more likely to take responsibility for their actions, be more motivated to achieve their goals, and experience less stress and anxiety. Meanwhile, individuals with an external locus of control may be more likely to feel helpless or resigned to their circumstances, and may be less likely to take proactive steps to improve their situation (Rotter, 1966).

There are gender differences in financial self-efficacy with women showing low confidence in financial decisions, but also men show weakness resulting from overconfidence when choosing financial investments such as stocks. Barber and Odean (2001) found that men traded stocks 45% more than women, and on average lost more than women because of this. Studies find that both genders experience benefits from financial education, but woman benefits more from knowledge than men, while men benefit more self-efficacy. Furthermore, studies have found that individuals with high financial self-efficacy perform better at school even though their knowledge in subjects are equal compared to individuals with low self-efficacy.

2.5.2 Financial socialization

Financial socialization refers to the process which individuals develops understanding and attitudes on financial management. This includes saving, spending, investments and borrowing. In other words, how and why individuals gain knowledge in financial decision making. The concept of financial socialization recognizes that an individual’s behavior and attitude are shaped by social and cultural factors starting in childhood.

In recent times, younger generations are struggling to acquire the necessary financial freedom compared to their predecessors. One factor is the significant increase in lenders and financial options that individuals now have compared over the last few decades. Despite the vast amount of financial information available, the specific nature of the data has made modern finance extremely complex. Additionally, the older generation may not have a complete understanding of the financial options available to teach the younger ones. However, their strong financial risk assessment skills regarding loans could offer invaluable guidance for the younger generation to develop sound financial behaviors. It is worth noting that modern finance has undergone significant changes compared to earlier times. For instance, the process of purchasing a house, one of the most significant investments individuals make in their lifetime, has changed considerably. While more support is available to financial professionals, those who receive assistance throughout the entire process may develop a false sense of security until they acquire the property, after which they are solely responsible for repaying their mortgage(Jordà et al., 2016).

Family financial socialization theory finds that family is a main factor for early development in financial understanding. Ward (1974) defined family financial socialization as “processes by which young people acquire skills, knowledge, and attitudes relevant to their functioning as consumers in the marketplace”

Some factors that may contribute to this gender gap include differences in upbringing and early experiences. For example, research has shown that boys tend to have more responsibilities at home and start working at an earlier age, which may provide them with more opportunities to develop financial management skills through hands-on experience (Satterthwait, 2010).

3.0 Methodology

3.1 Data collection

In this study, I use the original questionnaire from Kahneman and Tversky's paper on prospect theory. The questionnaire is given to students at Molde University College. The sample was chosen for convenience and is therefore not necessarily true to the whole population. To make the questionnaire more understandable to the participants, it is translated into Norwegian, and the monetary values are converted with respect to the median net income for a Norwegian family and rounded for simplicity. The questionnaire was distributed in writing to participants during class, with the support of the instructors. The instructors were contacted through email. The nursing students had mandatory attendance which made it was only needed to ask one class to fulfill the threshold of nursing students. Getting enough business students turned out to be more of a problem as they did not have mandatory attendance and most students took classes online. But after administrating the questionnaire in multiple classes I was able to get enough observations to meet the threshold for business student.

I quickly realized that is would be nearly impossible to balance the gender composition of the sample in each field of study. There was thus an oversampling of females nursing student and a small number of female business students. This made it even harder to meet the criteria for a fair comparison between nursing and business students as the two groups needed to have closely the same ratio of genders.

The participants were asked to enter their responses directly on the questionnaire. In addition to the questions from the original questionnaire, I also collected data on the participants gender, age, and field of study. To ensure that the sample size is sufficiently large to generate meaningful findings, I had at least 30 participants from each field of study.

Before the questionnaire was handed out, it was given to a test group, consisting of 5 individuals. This was done to find out if there were any problems understating the language and how long time the participants would use on the questionnaire. There were no difficulties understanding the language and the average time of answering the questionnaire was 7 minutes.

3.2 Changes from the original study

The question consisting of probalistic insurance was removed from the questionnaire as it is too long and complicated. The questions regarding a chance of winning a trip abroad were also removed due to the globalization changes since the original study. International travels might not have the same influence on participants as it had in 1979. Some might even have negative stances towards visiting England and may not want to win a free trip there.

In the original study, problems with strictly negative outcome were identified by a number followed by an apostrophe, where the number corresponded to a problem with the same numerical values. The difference between the problems is that one is strictly negative and the other is strictly positive. The negative problem is identified by the apostrophe. To make my research easier to understand, I gave each problem its own numerical notation, such as "Problem 1," "Problem 2," and so on.

The monetary values of outcomes used in my study were different from the one used in the original study. In Problem 1, the original study listed a 33% chance for 2,400 and a 66% chance for 2,500. The differential factor for this is 0.96, which is obtained by dividing 2,500 by 2,400. In my study, I considered that the simplicity of the question is more important, so I used a factor of 0.9, which is obtained by dividing 450,000 by 500,000.

In problem 2. The conversion factor is 0.83, which is obtained by dividing 2500 by 3000. Using this factor, we can calculate the NOK value by multiplying it with 560,000. The result is 466,666.67, which I rounded to 500,000. Similarly, we can convert the factor for D, which is 0.8, to a NOK value by multiplying it with 560,000. The result is 448,000, which I simplified to 450,000.

In problem 3, the options are presented differently than in problems 1 and 2. Option A is written as (4,000, .80), which means that there is an 80% chance of getting 4,000. Option B is written as (3,000), which means that 3,000 is guaranteed. To make the options consistent with the previous problems, I converted them to a common format. To convert option A, I divided 4,000 by 3,000 which equals 1.33. Multiply this by 560,000, and we get 746,666.67, which I rounded to 750,000 for simplicity. To convert option B, I divide 3,000 by 3,000 which equals 1. Multiply this by 560,000 and we get 560,000, which I rounded to 550,000, so the options are now consistent throughout the questionnaire.

In problem 4, option A is written as (4,000, .20) which means that there is a 20% chance of getting 4,000. Option B is written as (3,000, .25) which means there is a 25% chance of getting 3,000. To make the options consistent with the previous problems, I converted them to a common format. Option A, 20% chance to get 750,000. Option B, 25% chance to get 550,000.

In my study, I decided to remove the question about probabilistic insurance from the questionnaire for several reasons. Firstly, the question is quite complex and might be difficult for some subjects to understand. The question involves concepts such as probability and insurance, which might not be familiar to all participants. Additionally, the question is quite lengthy and might take up a lot of time for the subjects to complete, which could lead to fatigue and decreased response quality.

In addition to the probabilistic insurance question, I also removed the questions about winning a trip abroad. The original study was conducted in 1979 and at that time, the influence of international travels on participants may have been different. However, since then, the world has undergone significant changes in terms of globalization. Today, the influence of different countries on individuals may not be the same as it was in 1979. Moreover, some participants may even have negative views towards a particular country and would not want to win a free trip there. This could lead to a bias in the results and, therefore, I found it appropriate to remove these questions from the questionnaire.

By removing the questions, the questionnaire was less complex, shorter, and more relevant to the current context, which I hope lead to more accurate and meaningful results

Because of the removal of problem 5, 6 and 9 from the original questionnaire, the numerical notations are different for Kahneman & Tversky the questionnaires. Problem 7 is now problem 5, problem 8 is problem 6. Further on the problems is explained with my questionnaire in mind.

In problem 5, the options are presented as: Option A (6,000, .45), which means there is a 45% chance of getting 6,000. Option B is written as (3,000, .90), which means there is a 90% chance of getting 3,000. To make the options consistent with the previous problems, I converted them to a common format.

To convert option A, I divided 6,000 by 3,000 which equals 2. I then multiply this by 560,000, to get 1,120,000, which I simplified to 1,100,000. To convert option B, I divided 3,000 by 3,000 which equals 1. I then multiply this by 560,000 and I get 560,000, which I simplified to 550,000, so the options are now consistent throughout the questionnaire.

Problem 6 the options are presented as: Option A (6,000, .001), which means there is a 0.01% chance of getting 6,000. Option B (3,000, .002) which means that there is a 0.02% chance of getting 3,000. To make the options consistent with the previous problems, I converted them to a common format.

To convert option A, I divided 6,000 by 3,000 which equals 2. I then multiply this by 560,000, and to 1,120,000, which I simplified to 1,100,000. To convert option B, I divided 3,000 by 3,000 which equals 1. I then multiply this by 560,000 to get 560,000, which I simplified to 550,000, so the options are now consistent throughout the questionnaire.

Problem 1 to 6 is where Kahneman and Tversky illustrated the certainty effect.

In problems 7 to 10, I investigate the "reflection effect," which is found in prospects with identical numerical values as problems 3 to 6. The main difference between these two sets of problems is that problems 7 to 10 are strictly negative, while problems 3 to 6 are strictly positive.

Problems 11 to 13 are designed to investigate the "framing effect" which is the phenomenon where people's risk preferences can change based on how the question is framed.

In problem 11, option A is written as (4,000, .80) and option B is written as (3,000). These options are now written and converted in a consistent manner

In problem 12, the participants are told they will receive 1,000 before the game starts. To convert this to a consistent format, I divided 1,000 by 3,000 which equals 1/3. I then multiply this by 560,000 to get 186,666.67, which I rounded to 200,000 for simplicity. Then the participants are given two options: Option A, which is a 50% chance of getting 1,000, converted to 200,000 or Option B, which is a guaranteed 500, converted to 100,000.

In problem 13, the participants are told they will receive 2,000 before the game starts. To convert this to a consistent format, I divided 2,000 by 3,000 which equals 2/3. I then multiply this by 560,000 and we get 373,333.33, which I rounded to 400,000 for simplicity. Then the participants are given two options: Option A, which is a 50% chance of losing 1,000, converted to 200,000, or Option B, which is a guaranteed loss of 500, converted to 100,000.

In problem 14, the options are presented as follow: option A is written as (6,000, .25) which means that there is a 25% of getting 6,000 and option is written as (4,000, .25 ; 2,000, .25) which means there is a 25% chance of getting 4,000 and a 25% chance of getting 2,000 To make the options consistent with the previous problems, I converted them to a common format.

To convert option A, I divided 6,000 by 3,000 which equals 2. I then multiply this by 560,000, to get 1,120,000, which I simplified to 1,100,000. To convert option B, I divided 4,000 by 3,000 which equals 4/3. I then multiply by 560,000 to get 746,666.67 which I simplify to 750,000. Additionally, I divide 2,000 by 3,000 which equals 2/3. I multiply this by 560,000 to get 373,333.33, which I simplify to 375,000 which is also half of 750,000 which matched the format of the original question

I copied the formula in problem 14 for problem 15 to make the prospects strictly negative.

In problem 16, the options are presented as follow: option A is written as (5,000, .001) which means there is a 0.01% chance of getting 5,000. Option is written as (5) which means the recipient is guaranteed to get 5.

To convert option A I divided 5,000 by 3,000 which equals 5/3 and multiply that with 560,000 and get 933,333.33. I simplified this to 1,000,000. To convert option B, I divide 5 by 3,000 and get 5/3,000, multiply this with 560,000 to get 933.33 which I simplified to 1,000

In problem 17, I copied the formula from problem 16. With strictly negative prospects.

3.3 Data management

I input the data from the collected questionnaires and converted them into an excel dataset. To perform accurate measurements, the data inputted missing responses are removed from the data set. When all responses were typed in the dataset there was a total of 134 observations. All observations that had missing answers were removed. Four of the observations had missing “Field of study”, one observation had missing age, six observations had incomplete responses (Had skipped problems). Three observations did not specify their gender. After reviewing and removing all the incomplete observations, I was left with 120 usable observations.

3.3.1 Reviewing the data

From the 120 observations that were left, the statistics are as follows:

- 94 females
- 26 males
- 30 business students
- 90 nursing students

The ages ranges from 18 to 53 with the mean being 22.9.

3.4 Analyzing data

Firstly, I will check if the students at Molde university college do violate the expected utility theory. This is done by going through each problem and calculating percentages of responders who choose a particular option. Here is an example:

Problem 1

	A: 33% chance to win 500 000kr	B:	Guaranteed 450 000kr
	66% chance to win 450 000kr		
	1% chance to win 0kr		
N = (Sample size)	[per cent of answers]		[per cent of answers]*

The brackets are percentages of students that preferred the option above. N is the total number of responders in that category (choose that option). In this example there is only one category but when evaluating business and nursing there will be two. Note the asterisk after the second bracket, indicates the level of significance. One asterisk is .1, two asterisks are .05 and three asterisks are level .01. Furthermore, I will compare what I call "problem-pairs" i.e., problems that show violations to expected utility theory when students prefer A one problem and B in the next or vice versa.

Secondly, I will do the same when I look for different preferences depending on the student's field of study. Here is an example:

Problem 1

	A:	33% chance to win 500 000kr	B:	Guaranteed 450 000kr
		66% chance to win 450 000kr		
		1% chance to win 0kr		
N_N = Number of nursing students		[per cent of answers]		[per cent of answers]*
N_B = Number of business students		[per cent of answers]		[per cent of answers]*

The next step is to see if the proportions of business student that violate expected utility theory is comparable against the proportions of nursing student that violate expected utility theory. This I will do with the software Stata and use their "prtesti" command. The test is called a two-sample test of proportions. By examining the proportions, I can still find significance even though the two-sample sizes will be different.

Lastly, I will do two regressions. In regression one, I will use the full sample size and use the number of students that violated the expected utility, as the dependent variable and use the students age and field of study as independent variables. This regression will find out if the age or field of study are significant for the outcome. The second regression I use a female only sample and run the same regressions. If there is a change from significant to non-significance or vice versa, I will know that the findings are because of gender and not field of study. If a significant finding does not change in the female only regression, I will know that it truly is because of the field of study.

3.4.1 Limitations

The limitations of questionnaires are well documented, the main limitations for my study are:

Cultural: The original questionnaire was given to students in Sweden, USA, and Israel. I will only be focusing on students in Norway that can read and understand Norwegian. It is possible that participants have different preferences because of their culture.

Translation: As I was unable to use the original questionnaire and needed to make a new translated questionnaire in Norwegian, my questionnaire might not capture the same meaning as the original. Furthermore, the monetary amounts must be converted to

Norwegian kroner. This might also impact the real monetary amount as these countries have different tax system and the overall value of the amount can differ between countries.

Times: Over time populations may change their preferences naturally as science evolve, reaching a greater amount of people. My study is done 44 years later, by then the studied theory might have reached the population thus influenced their people’s preferences.

Although I am aware of other factors that may contribute to false preferences, I still believe that conducting a thorough scientific approach under the supervision and guidance of multiple PhD professors will render the study useful.

Some factors also can be raised in criticism to the original questionnaire by Kahneman and Tversky. The monetary amount chosen as reference point (the median income of a family) is high, and hard for students to comprehend as statistically most of them would not have made that much money before and their perception of the amount may be deceptive.

3.4.2 Deviations from the original study plan

One of the research questions relates to whether gender does in fact influence the preferences of individuals. While planning the data collection phase, I quickly became aware trough conversations with instructors, that it would be difficult to gather enough data on each gender in each field of study. The main reasons for this are that the number of men studying nursing is much lower than the number of women. Likewise with business, the number of men studying business outnumber the number of women. Moreover, since the Covid pandemic the business classes have mostly been done over the internet with instructors employing digital teaching. While business students had the option of attending classes physically. Most followed the instruction from home. This made it even harder to collect data from female participants in business classes. Nursing classes on the other hand had mandatory attendance, where a total of 130 students attended each day.

3.4.3 Norsk senter for forskningsdata (NSD)

The questionnaires are administered to participants and the responses are anonymous. There is no way to identify an individual from the collected responses.

4.0 Results

Utility in excepted utility is measured by multiplying the probability with the value of a prospect. Problem 1 – 4 systematically finds discrepancies in this theory. In these examples, I find what Kahneman and Tversky labeled the *certainty effect*. N denotes the number of respondents

4.1 Certainty effect

Problem 1

A:	33% chance to win 500 000kr	B:	Guaranteed 450 000kr
	66% chance to win 450 000kr		
	1% chance to win 0kr		
N = 120	[36]		[64]***

Problem 2

A:	33% chance to win 500 000kr	B:	34% chance to win 450 000kr
	67% chance to win 0kr		66% chance to win 0kr
N = 120	[65]***		[35]

In problem 2 it is important to note that this corresponds to problem 1 450 000kr at a 66% chance removed from both alternatives. The prospects would otherwise be identical. So, the students should have identical answers if they were following expected utility theory (EUT). But this is not the case.

This pattern violates the expected utility theory. EUT says $u(x)=x$ while this outcome says: $u(450\ 000) > .33u(500\ 000) + .66u(450\ 000)$ or $.34u(450\ 000) > .33u(500\ 000)$

Problem 3

A:	80% chance to win 750 000kr	B:	Guaranteed to win 550 000kr
N = 120	[31]		[69]***

Problem 4

A:	20% chance to win 750 000kr	B:	25% chance to win 550 000kr
N = 120	[59]***		[41]

Problem 3 and 4 also show a violation in the substitution axiom which says that if you prefer A over B then you would also prefer (A*p) over (B*p). A in Problem 3 can also be written as ((A).25) in problem 4 and B in problem 3 can be written as ((B).25) thereby showing violation in the substitution axiom.

Problem 5

A: 45% chance to win 1 100 000kr B: 90% chance to win 550 000kr

N = 120 [28] [72]***

Problem 6

A: 0.01% chance to win 1 100 000kr B: 0.02% chance to win 550 000kr

N = 120 [78]*** [22]

In problem 5 the expected value of outcomes is the same, but the higher likelihood of winning the smaller price makes the choice preferable. In problem 6 the expected value is the same, but the probabilities of outcomes are minuscule. In prospects where the expected value is the same the more option which is probable is more preferred, when both outcomes are unlikely the outcome which has the highest amount is preferred. This phenomenon cannot be explained with EUT, and is evidence that percentages are “felt” differently.

4.2 Reflection effect

I have in the previous examples illustrated that individuals do not respond in a linear fashion when faced with prospects where certainty and expected values are the dominant factors. The linear line in EUT is in reality a sloping curve when individuals are experiencing gains. The “reflection effect” shows were individuals start to form an “S-curve” when negative prospects are introduced. This is done by asking identical prospects, but changing the outcomes from strictly positive to strictly negative (the values change from x to -x)

Problem 3	A: 80% chance to win 750 000kr N = 120 [31] B: Guaranteed to win 550 000kr N = 120 [69]***	Problem 7	A: 80% chance to lose 750 000kr N = 120 [68]*** B: Guaranteed to lose 550 000kr N = 120 [32]
Problem 4	A: 20% chance to win 750 000kr N = 120 [59]*** B: 25% chance to win 550 000kr N = 120 [41]	Problem 8	A: 20% chance to lose 750 000kr N = 120 [27] B: 25% chance to lose 550 000kr N = 120 [73]***
Problem 5	A: 45% chance to win 1 100 000kr N = 120 [28] B: 90% chance to win 550 000kr N = 120 [72]***	Problem 9	A: 45% chance to lose 1 100 000kr N = 120 [67]*** B: 90% chance to lose 550 000kr N = 120 [33]
Problem 6	A:0.01% chance to win 1 100 000kr N = 120 [78]***	Problem 10	A:0.01% chance to lose 1 100 000kr

	B:0.02% chance to win 550 000kr N = 120 [22]		N = 120 [37] B:0.02% chance to lose 550 000kr N = 120 [63]***

(Table 1)

As you can see, when prospects change from strictly positive to strictly negative the participants change their preference from a loss-aversion to risk seeking behavior.

The second implication is that individuals' preferences between positive and negative prospects are inconsistent with EUT. This assumes that people make decisions based on expected value. Prospect theory on the other hand suggests that people overweight the importance of certain outcomes and are more loss-averse when experiencing gains and risk-seeking when experiencing losses.

4.3 Isolation effect

Individuals often try to simplify prospects, to make the decision-making process easier. While simplifying decisions, key common components may be overlooked or ignored. Individuals more often focus on the components that make the outcomes differ from each other. This can lead to people having inconsistent preferences and lead to an outcome they would not have proffered had they been aware of the fact (fully read and understand the problem). They way problems are explained can have a significant change in preferences. Kahneman and Tversky termed this phenomenon the "isolation effect".

Problem 11 is described as: "Your choice must be made before the game starts, i.e., before the outcome of the first stage is known.

Consider the following two-stage game. In the first stage, there is a 75% chance of ending the game without winning anything, and a 25% chance of proceeding to the second stage. If you reach the second stage, you have a choice between..."

A: 80% chance to win 750 000kr B: Guaranteed to win 550 000kr

N = 120 [28] [72]***

This problem is a more complex way of asking a previous problem. Note that the chance of winning A is .20 (.25 * .80) and the chance of winning B is .25 (.25 * 1) so the actual question is, Would you rather:

A: 20% chance of winning 750 000kr B: 25% chance of winning 550 000kr

Which is the same as problem 4. But in problem 4 59% chose A and 41% chose B.

44% of students chose A in problem 4, and B in problem 11.

The students ignored the text in the problem and considered it as a choice between (.80, 750 000kr) and (550 000kr) as they did in problem 3.

Problem 12 and 13 show the same phenomenon. The prospects were displayed as:

Problem 12: Chose A or B

Before the question is asked, you have received 200,000kr. You are now asked to choose between:

A:	50% chance to win 200 000kr		B:	Guaranteed to win 100 000kr
	N = 120	[28]		[72]***

Problem 13:

Before the question is asked, you have received 400,000kr. You are now asked to choose between:

A:	50% chance to lose 200 000kr		B:	Guaranteed to lose 100 000kr
	N = 120	[58]***		[42]

43% of the students chose B in problem 12 and A in problem B. Note that the problems have the same outcomes. A (400 000kr, .50 ; 200 000kr, .50), and B (300 000kr). The students' preferences further confirm the findings in Table 1.

EUT says that the starting wealth of the individuals is inconsequential. An individual should be indifferent between owning 1 000 000kr or gambling between 950 000kr and 1 050 000kr, but the answers in problem 12 and 13 show that there are major inconsistencies with that theory. This example suggests that people may care more about changes in their wealth than their current wealth by itself. From a logical perspective, one can consider a hypothetical scenario involving the wealthiest individual on earth and a student when presented with the option of flipping a coin for a chance to win 0 or 1000kr, or accepting a guaranteed 500kr. Based on the theory of utility, it can be assumed that the participants, who likely does not possess significant wealth, would be more inclined to choose the guaranteed 500kr, while the richest person on earth may be more inclined to take the gamble since it doesn't change his day in any meaningful way.

Problem 14

A:	25% chance to win 1 100 000kr	B:	25% chance to win 750 000kr 25% chance to win 375 000kr
	N = 120 [21]		[79]***

Problem 15

A:	25% chance to lose 1 100 000kr	B:	25% chance to lose 750 000kr 25% chance to lose 375 000kr
	N = 120 [51]		[49]

Problem 14 and 15 illustrate that the utility line is not linear. Problem 14 shows that the gains domain of the graph is concave. Interestingly problem 15 does not find the same effect as Kahneman and Tversky found in their study. My findings illustrate an insignificancy for losses in contrast to the convex line from Kahneman and Tversky.

Problem 16

A:	0.01% chance to win 1 000 000kr	B:	Guaranteed to win 1 000kr
	N = 120 [48]		[52]

Problem 17

A:	0.01% chance to lose 1 000 000kr	B:	Guaranteed to lose 1 000kr
	N = 120 [48]		[52]

Problem 16 and 17 find that the students are indifferent between the two options, which means they have no preference as opposed to Kahneman and Tversky's findings.

4.4 Business students and Nursing students.

Now I will look at the responses of business students and nursing students with the notation N_B for business students and N_N for nursing students. The results here will be similar as the whole population, but at what degree the field of study will alter the preferences is examinate. The brackets are denoted with one asterisk if the significant level is .1, two asterisk if .05 and three asterisk if .01

Problem 1

A:	33% chance to win 500 000kr 66% chance to win 450 000kr 1% chance to win 0kr	B:	Guaranteed 450 000kr
N_N = 90	[33]		[67]***
N_B = 30	[43]		[57]

Problem 2

A:	33% chance to win 500 000kr 67% chance to win 0kr	B:	34% chance to win 450 000kr 66% chance to win 0kr
$N_N = 90$	[57]***		[43]
$N_B = 30$	[90]***		[10]

The violation exists in both field of study. However, in problem 2 the ratio of how different the answers are might be surprising. 90% of business students chose B of while for nursing students, it was close to a 50/50 answer ratio. 50% of all business students violated EUT by following PT (choosing "b" in problem 1 and "a" in problem 2)

Problem 3

A:	80% chance to win 750 000kr	B:	Guaranteed to win 550 000kr
$N_N = 90$	[34]		[66]***
$N_B = 30$	[20]		[80]***

Problem 4

A:	20% chance to win 750 000kr	B:	25% chance to win 550 000kr
$N_N = 90$	[57]***		[43]
$N_B = 30$	[67]***		[33]

The same trends continue in problem 4 and 5. Business students have a higher percentage of violation of EUT compared to nursing students. 57% of business student and 41% of nurses followed PT (Choosing "b" in problem 3 and "a" in problem 4).

Problem 5

A:	45% chance to win 1 100 000kr	B:	90% chance to win 550 000kr
$N_N = 90$	[30]		[70]***
$N_B = 30$	[23]		[77]***

Problem 6

A:	0.01% chance to win 1 100 000kr	B:	0.02% chance to win 550 000kr
$N_N = 90$	[72]***		[28]
$N_B = 30$	[97]***		[3]

As stated earlier, problem 5 and 6 have the same expected value in terms of outcomes. However, in problem 6, only one business student answered B. This shows a strong preference, to the degree which is highly unlikely for a business student to choose B. This indicates that both fields of study consider the outcomes as two lottery gambles, but that the business students are more frequently to choose the highest outcome. 73% of business and

48% of nursing students violated EUT by following PT (choosing “b” in problem 5 and “a” in problem 6).

4.4.1 Reflection effect

Problem 3	A: 80% chance to win 750 000kr $N_N = 90$ [34] $N_B = 30$ [20] B: Guaranteed to win 550 000kr $N_N = 90$ [66]*** $N_B = 30$ [80]***	Problem 7	A: 80% chance to lose 750 000kr $N_N = 90$ [73]*** $N_B = 30$ [53] B: Guaranteed to lose 550 000kr $N_N = 90$ [27] $N_B = 30$ [47]
Problem 4	A: 20% chance to win 750 000kr $N_N = 90$ [57]*** $N_B = 30$ [66]*** B: 25% chance to win 550 000kr $N_N = 90$ [43] $N_B = 30$ [33]	Problem 8	A: 20% chance to lose 750 000kr $N_N = 90$ [21] $N_B = 30$ [43] B: 25% chance to lose 550 000kr $N_N = 90$ [79]*** $N_B = 30$ [57]
Problem 5	A: 45% chance to win 1 100 000kr $N_N = 90$ [30] $N_B = 30$ [23] B: 90% chance to win 550 000kr $N_N = 90$ [70]*** $N_B = 30$ [77]***	Problem 9	A: 45% chance to lose 1 100 000kr $N_N = 90$ [71]*** $N_B = 30$ [53] B: 90% chance to lose 550 000kr $N_N = 90$ [29] $N_B = 30$ [47]
Problem 6	A:0.01% chance to win 1 100 000kr $N_N = 90$ [72]*** $N_B = 30$ [97]*** B:0.02% chance to win 550 000kr $N_N = 90$ [28] $N_B = 30$ [3]	Problem 10	A:0.01% chance to lose 1 100 000kr $N_N = 90$ [40] $N_B = 30$ [27] B:0.02% chance to lose 550 000kr $N_N = 90$ [60]*** $N_B = 30$ [73]***

(Table 2)

Problem 3, 4, 5, 6 and 10 are consistent with prospect theory. But problem 6 and 10 are the only ones that show a strong reflection effect among the business students. However, the choice of nursing students illustrates the reflection effect to high degree in all the problem-pairs.

Problem 11 is described as: "Your choice must be made before the game starts, i.e., before the outcome of the first stage is known.
Consider the following two-stage game. In the first stage, there is a 75% chance of ending the game without winning anything, and a 25% chance of proceeding to the second stage. If you reach the second stage, you have a choice between..."

	A: 80% chance to win 750 000kr	B: Guaranteed to win 550 000kr
$N_N = 90$	[29]	[71]***
$N_B = 30$	[27]	[73]***

Both fields of study act in the way of prospect theory's isolation effect predicts, with a high similarity among the different students. Recalling that the outcome in this problem the exact same as in problem 4, the outcomes are really A = (25% * (80% chance to win 750 000kr)) = 20% to win 750 000kr, and B = 25% chance to win 550 000kr. Where the majority in both field of study had a preference to option A.
Problem 12: Chose A or B
Before the question is asked, you have received 200,000kr. You are now asked to choose between:

	A: 50% chance to win 200 000kr	B: Guaranteed to win 100 000kr
$N_N = 90$	[24]	[76]***
$N_B = 30$	[37]	[63]***

Problem 13:
Before the question is asked, you have received 400,000kr. You are now asked to choose between:

	A: 50% chance to lose 200 000kr	B: Guaranteed to lose 100 000kr
$N_N = 90$	[57]***	[43]
$N_B = 30$	[58]*	[42]

Problem 12 and 13 are also consistent between the different fields of study. Recalling that option A in problem 12 has the same outcome as option A in problem 13, 50% chance of winning 200 000kr means that the two possible outcomes are 400 000kr and 200 000kr. In problem 13 there is a 50% chance to lose 200 000kr and the two possible outcomes are 200 000kr and 400 000kr. The same with option B in both, the outcome is guaranteed to be 300 000kr. Note, in problem 13, there are three asterisk to denote that the significant level is .10.

Problem 14

A:	25% chance to win 1 100 000kr	B:	25% chance to win 750 000kr 25% chance to win 375 000kr
$N_N = 90$	[21]		[79]***
$N_B = 30$	[20]		[80]***

Problem 15

A:	25% chance to lose 1 100 000kr	B:	25% chance to lose 750 000kr 25% chance to lose 375 000kr
$N_N = 90$	[47]		[53]
$N_B = 30$	[63]***		[37]

Problem 14 and 15 show that the value function is concave with gains and convex with losses. However, there is stronger evidence with business students than nursing students as the nursing students show indifference in problem 15.

Problem 16

A:	0.01% chance to win 1 000 000kr	B:	Guaranteed to win 1 000kr
$N_N = 90$	[38]		[62]***
$N_B = 30$	[77]***		[23]

Problem 17

A:	0.01% chance to lose 1 000 000kr	B:	Guaranteed to lose 1 000kr
$N_N = 90$	[54]		[46]
$N_B = 30$	[27]		[73]***

Problem 16 and 17 show major discrepancies. In both problems the field of study influenced the preferences of the students. Business students were risk seeking when the options were strictly positive. In problem 16 the outcomes can be view as option A, with an extremely high gain and a low probability and option B which guarantees a low utility gain. So, the business students might have considered that the outcome of option B does not have a high enough utility gain to be meaningful to them compared to the chance of gaining an extremely high utility. The nursing students could have perceived it as the opposite. The sure gain of utility is more meaningful to them than gambling the secure outcome for a chance to win big. This explanation is consistent with the findings of Milton Friedman (1948).

Even though the preferences are opposite to each problem for the different field of study, they still show the reflection effect.

4.5 Comparing differences in proportions of business students and nursing students

This chapter presents a two-sample test of proportions to examine whether the proportion of EUT violations among business students is significantly different from nursing students. The analysis compares the number of students who violated EUT in both fields of study.

Results indicate that for problem 1 and 2, the difference in proportions of business students who selected option A in problem 2 relative to option A in problem 1 is significantly higher compared to the same comparison for nursing students ($p = 0.017$). These findings suggest that business students violate EUT to a greater extent than nursing students. Similarly, for problem 3 and 4, the difference in proportions of business students who chose option A in problem 4 relative to option A in problem 3 is significantly higher compared to nursing students ($p = 0.0159$). This implies that business students are more likely to violate EUT than nursing students.

Lastly, for problem 5 and 6, the difference in proportions of business students who chose option A in problem 6 relative to option A in problem 5 is significantly higher compared to nursing students ($p = 0.0044$). This indicates that business students engage in EUT violations to a greater degree than nursing students.

4.5.1 Reflection effect

The study examined the reflection effect by analyzing the proportions of business and nursing students selecting option A in problem-pairs 3 and 7, 4 and 8, 5 and 9, 6 and 10. The analysis showed that for problem-pairs 3 and 7, 4 and 8, and 5 and 9, field of study did not have a statistically significant effect on the reflection effect.

However, for problem-pair 6 and 10, field of study had a statistically significant effect. Specifically, the analysis revealed that business students exhibited a significantly greater degree of reflection effect in this particular problem-pair than nursing students.

4.5.2 Isolation effect

To find if the field of study have any impact on the isolation effect, I will again use the two-sample test of proportions and compare the fields of study against each other. The first test of the isolation effect is problem 11, where the students were asked to consider a two-staged game where the options must be chosen before outcome of the first stage is known. Here the majority answered option B were 71% for nurses and 73% for business. There is a high similarity between these answers, therefore the test showed no significant differences.

The second example for the isolation effect are problem 12 and 13. I use the two-sample test of proportions to compare the difference of proportions of business students that choose option A in problem 12 relative to option A in problem 13 and compare that against the difference in proportions of the nursing students who choose option A in problem 12 relative to the those who choose option A in problem 13. Again, the preferences are similar, and field of study had no significant effect.

4.5.3 The value function

Kahneman and Tversky explained the value function based on problem 14 and 15. Here I look at what impact that the different fields of study have on the value function. Comparing the difference of proportions of business students that choose option A in problem 15 relative to option A in problem 14 against difference of proportions of nursing students that choose option A in problem 15, relative to option A in problem 14, I find no significant differences at the .05 level. However, there is significant difference at the .10 level with a p-value of 0.08. Note, in problem 15 nursing students illustrated indifference while business student demonstrated a preference.

The second example of the value function is problem 16 and 17. I use the same approach as in the first example. Here is find that fields of study significantly change the preference (p-value of 0.0002). Recall, that business and nursing student had different preferences in these problems.

4.6 Gender effects

For the robustness check I will test for the presence of gender effects. This is done by running a regression on the full sample and the female-only sample. I estimate the following model:

$$\text{Diff} = \beta_0 + \beta_1 \text{age} + \beta_2 \text{nursing} + \epsilon \quad (1)$$

Were Diff being a dummy variable equal to 1 if a participant changed their response from option A to option b or vice versa, thus violating EUT. “nursing” is an indicator equal to 1 if a participant is a nursing student and 0 if he or she is a business student. I run two sets of regressions from equation (1). One involving the full sample and the other, the female-only sample.

	Full size	Female-only sample size	
Problem pair 1-2	Coefficient: .136636 (0.190)	Coefficient: .1370808 (0.267)	No significance in both sample sizes
Problem pair 3-4	Coefficient: -.0636417 (0.535)	Coefficient: -.0784667 (0.513)	No significance in both sample sizes
Problem pair 5-6	Coefficient: -.1913987 (0.052)	Coefficient: -.2968583 (0.009)	Significance in both sample sizes
Problem pair 7-8	Coefficient: .2028408 (0.057)	Coefficient: .1811843 (0.160)	Gender effects
Problem pair 9-10	Coefficient: .0334188 (0.756)	Coefficient: .0215139 (0.867)	No significance in both sample sizes
Problem 11	Coefficient: .0379957 (0.683)	Coefficient: .061606 (0.563)	No significance in both sample sizes
Problem pair 12-13	Coefficient: -.0520813 (0.617)	Coefficient: -.0871976 (0.480)	No significance in both sample sizes
Problem pair 14-15	Coefficient: -.1985796 (0.060)	Coefficient: -.2592738 (0.041)	Significance in both sample sizes
Problem pair 16-17	Coefficient: -.1492208 (0.134)	Coefficient: -.202428 (0.075)	Gender effects

When field of study is the significant factor the level of significance of the field of study coefficient is equal in both categories. When there are no significant differences in both samples, and the field of study coefficient are significant, gender has no significant impact on preference. When the significance changes from significant to non-significant or vice versa, it illustrates that gender was significant factor in the individual's preferences. From the table above we can see that problem pairs 7-8 and 16-17 had significant gender effects. Note, .1 is the significant level used in this test. Even though the coefficient might not be significant at conventional levels one should pay attention to the effect size (magnitude of the p-value).

5.0 Conclusions

In this thesis, the impact of field of study as a variable on individuals' preferences was tested using questions from the original prospect theory by Kahneman and Tversky was explored. Previous studies had mainly used business students as responders, arguing that they were most relevant to the findings of prospect theory since they are likely to make financial decisions in the future. This study included 90 nursing students and 30 business students and found that both nursing and business students violated the expected utility theory to a large degree and that prospect theory was a better descriptive model. Additionally, nursing students tended to be more risk-averse, while business students were more inclined to take risks to increase the expected value of outcomes. Furthermore, the participant's gender had an additional impact on their preference, with men tending to possess higher risk tolerances. This study provides evidence that the participant's field of study has a significant impact on their preferences and highlights the existence of gender preferences. The findings of this study support the explanations of prospect theory.

5.1.1 Further research

This thesis objective was too illiterate if there is any significant effect with field of study or gender within the prospect theory. As one study can't be true to the whole population it must be replicated multiple times. It would also be interesting to see if other variables are significant, such as culture, age, geographic etc... My thesis can be used as a template for such studies.

5.1.2 Limitations

The main limitation of this study is the sample sizes, with proportions closer to a 50/50 split being preferable when looking for differences within the sample size. When comparing two variables it is essential to understand what separates the two. The study of business is dominated by men and nursing dominated by women. Which makes comparison difficult. The last test in my thesis tries to find when field of study of gender is the significant factor and does this successfully but this might be a false positive since the sample size is too small to be conclusive.

5.1.3 Closing literature findings

While the findings of prospect theory suggest that individuals are generally risk-averse in situations involving potential gains, they also suggest that individuals may be more likely to take risks in situations where their expected utility is low. This behavior can be explained by the Friedman-Savage utility function (1948), which posits that the curvature of an individual's utility function varies depending on their level of wealth. Specifically, individuals are more likely to exhibit risk-loving behavior, such as gambling, when they possess lower levels of wealth. The utility function explains why individuals may be more inclined to engage in behaviors that offer a small chance of a large payout, despite the overall negative expected value. Furthermore, it can explain why problem 16 and 17 have different preferences depending on the respondent’s field of study. Here the outcome of (5) might so low that it is now even considers as a real option. For reference a cup of coffee is (13) in the cantina at Molde university college.

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