REPUBLIC OF TURKEY
YILDIZ TECHNICAL UNIVERSITY
GRADUATE SCHOOL OF ECONOMICS
DEPARTMENT OF ECONOMICS
MASTER OF ARTS PROGRAMME IN ECONOMICS

MASTER'S THESIS

COGNITIVE BIASES AND HEURISTICS IN TERMS OF BEHAVIORAL ECONOMICS: APPLICATIONS OF ANCHORING EFFECT AND LOSS AVERSION

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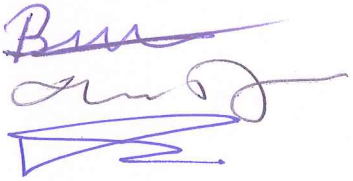

İSTANBUL
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ÖZ

DAVRANIŞSAL İKTİSAT AÇISINDAN BİLİŞSEL YANLILIKLAR VE SEZGİLER: ÇIPALAMA VE KAYIPTAN KAÇINMA UYGULAMALARI
Mehmet Sevgin
Aralık, 2019

Standart iktisadi düşünce insanı bencil, rasyonel ve duygusuz bir varlık olarak tanımlar. İnsanlar son derece rasyonel olduklarından kararlarına duygularını karıştırmazlar. İktisatta uzun süre insanların mükemmel derecede rasyonel olduğuna inanıldı. Ancak, gerçek hayattaki bazı gözlemler ve kontrollü deneyler rasyonalite ile çeliştiği için standart iktisadın varsayımlarına şüphe ile yaklaşmalıyız. Bu sebepten ötürü, davranışsal iktisatçılar rasyoneliteyi kabul ederler ancak tam rasyoneliteyi kabul etmezler. Bu yüzden bu kavramı ''sınırlı rasyonelite'' olarak yeniden adlandırdılar. Bu çalışmanın temel amacı iktisat ve insan hayatı hakkında daha iyi bir perspektif kazanabilmek adına insanların iktisadi faaliyetleri sırasındaki davranışlarının rasyonelliğini analiz etmektir. Bu çalışmada ilk olarak iktisatta rasyonalite kavramını analiz ettim. Ayrıca gerçek hayatta insanların karar verme süreçlerinde yaptıkları bazı bilişsel yanlılıklar ve sezgileri deneysel gözlemler ışığında tartıştım. Son kısımda da insanların rasyonelliğini bazı bilişsel yanlılıklar açısından test etmek adına Polonya'da Wroclaw Üniversitesi'nde ve Türkiye'de Yıldız Teknik Üniversitesi'nde öğrencilerle yaptığım sınıf deneylerini analiz ettim.

Anahtar Kelimeler: Davranışsal İktisat, Deneysel İktisat, Bilişsel Yanlılıklar ve Sezgiler, İktisatta Rasyonalite, Karar Verme Süreci.

ABSTRACT

COGNITIVE BIASES AND HEURISTICS IN TERMS OF BEHAVIORAL ECONOMICS: APPLICATIONS OF ANCHORING EFFECT AND LOSS AVERSION

Mehmet Sevgin
December, 2019

The assumptions of standard economics describes humans as a selfish, rational and insensitive species. According to this view, since humans are extremely rational about their choices, they do not mix their feelings with their choices. However, since real-world observations and controlled experiments contradict rationality, we must doubt the assumptions of standard economics. It was believed that people are perfectly rational in their choices and economic decisions for many years. However, in real life, there are many mistakes and irrationality examples that are done by individuals according to experimental evidences. Therefore, behavioral economists accept the rationality but do not accept the perfect rationality. Hence, they renamed this term as ‘’bounded rationality’’. The main purpose of this study is analyzing human behaviors during their economic actions to have a better perspective about the economy and human life. In this study, first, I analyze the rationality principle in economics. Moreover, I discuss cognitive biases and heuristics during the decision-making process of individuals regarding experimental findings. In the last part, I analyze two experiments that I conducted with students at University of Wroclaw and Yıldız Technical University to test rationalities of individuals regarding some cognitive biases.

Key Words: Behavioral Economics, Experimental Economics Cognitive Biases and Heuristics, Rationality in Economics, Decision-Making Process.

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İstanbul; December, 2019 Mehmet Sevgin

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ABBREVIATIONS

EU	**:** Expected Utility
EUT	**:** Expected Utility Theory
PT	**:** Prospect Theory
WTA	**:** Willingness to Accept
WTP	**:** Willingness to Pay
TIAA	**:** Teachers Insurance and Annuity Association
CREF	**:** College Retirement Equities Fund
UN	**:** United Nations

1. INTRODUCTION

The subject of this study is the exploration of the experimental evidence of cognitive biases and heuristics. A heuristic is defined as mental shortcuts and simple strategies that help individuals to form quick and efficient judgments. A cognitive bias refers to a systematic deviation from rational behaviors. According to Becker (1962, 1), the definition of rational behavior is debated. Nevertheless, the contemporary consensus is consistent maximization of a well-ordered function, such as a utility or profit function. However, the critics do not agree with the statement that there is a consistent utility maximization by individuals and firms. It is claimed that the theory is not sufficient to explain economic behaviors.

Rationality or rational behavior is a keyword for the rational choice theory which postulates that individuals are informed about all positive and negative sides of choices and the probability of their outcomes; thus, they have perfect information about the outcomes. The rational choice theory posits also that individuals have no cognitive limitations to process the information and they have super calculation abilities of outcomes (Burns, Rozkowska, 2016, 197).

The assumptions of rational choice or more generally standard economic theory have great success regarding their contribution to economic theory. Nevertheless, their assumptions are systematically inconsistent with some real-world observations and controlled experiments (Opaluch, Segerson, 1989, 1). Indeed, these observations strongly suggest the existence of cognitive biases and heuristics. Standard economic theory is also known as neoclassical economics (Dawnay, Shah, 2005, 3) and we prefer to use the term standard economics instead of neoclassical economics as many other scholars such as Thaler and Benartzi (2004, 164-187), Kahneman and Tversky (1984, 341–350) preferred the same.

The general economic analysis of cognitive biases and heuristics comes from behavioral economics. Behavioral economics emerged to question the rationality concept in standard economic theories, and it attempts to increase the explanatory power of eco-

nomics by bringing more realistic and observable psychological basis to economic behaviors of individuals and firms. Behavioral economics is an endeavor that attempts to provide a psychological background to economics to make a more realistic analysis, to bring better predictions and to suggest better policies. However, the neoclassical approach to economics, which basis is closely related to maximization, utility, efficiency, and equilibrium, is not completely dismissed by behavioral economics or bounded rationality. Bounded rationality is a term that is used by behavioral economists to explain the rationality factor in economics. According to bounded rationality, people have rationality, but this rationality is bounded by many factors. Neoclassical economics provides a theoretical background that can be applied to almost any type of economic and noneconomic behavior. In this way, neoclassical economics makes refutable predictions to the economy (Camerer, Loewenstein, 2003, 3).

The importance of this subject is based on an individual's behavioral mechanism as the most basic decision-maker in the economy. Hence, cognitive biases and heuristics are the main subjects of this study as they provide important explanations of the economic behaviors of individuals during the decision-making process.

In the first chapter of this study, I present a general and historical framework of behavioral economics and the factors which distinguish rational models and behavioral models. In the second chapter of this study, I present several cognitive biases and heuristics such as loss aversion, status quo bias, endowment effect, framing effect, anchoring effect, mental accounting, sunk cost fallacy and their empirical findings from several experiments in the literature. Finally, I present empirical findings from a classroom experiment that I conduct at the University of Wroclaw in Poland about anchoring effect and another one at Yıldız Technical University in Turkey about loss aversion bias.

2. BEHAVIORAL ECONOMICS

In this chapter of the study, we will discuss the definition and historical framework of behavioral economics and the factors that distinguish it from rational models. We will also discuss two important theories of judgment under uncertainty and risk: Expected Utility Theory (EUT) and Prospect Theory (PT).

Behavioral economics is a branch of economics that benefits from psychological methods to support economics. Camerer (1999, 10575) assumes that:

> "Behavioral economics improves the realism of the psychological assumptions underlying economic theory, promising to reunify psychology and economics in the process. Reunification should lead to better predictions about economic behavior and better policy prescriptions".

As economics investigates how resources are distributed by individuals and institutions such as companies and markets, it will be useful to involve psychological factors to economic theory. Because the psychology of individual behaviors can bring a meaningful basis to economic theory in the same way as physics support chemistry or archaeology support anthropology. In this direction, 'behavioral economics', as a fresh branch of economics, aims to use the psychology of economic behavior to support economics but simultaneously maintain stressing the importance of mathematical models and field data (Camerer, 1999, 10575). Moreover, while reunifying psychology and economics, behavioral economics does not reject all neoclassical economics assumptions. Behavioral economics consider these assumptions are useful and applicable to different forms of economics since they bring theoretical frameworks to economic theory. (Camerer, Loewenstein, 2003, 3)

After explaining behavioral economics, let us discuss it from a historical perspective.

2.1. Historical Context

Although the most visible association of psychology and economics come from the 1980s, the foundations of behavioral economics have been laid by Adam Smith (Ester, Ruben, 2015, 4). Interestingly, even tough he was typically considered that he is the

founder of the Classical Economy, it is possible to see some psychological terms and statements in his research. For instance, in his book Theory of Moral Sentiments, he states that "we suffer more... when we fall from a better to a worse situation, than we ever enjoy when we rise from a worse to a better." This is what behavioral economists called later "loss aversion". (Smith, 1759, 311 as cited in Camerer, Loewenstein, 2003, 2-3). However, his analysis was not enough to make behavioral economics as a new discipline. Because in the 18th century, psychology was not a science yet and there were many prejudices against psychology. During the 19th century, economists referred to some psychological words in their studies until the beginning of the 20th century. At the beginning of 20th-century influence of psychology in economics decreased substantially due to new approaches to economics such as logical positivism and the idea of 'pure economics' (Dumludağ, Ruben, 2015, 4-5).

However, the separation of psychology and economics occurred slowly. For instance, at the beginning of the 20th century, some important economists such as Irving Fisher and Vilfredo Pareto provided various speculations regarding the psychology of economic choices. Moreover, John Maynard Keynes also brought several psychological insights into economic theory at that time. Neverthless, these small influences were not enough, therefore psychology lost its influences in economics in the middle of the 20th century. In the middle of the century, however, some economists such as Herbert Simon and George Katona emphasized the importance of psychological factors and limits of rationality in economic theory. Although their efforts drew attention, they were not enough to influence the direction of economic theory (Camerer, Loewenstein, 2003, 4-5).

In the second half of the 20th century, Allais (1953, 503-546) and Ellsberg (1961, 643-669) remarked several violations of rational behaviors. Later, Kahneman and Tversky (1979, 263-292), Thaler (1981, 201-207) also empirically demonstrated several violations of rational behavior in their researches. "In the beginning of the 1970s, psychologists such as Ward Edwards, Duncan Luce, Amos Tversky, and Daniel Kahneman, began to use economic models as a benchmark against which to contrast their psychological models." Kahneman and Tversky's researches about decision-making under risk and uncertainty during the 1970s, presumably can be considered as one of the most important contributions to behavioral economics (Camerer, Loewenstein, 2003, 5).

Simon's research also played an important role in the rise of behavioral economics. He was awarded the Nobel Prize in 1978 in economics due to his contribution to behavioral economics regarding his researches about decision-making process of individuals under uncertainty. Moreover, he is the first person who discussed "bounded rationality" which became one of the main themes of behavioral economics later (Dumludağ, Ruben, 2015, 7).

As an important evolvement of behavioral economics, Daniel Kahneman from Princeton University and Vernon Smith from George Mason University shared the Nobel Prize in the branch of economics in 2002. Kahneman was awarded to Nobel Prize due to his researches about behavioral insights into economics and decision-making under uncertainty, while Vernon Smith, due to his empirical studies in laboratory environments mostly about alternative market mechanisms (Sent, 2004, 736).

Moreover, Richard Thaler was awarded the Nobel Prize in economics in 2017 due to his contribution to behavioral economics. In his studies, he provides some suggestions about how to improve the decisions of humans about health, wealth and happiness with small nudges. He is the author of the book so-called "Nudge" that is quite popular nowadays.

After presenting a short history of behavioral economics, let us continue with the differences between rational and behavioral models in economics.

2.2. Rational Models versus Behavioral Models in Economic Behavior

In this title, we will discuss the factors that distinguish behavioral models from rational models. Beyond a shadow of a doubt, rationality concept is one of the main discussion between rational and behavioral models. The difference between rational and behavioral models regarding rationality is based on the discussion of the existence of perfect rationality that is supported by rational models. Behavioral models, however, supported the existence of bounded rationality in economic behaviors of individuals. According to Camerer (1999, 10575-10577), except for rationality principle, there are four more principles that distinguish behavioral models from rational models. These principles are given at the Table 1.

Table 1: Behavioral Models vs. Rational Models

Rational Models	**Behavioral Models**
Own payoff maximization	Social Utility
Discounted Utility	Hyperbolic Discounting
Equilibrium	Learning, Evolution

Camerer, Colin F. 1999. Behavioral Economics: Reunifying Psychology and Economics. **Proceedings of the National Academy of Sciences.** vol. 96. no. 19: 10575-10577.

First, we will discuss each principle one by one that are given at the Table 1. Later we will analyze two other important factors between rational models and behavioral models. One of the factor is bounded rationality that we will discuss under rationality principle in economics. Another important difference between rational models and behavioral models comes from decision under risk and uncertainty. Rational models explain it with Expected Utility (EUT), while behavioral models explain it with Prospect Theory (PT). Let us first discuss each principles that are given at the Table 1.

2.2.1. Own Payoff Maximization versus Social Utility

According to rational models, individuals care about only themselves and try to maximize their payoffs. Although in most cases it can be true, some real-life examples violate this statement. For instance, ultimatum games are a great violation example. In ultimatum games, individuals tend to show some behaviors that can be related to irrationality rather than rationality. Consider a game that offers to share $10 between two players. If the second player rejects the offer that comes from the first player, they both win nothing. In this case, a rational player should offer only a very little portion of this amount of money. However, as the results show, people generally offer $4 from of this $10. Moreover, 50% of the offers that are less than $2 are rejected (Camerer, Thaler, 1995 as cited in Camerer, 1999, 10576). This shows that people do not like unfair distributions (Fehr, Schmidt, 1999 as cited in Camerer, 1999, 10576) and they like reciprocate (Rabin, 1993 as cited in Camerer, 1999, 10576).

2.2.2. Discounted Utility versus Hyperbolic Discounting

Discounted utility and hyperbolic discounting are two different models that try to explain intertemporal choices. According to discounted utility theory, different periods are counted by a fixed coefficient. This assumption states that people behave consistently with time. “It also posits that the relative evaluation of two payments depends on only the amount of delay between the two payments.” However, the assumptions of discounted utility are not always correct. Individuals in most cases prefer today’s reward over tomorrow’s reward and some examples clearly remark the violation of the assumptions of discounted utility. For instance, people might treat getting an extra $20 in 2 weeks in different ways in different periods. While they would choose to get $80 now over $100 in 2 weeks, they might tend to choose $100 in 9 weeks over getting $80 in 7 weeks. (Camerer, 1999, 10576). Discounted utility theory does not provide any explanations for such situations while hyperbolic discounting does. As another example, Thaler (1981, 204) empirically show that people are indifferent between $15 today or $30 after three months, $250 today or $300 after three months and $3000 today or $3500 after three months. This means that the discounted rate in the first situation is 277%, 73% in the second and 62% in the third. As we can see, discounted rates are decreasing. Hence, it would be incorrect if we would consider the coefficient of time as constant.

2.2.3. Equilibrium versus Learning-Evolution

In economic theory, equilibrium refers to the intersection of supply and demand curves in the market. However, since economics developed mathematically, there has not been enough attention to the way of equilibrium, namely how equilibrium comes about. Nonetheless, some theories that come from experimental observations such as theory on population evolution (Weibull, 1995, as cited in Camerer, 1999, 10576), learning from others (Bikhchandani, Hirshleifer, Welch, 1998 as cited in Camerer, 1999, 10576) and rules for individual learning suggest penurious tenets of equilibration. “In the most general and predictively accurate theory, people learn by ‘‘reinforcing’’ strategies that performed well or would have performed well had they been chosen.” (Camerer, Ho, 1999 as cited in Camerer, 1999, 10576).

2.3. Bounded Rationality

The main criticism of behavioral economics to standard economic assumptions is based on the rationality principle in economics. According to behavioral economics, individuals have "bounded" rationality rather than perfect rationality. Before discussing bounded rationality, we must know what standard economic assumptions refer to rationality in economics.

Rabin (2002, 4) postulates that the term "homoeconomicus" or "economic man" is used by standard economic models that describe humans as self-interested, rational and capable to do rational choices even in complex situations. Moreover, they ignore moral and ethical values when they make rational choices. It is also assumed that this man has an efficient and solid system of preferences. What is more, he is also marked by an ability of calculating due to which he is able to make an alternative computation that is accessible in his case. All of the things mentioned above are crucial as they allow him to get to the highest available point of his scale of preferences (Simon, 1955, 99).

However, Simon also posits the view that this level of rationality is not valid in real-life examples. Experimental findings of individual's behaviors systematically violate the principles of rationality. Therefore, bounded rationality is a better word to describe the economic behavior of individuals. Bounded rationality is a term which claims that the rationality of individuals is limited because of several factors such as environmental limitations, time constraints and cognitive limitations of the human brain. This term is first discussed by Herbert Simon in 1955 in his study "Theories of Bounded Rationality" (Simon, 1955, 161-176).

According to Simon (1972, 163-164), three factors bound the rationality of individuals. The first one states that individuals do not have perfect knowledge of demand and cost functions, they are rather informed about their distributions. This change in the assumption might lead individuals to face several difficulties to find the optimum choice. In the case of uncertainty and risk, it becomes even more difficult to reach the optimum value compared to certain situations. The second factor which bounds rationality is that the individuals have incomplete information about alternatives. Therefore, the question of finding the best alternative switches to the question of how much the individuals' resources should be used to search for action. The last factor which the

author claim that bound the rationality is related to the complexity of the cost function and environmental constraints. The existence of these notions prevents individuals to calculate the best option among alternatives.

According to Simon, instead of finding the 'optimum option', individuals search for 'satisficing option' (Simon, 1956, 129). Simon also uses administrative man instead of 'economic man' that is used by standard economic assumptions. He describes the administrative man as the cousin of the economic man. The economic man attempts to maximize his utility by choosing the best alternative among all possible choices, while the administrative man searches for a satisfactory or 'good enough' option. According to him, the administrative man is aware of his boundaries, thus he satisfies rather than maximizes. Therefore, he does not have to evaluate all possible choices. Also, being aware of his capacity simplifies his decision-making process (Simon, 1976, 25).

Moreover, individuals are limited by several aspects. Starting from their abilities which they are not aware of, their habits, values, reflexes, the information they have and the knowledge they gain. All these aspects may limit them to make a rational choice. Hence, the author postulates that this level of rationality does not determine behavior and can not explain the decision-making process truly. According to him, people can not make rational decisions because of the boundaries that we listed above (Simon, 1976, 241). Therefore, we can not describe individuals as rational, they are rather bounded rational.

After analyzing the most important issue between rational and behavioral models, we will continue with other principles that distinguish behavioral models from rational models as we presented at the Table 1. Let us start with the first principle.

2.4. Expected Utility Theory and Prospect Theory

In this section of our study, we will discuss the features and differences of EUT and PT that are two important theories of the decision-making process of individuals under risk and uncertainty. Later, we will empirically discuss the violations of EUT under risk and uncertainty.

Before starting to discuss EUT and PT, it will be useful to define the terms uncertainty and risk. Knight (1921, 19-20) distinguishes risk and uncertainty in his book "Uncertainty, Risk, and Profit". According to him, risk refers to measurable uncertainty; thus,

the risk is measurable, and its probability distribution is known. However, uncertainty describes a situation that does not consist of a probability distribution and that is why it cannot be measured.

Now, let us elaborate EUT more under another title.

2.4.1. Expected Utility Theory

Although Knight (1921) states that uncertainty can not be measured, Bernouilli did not agree with this statement and he explored Expected Utility Theory. Later, this theory was improved by John von Neumann and Oscar Morgenstein in 1944 (Aksoy, Işıl, 2009, 6) and it became a dominant theory in decision-making under uncertainty and risk until the exploration of Prospect Theory (Kahneman, Tversky, 1979, 263-292). In 1954, EUT was improved by Leonard Savage in his book "The Foundations of Statistics". In this book, he renamed EUT as Subjective Expected Utility Theory (Karni, 2005, 3).

Since EUT is considered as a normative model of rational choice, it is expected that all rational individuals should follow the principles of this theory, and they mostly do (Kahneman, Tversky, 1979, 263). According to EUT, individuals evaluate utilities of each outcome and weigh those utilities by their probabilities and select an option that brings the greatest amount (Loewenstein, Rick, Cohen, 2008, 651). Thus, the formula of EU can be written as:

$\boldsymbol{EU} = \sum_{i=1}^{n} P_i U(X_i)$, where $U(X_i)$ refers to the utility of the outcome and P_i refers to its probability (Camerer, 1999, 10575). For instance, to calculate the expected utility of \$100 with the probability of 90% and \$200 with the probability of 10%, we should multiply the outcomes by their probabilities:

EU= 100. 90% + 200. 10% = \$110.

EUT states that when individuals calculate the utility of an outcome, they must involve their previous asset to the calculation. For instance, consider a gamble which offers \$20 with 0.5 probability and \$10 loss with 0.5 probability. If a person has \$1 million as his current asset, according to EUT, he makes his choice by considering this gamble as:

- Experiencing the utility of \$1.000.020 with the probability of 0.5 or
- Experiencing the utility of \$999.990 with the probability of 0.5

However, in this case, most people would consider this gambling as gaining $20 or losing $10 (Loewenstein, Rick, Cohen, 2008, 651).

According to Kahneman and Tversky (1979, 263-264), EUT is based on three important tenets:

- **Expectation:** This tenet refers to the calculation of overall expected utility of outcomes. More specifically, expectation of an outcome is equal to its total expected utility that is derived by calculation of each outcome.
- **Asset Integration:** Individuals calculate the utility of a gamble and accept it if the total utility is bigger than the utility of those assets alone. Total utility refers to the integration of the prospect with the utility of the asset.
- **Risk Aversion:** Risk aversion states that people tend to choose certain prospects over risky prospects. If someone choose a certain option instead of a risky option, this person can be considered as a risk-averse person.

The empirical findings of Kahneman and Tversky (1979, 265-273) show that some factors violate the tenets of EUT that we listed above. Based on these violations, they explored Prospect Theory (PT) and its tenets. The factors that violate the tenets of EUT are certainty effect, reflection effect and isolation effect.

Now, we will explain each effect and demonstrate their empirical findings to understand the differences between EUT and PT in a more comprehensive way.

2.4.2. Certainty effect

Kahneman and Tversky (1979, 265) conduct a series of experiments and their empirical findings suggest that people tend to overweight certain situations. This is called certainty effect.

One of the most important examples of certainty effect was explored by Ellsberg (1961) and later, his findings were called ‘Ellsberg paradox’. He criticizes Subjective Expected Utility Theory and his study can be considered as the first study regarding certainty effect. Ellsberg conducts an experiment and asks the subjects to choose an option from two different gambles. His study is presented below:

Imagine there are two urns as Urn 1 and Urn 2 and both urns consist of 100 balls. The subjects know that Urn 2 has an equal number of balls from each color: 50 red and 50

blue, while they do not know the distribution of Urn 1. He offers two different gambles to the subjects as:

- **A:** "A ball is drawn from Urn 1 $100 if red, $0 if blue"
- **B:** "A ball is drawn from Urn 2 $100 if red, $0 if blue"

Later, they are all asked to choose one of the options from below:

- **C:** "A ball is drawn from Urn 1 $100 if blue, $0 if red"
- **D:** "A ball is drawn from Urn 2 $100 if blue, $0 if red"

The results: Most of the subjects preferred the gambles which are drawn from Urn 2, rather than Urn 1. More specifically, B is preferred more than A and D is preferred more than C. "These choices are inconsistent with Subjective Expected Utility Theorem since the choice of B implies a subjective probability that fewer than 50 percent of the balls in Urn 1 is red, while the choice of D implies the opposite." The results show that people do not like the uncertainty of probability distribution of risky choices (Ellsberg, 1961 as cited in Barberis, Thaler, 2002, 20).

Another example of uncertainty effect is explored by French economist Maurice Allais (1953), and later his findings were called "Allais paradox". The following example which is presented by Kahneman and Tversky (1979, 265-266) is a variation of Allais' example (N represents the sample size).

Problem 1: Choose between

- **A**: 2,500 with probability of 0.33; 2,400 with probability of 0.66 and 0 with probability of 0.01
- **B:** 2,400 with certainty

The results: N= 72, 18% of the participants chose option A and the rest chose the option B.

Problem 2: Choose between

- **C**: 2,500 with probability of 0.33; 0 with probability of 0.67
- **D**: 2,400 with probability 0.34; 0 with probability 0.66

The result: N= 72, 83% of participants chose the option C and the rest chose the option D.

(The amounts are represented by Israeli currency and the median monthly income for a family is about 3.000 Israeli pounds).

First, if the subjects would follow the principles of EUT, in the first problem it would be expected from them to choose the option which maximizes their utilities. However, although the expected utility of option A is higher than option B, most of the subjects preferred option B over option A. Also, considering people overweigh certainty (also more probable option over less probable option), in the second problem, it was expected from the subjects to choose option D over option C. More specifically, if they prefer B over A, they must have been preferred D over C. The authors prove this inconsistency with mathematical calculations as well. Under the condition of U (0) = 0, the following equality can be found from Problem 1. The expected utility of the outcomes is presented below:

U (2.400) > 0.33U(2.500) + 0.64(2.400) or 0.34U (2.400) > 0.33U (2500)

However, if we do the same calculation in problem 2, the results remark the opposite direction:

0.33U (2.500) > 0.34U (2.400).

Another example of Allais paradox with a simpler version is presented by Kahneman and Tversky (1979, 266-267) below:

Problem 3. (N=95)

- **A.** 4.000 with the probability of 0.80
- **B.** Certain 3.000

The results: 20% of the subjects chose option A, while 80% of the subjects chose option B.

Problem 4.

- **C.** 4.000 with the probability of 0.20
- **D.** 3.000 with the probability of 0.25

The results: 65% of the subjects chose option C, while 35% of the subjects chose option D.

If we do the same calculation as we did in the previous Allais' example:

U (3.000) / U (4.000) > 4/5

However, in Problem 4 the calculations remark the opposite direction:

U (3.000) / U (4.000) < 4/5

There is an obvious violation of EUT by most of the subjects. The calculation of C (4,000, 0.20) can be framed as (A, 0.25), whereas the calculation of D (3,000, 0.25) can be reframed as (B, 0.25). Thus, if B is chosen over A, in the same probability level B must be chosen over A: (B, p)> (A, p). However, most of the subjects in this example did not follow this principle. The reduction of the gaining probability from 1.0 to .25 has a more impact than the reduction from 0.8 to 0.2. (Kahneman, Tversky, 1979, 264-266).

2.4.3. Reflection effect

The second effect that violates EUT is reflection effect. Kahneman and Tversky (1979, 268-269) investigate that what happens if they change the signs of the outcomes, namely reversing positive outcomes (gains) to negative outcomes (losses). The authors reframed Problem 3 and Problem 4 with negative magnitude as:

Problem 3':

- **A.** -4.000 with the probability of 0.80
- **B.** -3000 certain amount

The results: 92% of the subjects chose option A, while the rest preferred option B.

Problem 4':

- **C.** -4.000 with the probability of 0.20
- **D.** -3.000 with the probability of 0.25

The results: 42% of the subjects chose option C, while the rest preferred option D.

In Problem 3 subjects chose the certain amount while they chose the gamble in Problem 3'. The results demonstrate that participants are risk averse when there are positive outcomes while they are risk-seeker when there are negative outcomes. This is called reflection effect. Also, in problem 3, although the expected utility of option A is higher than option B, most of the subjects preferred option B to avoid from a risky option. This also violates the principles of EUT.

Moreover, in problem 3' and problem 4' like problem 3 and problem 4 the subjects overweighted certain outcomes compared to uncertain outcomes. The certainty effect

caused to risk-averse behaviors for a certain positive outcome over a higher positive outcome whose probability is less. However, it caused to risk-seeking behavior for a negative outcome that is less probable over a lower negative outcome that is certain. Therefore, EUT is violated in both positive and negative domains by most of the subjects.

"Furthermore, the reflection effect eliminates aversion for uncertainty or variability as an explanation of the certainty effect." For instance, consider the preferences of the subjects for (3,000) over (4,000, .80) and for (4,000, .20) over (3,000, .25). To resolve this clear inconsistency of the preferences, we should remember the assumption that people prefer the choices which have high expected value and low variance. As we can see (3.000) has zero variance whereas (4.000, 0.80) has a big variance. Although (3000) has a lower expected value, it could be chosen since it has zero variance. When there are lower outcomes, however, the differences between the variances of (3,000, 0.25) and (4,000, 0.20) might not be enough to overcome the differences between expected values of the prospects. (-3000) has both higher expected value and lower variance than (-4,000, .80). However, the results show that this choice is preferred much less than the other choice. The data is clearly inconsistent with the statement of 'certainty is generally desirable'. It would be more correct if we would say certainty effect causes increases in averseness of negative outcomes. It also increases the desirability of positive outcomes (Kahneman, Tversky, 1979, 268-269).

2.4.4. Isolation effect

To simplify the choices, individuals usually tend to ignore the common parts of the choices and focus on the parts which distinguish the choices. However, this approach might create inconsistent preferences. Because different frames might bring different results. This is called the isolation effect. Kahneman and Tversky (1979, 271-272) explain this effect with the following examples.

Problem 5:

"Consider the following two-stage game. In the first stage, there is a probability of 0.75 to end the game without winning anything, and a probability of 0.25 to move into the second stage. If you reach the second stage you have a choice between (4,000, 0.80) and (3,000)" (Kahneman, Tversky, 1979, 268-269). N=141. (The choice must be done before the game starts).

If we make a proper calculation, we can reframe the choices as:

(4,000, 0.20) and (3,000, 0.25). Note that these are the same choices as problem 4. However, inconsistent with the results of problem 4, 78% of 141 participants preferred the option (3.000, 0.25) Apparently, the subjects ignored the first stage of the game and considered the game between (3,000) and (4,000, 0.80) as in Problem 3 (Kahneman and Tversky, 1979, 271).

2.4.5. Prospect Theory

Kahneman and Tversky (1979, 263-291) explored PT by their findings from the violations of EUT as we discussed in the previous section. According to these findings, the features of PT is presented below:

- Certainty is evaluated and applied in different ways by individuals
- It is observed that people are risk averse in domain of gains and risk seeker in domain of losses.
- When problems are framed in different ways, the preferences might be reversed.
- It is a reference-dependent model.

The formula and the value function of PT is presented below:

$V = \sum_{i=1}^{n} \pi(p_i)v(x_i)$, where π represents decision weight with the probability of p and v represents the subjective value of each outcome (Kahneman and Tversky, 1979, 276). "Decision weights measure the impact of events on the desirability of prospects, and not merely the perceived likelihood of these events". Decision weights should not be considered as probabilities since they do not follow the rules of probabilities. Moreover, they are not measures of degree or belief as well (Kahneman and Tversky, 1979, 280). For instance, in a fair coin, someone can believe that the probability of a head is 0.5, but when he assesses the prospects, he can evaluate this probability as less than 0.5 (Trepel, Fox, Poldrack, 2005, 37).

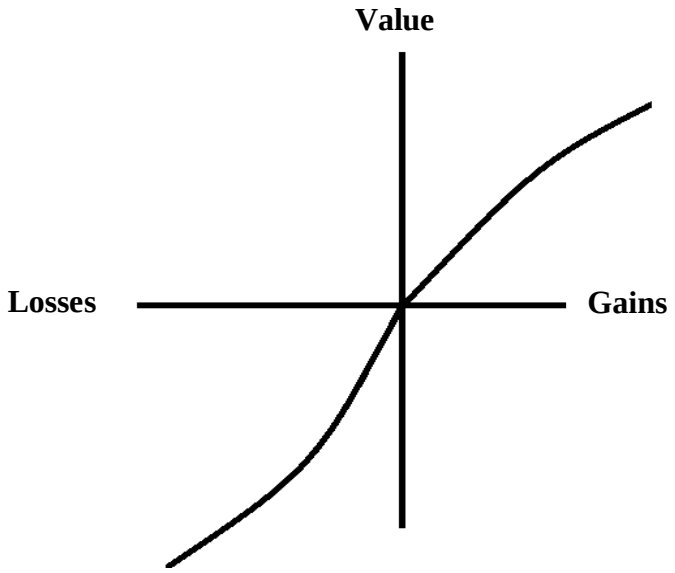

Figure 1: Value Function of Prospect Theory

Kahneman, Daniel, Amos Tversky. 1979. Prospect theory: An analysis of decision under risk. **Econometrica.** vol. 47. no. 2: 263-291.

As it can be seen on the graph, the shape looks like S. The interpretation of the graph based on the shape of it can be as follows:

- The shape is concave for gains whereas it is convex for losses: S-shaped (This contributes to risk aversion behavior in the domain of gains, while it contributes to risk-seeking behavior in the domain of losses.)
- Defined on deviations from the reference point
- Steeper for losses relatively to gains. Therefore, the pain of losing is more powerful than the pleasure of gain (Kahneman and Tversky, 1979, 279).

The pain of loss is approximately as twice as the pleasure of gain. Kahneman and Tversky (1991, 1053-1054) estimated the ratio of gains and losses (G/L) over 2:1 in several experiments. In one experiment the authors found this ratio as 2.5:1. The subjects barely accepted a 50-50 bet to win $25 or lose $10.

Moreover, it is important to present the differences of PT and EUT. PT differs from EUT based on several important factors:

- PT does not integrate assets; it rather focuses on losses and gains. As one of the principles of EUT, asset integration states that people integrate their assets

with the prospects when they face with risky choices. However, PT estimates losses and gains based on a reference point rather than an overall wealth. Therefore, this model is considered as a reference-dependent model.

- PT states that individuals weigh the outcomes with decision weights whereas EUT states that individuals weigh the outcomes with their probabilities. Decision weights can not be considered as probabilities since they do not follow the rules of probabilities. Moreover, individuals usually overweight low probabilities and underweight high probabilities relative to certain options (because of certainty effect). In fact, this is one of the reasons why buying insurance or playing a gamble seems attractive to individuals (Kahneman, Tversky, 1979, 263-292).

Additionally, as a principle of EUT, description invariance postulates that preferences can not be influenced by the way of the presentation of the choices. However, unlike EUT, PT consists of framing effect in risky choices. (Trepel, Fox, Poldrack, 2005, 38-39). PT assumes that individuals may give different reactions to factually equivalent choices when they are presented in different ways (Shafir, Diamond, and Tversky, 1997, 346). This is in fact, one of our cognitive biases that is called 'framing effect' which we will elaborate later under another title.

Moreover, the asset integration principle of EUT states that people add their assets to the current outcomes and evaluate them in this context. However, there is a type of cognitive bias which we will discuss under another title of this study that is called mental accounting. According to this notion, individuals tend to categorize their incomes and expenditures instead of putting all of them in the same box. For instance, individuals tend to use more money from an easy income such as lottery than a source of money which comes from an investment that increased in value (Camerer, 1999, 10576).

To show the difference between EUT and PT, an example is presented by Kahneman and Riepe (1998, 59-60) below:

A block of stock is purchased by two different investors. Investor A purchased it for $100 per share while investor B bought it for $200. The value of the block of stock was $160 per share yesterday and dropped to $150 today. In this case, which one is more upset?

According to EUT, since today they have the same block of stock with the same value, their level of sadness must be the same. However, according to PT, based on the reference (initial) point, investor B will be more upset. Because investor B will interpret this as increasing in the loss while investor A will interpret it as a reduction in gain. Based on this example, we generally expect investors to consider their reference point to sell a stock or wait for a while more.

In this section of our study we generally analyzed the differences of behavioral models and rational models. Later, we attempted to analyze the factors that distinguish them. As a conclusion of this section, while rational models suggest "how people should behave", behavioral models suggest "how people do behave." (Camerer, 1999, 10577).

In the next section of this study, we will discuss cognitive biases and heuristics, their meanings and types. Later, we will elaborate each cognitive bias and heuristic one by one and will present their empirical findings.

3. COGNITIVE BIASES AND HEURISTICS

Cognitive biases and heuristics, as a term, first introduced by Kahneman and Tversky at the beginning of the 1970s. Their researches about cognitive biases and heuristics were addressed to the individual's decision-making process under limited sources. These researches were inspired by Simon's bounded rationality concept (Wilke and Mata, 2012, 531). For instance, Furnham and Boo (2011, 25) assumes that this bounded rationality model can be considered as "model of heuristic cognition" too.

According to Tversky and Kahneman (1974, 1124) when estimating an uncertain event or value, people count in some heuristic principles to simplify the complexity of the process of decision making. Usually, these heuristics are useful in terms of simplification of the process. However, they sometimes lead to some systematical errors.

Although the terms ''bias'' and ''heuristic'' are very similar, they represent different things. To avoid this confusion, we would like to explain their meanings. The heuristic can be defined as mental shortcuts that simplify the decision-making process by helping individuals to make quick and efficient decisions. Bias is the result of the application of one or more heuristics. "Cognitive bias is a systematic deviation from rationality in judgment and decision-making common to all human beings which can be due to cognitive limitations, motivational factors, and/or adaptations to natural environments." (Wilke, Mata, 2012, 531).

Behavioral economics analyzes some systematical cognitive biases and heuristics in the economic behaviors of individuals with the help of experimental methods. For instance, Tversky and Kahneman (1974, 1124-1131), Kahneman and Tversky (1979, 263-292), Samuelson and Zeckhauser (1988, 7-59), Kahneman, Knetsch and Thaler (1991, 193-206), Thaler (1985, 199-214), Arkes and Blumer (1985, 124-140) and many other scholars empirically proved and showed the existence of several cognitive biases and heuristics in the behavior of individuals.

Cognitive biases might occur as a result of short-cuts and fast thinking process. They mostly work as automatic and it might difficult to avoid from them. Although in some cases they might be useful, they may lead individuals to make inconsistent and biased decisions. There are more than 100 cognitive biases and heuristics (Ehrlinger, Readinger, Kim, 2016, 3).

We set two important criterias to decide which cognitive biases and heuristics we should choose in our study. As a first criteria, we decided to analyze the ones that are the results of prospect theory and its value function (therefore also the result of a reference-dependent model). As a second criteria, we set our goal to determine the ones that we can find the most application examples that are related to economics. The combination of these criterias helped us to determine the ones that we can analyze in our study. As a result, our selection process remarked seven important cognitive biases and heuristics: loss aversion, status quo bias, endowment effect, anchoring effect, framing effect, mental accounting, and sunk cost fallacy.

Now, let us start with one of the most important cognitive bias, loss aversion, which contributes most of the cognitive biases and heuristics that we listed above.

3.1. Loss aversion

Since we discussed the explanations of loss aversion while we analyze three important effects (certainty, reflection and isolation effect) and PT, we would like to present a short description of of loss aversion and continue with the examples and empirical findings of it. The most common explanation of loss aversion is that people weigh losses more than similar gains. According to this idea losing an object looms a larger effect than gaining an object does (Kahneman, Tversky, 1979, 279). According to Kahneman and Tversky (1979, 268), the reflection effect is the main reason why loss aversion occurs. As was discussed before, the reflection effect assumes that individuals have different preferences depending on the type of outcome (loss or gain). They are risk-averse when there is an outcome related to gains, while they are risk-seeker when there are negative outcomes. Now, let us continue with the applications and empirical findings of loss aversion.

In general, loss aversion is observable in some important economic behaviors such as consumption, saving and investment behaviors. For instance, Dimmock and

Kouwenberg (2010, 1-54) test the influences of loss aversion in the portfolio choices of households. They explored a negative relationship between loss aversion and the desire to own a stock. When the loss aversion coefficient increases from 25% to 75% for a person, the probability of owning stock will decrease by 7% for this person. Individuals who have a high loss averse coefficient tend to invest in mutual funds rather than individual stocks.

Loss averse behavior was observed in saving behaviors and they are demonstrated by Bowman, Minehart, and Rabin (1999, 155-177). Their results show that when there is enough uncertainty, there is an obvious asymmetry in the consumption-income behavior of individuals which is inconsistent with other consumption-income models. However, this behavior is consistent with prospect theory. A person's utility level from consumption does not only depend on his current consumption, but also his past consumption that we can consider as a reference point. They formulate the situation and claim that gain-loss utility function depends on the differences between the consumption and the reference point as follows:

$U(r, c) = w(r) + v(c - r)$, where r is the reference level and c is the consumption level. The findings show that under sufficient uncertainty, as a response to bad news about income- for instance, a negative shock to future income-, people resist lowering their consumption. This resistance is more than the resistance to increasing the consumption level when individuals receive good news about their income. Individuals tend to adjust their consumption level immediately as a response to increases in expected future income. They do not like to decrease their consumption level below their reference point, considering they will not be able to continue their previous level of living standards in the case of negative news about their expected future income. Since there is uncertainty, people tend to postpone their losses with the belief that maybe in the future there will not be any loss. That is why, they tend to not to decrease their consumption level. Once people get used to a consumption level, it might be difficult for them to have some losses at those levels.

With related to the persistence of consumption level, workers are also loss averse below their reference point in terms of their income level. They may consider their previous wage (from the last job they used to receive) as a reference point. Therefore, the workers might try not to lower their consumption level and they might take their previous wage as a reference point. For instance, since unemployment insurances are

lower than workers' previous wage, unemployed people consider their current status painful in terms of loss aversion and work harder to look for a job (Della Vigna et al., 2015, 1-31).

As another example of loss aversion effect in saving behaviors, Fisher and Montalto (2007, 4-14) demonstrate the importance of positive and negative adjustments in income levels. According to the results, having income less than the individuals' reference level decrease the probability of savings by 50.4%. This is significant according to the p-value of the test ($p < 0.001$). However, having an income higher than the individuals' reference level increase the probability of savings only 8.3% which is not a significant amount according to the p-value of the test ($p > 0.05$). This inconsistent behavior occurs due to loss aversion bias.

Thaler and Benartzi (1995, 1-32) attempt to explain the equity premium puzzle with a term which is called "myopic loss aversion". The combination of loss aversion and short evaluation period is called myopic loss aversion. "Equity premium puzzle refers to the fact that stock returns have been much larger than bond returns over the last century." For example, a survey from 1926 to 1990 among U.S. stocks and bonds remarked the existence of an equity premium puzzle. The return of stocks was 6.4%, while the bonds had only 0.5% return. Thus, there is a high equity premium almost around 6% (Siegel, 1991, 1992 as cited in Benartzi, Thaler, 1995, 6). This high difference between the bond returns and stock returns can not be explained only by the notion of "risk aversion". Because in this case, people must have a coefficient of relative risk aversion over 30 considering "a logarithmic function has a coefficient of relative risk aversion of 1.0" (Mehra, Prescott as cited in Benartzi, Thaler, 1993, 7). To have this level of high-risk aversion, a person must be indifferent between a gamble that offers a 50% chance of earning $100.000 and a 50% chance of earning $50.000 and a sure gain of $51.209. Not many people would be this much risk-averse (lso, Mankiw, Zeldes 1991, as cited in Benartzi, Thaler, 1995, 7).

To explain this 6% difference more dramatically, Thaler (1980, 200) illustrates this notion with one example. This 6% also means that a person whose $1 in stock in 1926 would have more than $1800 in 1998. On the other hand, if he would invest this dollar into the bonds, he would have only $15 by the year 1998.

The authors suggest that instead of risk aversion, there are two important factors that can explain this puzzle: loss aversion and a short evaluation period. It means that the investors are more sensitive to losses than gains and they evaluate their portfolios frequently to act immediately when there is any loss. Therefore, the equity premium puzzle occurs. According to them, people who evaluate their portfolios frequently are considered as myopic and the shorter the evaluation period, the greater the loss aversion bias they face with. Because in short evaluations, stocks tend to decline in value more than bonds. Moreover, "the longer the investor intends to hold the asset, the more attractive the risky asset will appear, as long the investment is not evaluated frequently." Furthermore, investors are not averse to the variability of the portfolio, rather they are averse to negative outcomes, which makes them loss averse (Benartzi and Thaler, 1995, 4). To solve this equity premium puzzle, more specifically to make the returns of bonds and stocks equal, the authors determine the most suitable evaluation period as 13 months. This means that if an investor evaluates his portfolio approximately once a year, this puzzle can be solved (Benartzi, Thaler, 1995, 1-32).

Shefrin and Statman (1985, 777-790) observe loss aversion behaviors in the investment decisions of individuals. "Investors display a disposition to sell winners too early and ride losers too long." More specifically, most of the individuals tend to sell the investments that increase in value quickly, while they tend to keep losing investments because of the existence of loss aversion. This tendency called the disposition effect. This effect consists of some elements such as mental accounting, regret aversion, and self-control. We prefer to explain mental accounting factors under the title of 'mental accounting' later in this study. As a second component of the disposition effect, self -control states that people do not have enough self-control to behave as they should behave in terms of rational behaviors. Their rational part and emotional part conflict with each other. Thus, they do not have sufficient control to realize losses when they should. The third element, regret aversion refers to the fact that admission of losses is painful for investors, thus they postpone realizing the losses with the hope that things will get better for their investments. The psychology behind this behavior is that individuals avoid to feel the pain of realizing losses and they search for the pleasure of gains. Therefore, they keep the process of selling the stock longer when they should sell since selling is an admission of loss. Moreover with their words: "In our view, investors ride losers to postpone regret, and sell winners 'too quickly' to

hasten the feeling of pride at having chosen correctly in the past" (Shefrin and Statman, 1985, 782).

Shefrin and Statman (1985, 779) explain the disposition effect with one example. Consider one month ago an investor bought a stock for $50 and now the value of the stock is $40. Under the condition that there are no taxes and no transaction costs, the stock will increase or decrease in value by $10 during the subsequent period. The investor now should choose between holding the stock for one more period or realize the loss. According to prospect theory, the investor frames the choices as follows:

A. Realize $10 'paper lose' by selling the stock.

B. Keep the investment for one more period with 50-50 probability of loosing another $10 in the subsequent period or offset the loss of previous period by earning $10 in the investment.

According to prospect theory, the investor will prefer B rather than A by riding his losing stock to offset his losses from previous periods.

When an investor sells his stock, the gains or losses are taxed. As another view that explains investor behaviors, the tax consideration view (also the rational view) from Constantinides (1983, 611-663) states that losses should be realized in short term and gains should be realized in long term. This view categorizes the durations in three different round trip: 1-2 months (short term), 2-6 months, 7-12 months (long term). A round trip duration assumes how long an investor keeps an investment before selling it. The tax consideration view states that realization is low in the short term in terms of gains because of two reasons: hight tax rates and transaction costs. Due to the combination of high tax rates and transaction costs, the realization of gains in the first 6 months is very low, while it is high in the long term. Loss realization in the short term has an advantage from the perspective of taxes and disadvantage from transaction costs, therefore it is on average level. Loss realization reaches a high level in 2-6 months period and gradually decreases to a low level in the long term. As a result, the ratio of the number of transactions where a gain is realized to all realizations (losses and gains) is low in 1-2 months, very low in 2-6 months and high in 7-12 months (Constantinides, 1983 as cited in Shefrin, Statman, 1985, 785-786).

However, another study among stock investments between 1964 and 1970 shows that there are no significant differences between loss realizations and gain realizations

during these three periods. Approximately 40% of all realizations are losses in all periods (Schlarbum, Lewellen, Lease, 1978 as cited in Shefrin, Statman, 1985, 785-786).

According to Shefrin and Statman (1985, 787), there might be two conclusions we can infer from these results. One of them is that tax-induced trades share only a small allocation of all trades. Secondly, a significant contribution from the investors who tend to behave as tax consideration is offset by the investors whose behavior is consistent with what disposition effect assumes. Hence, Shefrin and Statman (1985, 785) suggest that both views (tax consideration and disposition effect) are useful to explain investor behaviors, therefore a combination of both views is required. Because the behavior of investors may vary based on many factors. For instance, some investors might realize losses when they occur and act immediately, while others might be aware of the advantages of taxes. However, awareness might not be enough since they may not be able to act because of the disposition effect. Hence, the best way to explain the issue is that both views contribute to explanations for investor behaviors.

There is another issue we would like to discuss disposition effect and tax consideration view. According to Dyl (1977, 165-175), an unusual trade volume was observed among investments during the December period. Dyl (1977, 174 as cited in Shefrin, Statman, 1995, 783) states that:

> "The data reveal abnormally low volume for stocks that have appreciated during the year, presumably reflecting the year-end capital gains tax-lock in effect, and abnormally high volume for stocks that have declined in price during the year, presumably reflecting year-end tax loss selling"

The findings of Constantinides (1983, 611-663) also consistent with the findings from Dyl (1977, 165-175) in terms of a high level of tax-loss selling behavior in December when there is the transaction cost. However, his findings can bring a rational explanation only for the stocks which were purchased in July. But, what if a stock was not purchased in July? There is no explanation for such situations in his view. Yet, as another explanation for other months except for July, the rational view postulates that this high volume trade occurs in December due to a higher interest rate in the subsequent year. Hence, according to the rational view, investors prefer to realize the losses this year instead of next year since next year there will be higher interest rates. However, it must be expected from a rational individual to evaluate all possible

advantages of realizing losses during the year rather than at the end of the year (Shefrin, Statman 1985, 782-784).

Instead, according to Shefrin and Statman (1985, 784-786), in their view, investors also aware of the tax consequences of realizing losses and gains. Moreover, their individuals also have the same level of desire to benefit from the advantages of tax rules. However, while in behavioral view individuals are affected by the components of the disposition effect, especially self-control mechanisms, rational individuals tend to ignore these effects. Because of the special character of December, investors tend to consider tax planning more serious in December. For instance, financial consultants suggest individuals to not to leave their tax planning decisions until December. "Therefore, the authors conjecture that tax planning in general, and loss realization in particular is disagreeable and requires self-control". The behavioral view refers that self-control and self-motivation are easier to show in December because of deadline effect. Deadlines are motivative for individuals regarding what they must do. Shortly, individuals mostly do not show disposition effect in December due to the special characteristic structure of December. Hence, investor behaviors are consistent with the behavioral view in December, while it is not consistent with the rational view.

Odean (1988, 1775-1798)'s findings also remark disposition effect among the accounts from 1987 to 1993. He explains the disposition effect with formulations. According to him, disposition effect occurs when PGR (Proportions of Gains Realized) is higher than PLR (Proportions of Losses Realized). PLR and PGR are formulated by the author as follows:

$$\text{PGR} = \frac{Realized\ Gains}{Realized\ Gains + Paper\ Gains}, \quad \text{PLR} = \frac{Realized\ Losses}{Realized\ Losses + Paper\ Losses}$$

His findings demonstrate that among 79.658 paper gains 13,883 of them are realized during the year and among 110.348 paper losses, 11.930 of them are realized. Hence, the ratio is 14.8% (PGR) to gain realizations and 9.8% (PLR) in loss realizations. PGR is obviously higher than PLR. His findings are also consistent with high loss realization in December. According to his findings, PLR (12.8%) is higher than PGR (10.8%) although the whole year gain realization was higher than loss realization (Odean, 1988, 1782-1783). He also empirically shows that the winning investments which are sold by their owners perform 2.4% higher than the market in the following year. Also, the losing investments which hold by the owners perform 1% lower than the market in the

following year. Thus, the disposition effect may lead investors to make irrational decisions (Odean, 1988, 1796).

After talking about the applications of loss aversion in several areas, in the next two titles, we will analyze status quo bias and the endowment effect. Note that these two cognitive biases are highly related to loss aversion. Although they look very similar, some details can distinguish them. Therefore, we decided to analyze them separately. Now, let us start analyzing explanations and empirical findings of status quo bias.

3.2. Status quo bias

Status quo bias refers to the tendency of not changing the current situation or doing nothing when there is a new situation (Samuelson, Zeckhauser, 1988, 8). One feature of loss aversion indicates that people might tend to stay at the status quo since staying at the status quo is more profitable than leaving (Kahneman, Tversky, 1979, 197-198). Status quo bias is consistent with prospect theory. If we consider the status quo as a reference point, the individual weighs losses that occur because of changing the current status quo as larger than the potential gains. Thus, because of the existence of loss aversion, the individual is considered as biased in terms of status quo (Samuelson, Zeckhauser, 1988, 35-36). Consider a person who changes his current situation and switches to another option. If he realizes that his new situation is less attractive or useful than his previous situation, he will feel sad about this and regret that he changed his status quo. On the other hand, if he realizes his new situation is better than the previous one, he will be happy that he changed his status quo. However, since people are loss averse, the potential pain of being sad will be more than the potential pleasure of happiness.

Status quo can be considered as bias since it prevents people to make a free choice without sticking to their current situation. Moreover, people might miss better choices and chances in the presence of status quo bias.

It is possible to see some status quo biases in our daily life. For instance, Coca Cola that is considered as one of the most consumed drink all over the world has an interesting story that we can relate to status quo bias. In 1985, when Coca Cola company launched a new version of Coca Cola, the producers put it to the blind test. The results demonstrated that most of the people chose New Coke over the Coke

Classic. However, when they started to sell both versions of cokes in the market, consumers continued drinking the classic one. This inconsistency of behaviors occurs because of the existence of status quo bias. In the end, the company stopped producing the new version of Coca Cola. In terms of a rational perspective, people must have chosen the one which gives the maximum utility to them. Although most of the subjects stated that the new version tastes better in a blind test, they did not change their preference due to the existence of status quo bias. This is an example of a marketing failure (Samuelson, Zeckhauser, 1988, 11).

Although status quo bias is consistent with experimental results of loss aversion and loss aversion makes a contribution to the existence of status quo bias, there is an important difference between them. "Status quo bias attributed to loss aversion depends directly on the framing of gains and losses." However, their results show that there is status quo bias even when there are no gain/ loss framing effects (Samuelson, Zeckhauser, 1988, 36). Therefore, loss aversion contributes to status quo bias and it is consistent with the findings of loss aversion but it does not occur only due to loss aversion. Some other factors also contributes to status quo bias such as psychological commitment and transition cost. Therefore, status quo bias may occur in the absence of loss aversion as well (Samuelson, Zeckhauser, 1988, 33). Nevertheless, according to Kahneman and Tversky (1979, 199), the observations from endowment effect, status quo bias, and many other cognitive biases and heuristics remark high contribution of loss aversion.

As we mentioned above, some factors contribute to status quo bias. There are three main elements that explain why the status quo occurs. "Status quo effect can be seen as a result of taking rational decision when there is transition cost or/and uncertainty; cognitive misperceptions; and psychological commitment." (Samuelson, Zeckhauser, 1988, 33). Rational explanations state that individuals stick to their current status, to avoid the cost of changing when there are transition costs and/ or uncertainty. These kinds of transition costs cause a status quo bias when the cost of changing the current status exceeds the potential gains of the better option. Many inefficient tools prevail in their existence to the fact that changing is costly. For instance, although there are better keyboards than standard keyboards in terms of efficiency, mostly standard keyboards are preferred due to the existence of transition costs (David, 1985 as cited in Samuelson, Zeckhauser, 1988, 33). As another example, various American institutions

like educational and presidential ones owe their existence mostly to historical traditions and difficulty of a wholesale change or examination. The presence of uncertainty is another reason why status quo bias occurs. Individuals might stick to their current status quo just because the outcomes of alternatives are uncertain. For example, someone who has a low-paying job might avoid searching for a well-paid job just because the process of searching for a new job is slow, uncertain, and/or costly (Samuelson, Zeckhauser, 1988, 34). Instead of going through an uncertain situation, people might stay in their current situation even if there is a possibility of a better situation in uncertainty.

As a second factor, cognitive misperception is another reason why status quo bias occurs. One type of cognitive misperception is surely loss aversion. As we discussed the importance of loss aversion at the beginning of this title, we would like to continue with another type of cognitive misperception: anchoring. Anchoring is a strong desire of taking an initial point as a reference point and adjusting it to make an estimation (Tversky, Kahneman, 1974, 1128-1130). Individuals might tend to stick to their current status quo since a complete analyzes other available options requires extra efforts. If someone is satisfied with his current choice, he might tend to ignore other available options since analyzing them might be too costly and complex for him. With this logic, the best strategy might be sticking to the initial choice. Therefore, the status quo option might get a decision advantage (Samuelson, Zeckhauser, 1988, 35).

Some psychological commitments also might contribute to status quo bias. In the presence of status quo bias, individuals might tend to stick to their past efforts, investments and sunk costs (the costs which are already done). However, as we know from economics people should make their decision according to incremental benefits and costs (Samuelson, Zeckhauser, 1988, 35). For example, someone pays $300 per year for a tennis club membership, but later he gets injured from his elbow but he continues playing in pain just not to ‘waste’ the money that he paid for the whole year (Thaler, 1980, 47). The more there are past investments, the more contribution to status quo bias. Therefore, we can state that the sunk cost also contributes to status quo bias. We will analyze sunk costs more under another title in this study.

After giving the explanations of status quo bias, let us continue with the examples and empirical findings of status quo bias.

Examples and applications

Status quo bias can provide meaningful explanations to some areas in economics such as the hardship of changing public policies, several kinds of marketing strategies and the character of competition in markets (Samuelson, Zeckhauser, 1988, 48). Moreover, it is possible to observe status quo bias in investment decisions, saving plans and consumer choices too. Now, we will present several examples of status quo bias.

In one of the examples that are illustrated by Samuelson and Zeckhauser (1988, 12-19) status quo bias was visible in the investment decisions of 486 college students. The subjects were asked to choose their investment plans among different portfolios based on some imaginary money that inherited them from their great uncle. There were 4 different portfolios based on different risk options and the experiment consists of two groups: the control group and the experimental group. The experimental group received a piece of extra information on their forms while the control group did not receive any. The subjects in the experimental group received the information as: "A significant portion of this portfolio is invested in moderate-risk Company A. You are deliberating whether to leave the portfolio intact or to change it by investing in other securities." Any commission which occurs due to change should be considered as trivial. Hence, it was expected that this extra information will lead to status quo bias in the experimental group. According to the results, the experimental group chose the moderate-risk Company A significantly more than the control group who did not receive any extra information. On average, in the experimental group, the moderate-risk company A was chosen 20% more than the control group although the options were completely the same in both groups.

Status quo bias can be observed in public economics too. Some examples are listed below from Samuelson and Zeckhauser, and the designs of them are the same design as the one that we discussed in the previous example. In one study, a water allocation problem was presented to the subjects. In the presence of a water shortage in a town, the subjects were asked to choose the best plan to solve the issue among several options. The subjects were asked to make a decision by considering themselves as a water commissioner of the town. Note that this water allocation problem mathematically has an optimum value with respect to its solution. The experimental group received a piece of information about what previous managers did to solve the shortage problem, while the control group did not receive any information. The option

that was chosen from the previous managers is also not an optimum option. According to the results, an optimum solution was calculated and chosen by 52% of the control group, while 30% of the experimental group calculated and chose the optimum solution. Moreover, the alternative option which was presented as the status quo option was chosen by 48% of experimental groups and chosen only by 17% of the control group. Presumably, the subjects in the experimental group received a piece of information about what previous managers did, considered this information as a reference point. Therefore, almost half of them preferred not to change the previous plan (Samuelson, Zeckhauser, 1988, 19-21).

In another example related to public economics, participants were asked to choose the most efficient allocation of their budgets to solve a safety problem in traffic. The status quo option was created as informing that this option is currently in force. When 40-60% allocation was presented as the status quo option, this option was preferred by 61% of the subjects over an equal allocation of the budget. Moreover, when the equal allocation was presented as the status quo option, 76% of the subjects preferred this option. However, in the absence of status quo option, 54% of the subjects chose to allocate their budget equally to highway safety and automobile safety, while 46% of the subjects preferred the allocation of 40% of the budget to automobile safety and the rest to the highway safety (Samuelson, Zeckhauser, 1988, 17-18).

Status quo bias can be seen in political elections too. Consider an election between two candidates that each of them have 50-50 chance in the neutral setting. However, imagine a situation that one of these candidates is the incumbent officeholder. Incumbent refers to "a status generally acknowledged as a significant advantage in an election". In this case, the experimental findings show that the incumbent candidate (status quo option) wins the election by getting 59% of the votes. There are even more dramatic examples. Consider a competition between four candidates and one of them is an incumbent candidate. In a neutral setting, all of them have a 25% chance to win the election. But the results show that when there is an incumbent candidate, he wins the election by taking 38% of the votes (Samuelson, Zeckhauser, 1988, 9).

Status quo bias may bring a psychological background to the fact that pioneering brands have a long-run advantage in the markets. Empirical findings show that in the presence of a monopoly market, when the second company enters the market, the market share of pioneering brands occurs as 58.5%. With the same logic, when the

third company enters, this percentage decreases to 43.6% and it decreases to 35.7% when the fourth company enters the market. Although many other factors attempted to explain this issue, none of them brought a proper explanation to pioneer's market share advantage scientifically, except status quo bias. (Urban, Carter, Gaskin, and Mucha, 1986 as cited in Samuelson, Zeckhauser, 1988, 45).

Observations among health insurance preferences of employees at Harvard University remark strong status quo bias. An experiment conducts among Harvard University employees about their health insurance preferences. An insurance company that is called BCBS is the one that is in force for the old enrollees. Therefore, we can consider this option as a status quo option for old enrollees. Later they added a few more different insurances. Next, they tested if there are any differences in preferences of old enrollees and new enrollees when newly available insurances are added to the list. Since preferences might vary depending on the age level, they tested the same ages between old and new enrollees to make the results more meaningful. They divided the employees into 4 different age groups in both new and old enrollees: 21-31, 32-41, 42-51, and 52-61 years old. "According to the results, for new enrollees, the BCBS proportions by age group are 6.4%, 12.4%, 22.7%, and 24.7%. For old enrollees, the corresponding proportions are 27.4%, 33.0%, 43.1%, and 50.0%". Old enrollees, in general, chose the status quo option much more than new enrollees as the results show. For instance, in the 52-61 age group, half of the old enrollees remained at their initial choices (Samuelson, Zeckhauser, 1988, 27). Note that, status quo was an anchor for old enrollees in this example. Presumably, the evaluation of all other available plans was costly and complex for the old enrollees, therefore some of them preferred to stay with their current health insurance that they know its positive and negative sides to get rid of the cost of search and complexity. Status quo bias gets a decision advantage in this case (Samuelson, Zeckhauser, 1988, 37-38).

As another example among Harvard employees, status quo bias was observed in their retirement investment portfolio decisions between TIAA (bonds) and CREF (stocks) Note that employees can change their retirement plan every year between the funds with zero cost. The survey was done between 1981-1986 and according to the results, the employees who chose 100% of TIAA in their portfolio did not change their portfolio allocations for 5 years. The percentage of this allocation was preferred by 22% of the employees in 1981, and it was either 23% or 24% in the other years until

1986. The results were similar in the other level of allocations as well. For instance, a 50-50 equal allocation between bonds and stocks was 46% in 1981-1983 and it was 47% in 1984-1986. Thus, this simple allocation was preferred by almost half of the participants during the years 1981-1986. In general, only 28% of the employees changed their asset allocation between stocks and bonds. Also, only %8 of them changed their asset allocation more than once. Moreover, in the second part of their study, old employees display a strong status quo bias by sticking to their original allocations (Samuelson, Zeckhauser, 1988, 31-32).

Beyond a shadow of a doubt, the most important topic we would like to discuss under this title is the status quo effects in retirement saving plans. We would like to analyze the findings of Thaler and Benartzi (2004, 164-187) since they provide important empirical findings from their studies. Status quo bias may help to create an automatic enrollment system for saving plans. The importance of status quo bias comes from the design of the system. In this kind of retirement system, when the employees become eligible for a retirement plan, the system automatically starts and continues as long as the employees do not cancel the plan. Therefore, different than other plans, the default option is participating in the plan instead of not participating. The default option refers to an option that will be in force unless the opposite would be stated. Employees who do not do anything to cancel the plan, automatically will be enrolled in the system at a small saving rate such as 3%. Standard economic theory suggests that these kinds of changings would not have any significant influence on the participation of retirement plans. However, in the presence of status quo bias and procrastination (postponing unpleasent tasks), an automatic enrollment system can increase the participation rates significantly (Thaler and Benartzi, 2004, 166-170). As a supportive example of this theory, a plan which is designed as automatic increased the participation rates among new employees from 49% to 86% (Madrian and Shea, 1999 as cited in Thaler and Benartzi, 2004, 169). Another study remarks a higher level of participation rates: 90% (Choi et al., 2001b as cited in Thaler, Benartzi, 2004, 169).

However, many employees state that they could choose a higher saving rate than 3% if the decision would be depended on them. Therefore, Thaler and Benartzi created another program that is called “Save More Tomorrow (SMarT)” to benefit from the advantages of the automatic enrollment system and avoid the disadvantages of it (Thaler, Benartzi, 2004, 169).

Thaler and Benartzi (2004, 168-170) approach the problem of saving less as a disease. To make a proper treatment, the symptoms should be known clearly. Therefore it is important to know which factors lead individuals to save too little. The first element which prevents people to make a proper saving rate is the difficulty of determining a proper saving rate. To determine a proper saving rate individuals must be perfectly rational. However, the existence of bounded rationality prevents individuals to find a proper saving rate. Secondly, the self-control problem is another important factor that does not allow individuals to participate in a proper saving plan. Many people state that lack of willpower leads them to save less although they would like to save more. Procrastination is another important issue that is an obstacle in front of a proper saving rate. It is also related to self-control and it implies a tendency to postpone unpleasant tasks. For instance, in a self-report, 35% of under savers state that they have an intention to increase their retirement savings, but only 14% of them followed their words.

As it was stressed before, hyperbolic discounting is also an important element in saving plans. Individuals find it more attractive when they are informed that the savings will be in the future rather than today or the far-term rather than the near term. Hyperbolic agents procrastinate makes individuals think any action which is happening today is more important than anything later, thus they weigh heavily consuming today over in the future. The existence of procrastination might create status quo bias. Because in the presence of procrastination, sticking to the status quo option will seem logical for individuals. As we discussed before, status quo bias can be used to design an automatic enrollment plan, thus status quo bias is also an important phenomenon in saving behaviors.

Another behavioral factor that explains why individuals save too little is loss aversion. It might influence saving decisions as individuals do not like to see more reduction on their account once they get used to some level of disposable income. They might not be willing to increase the saving rates since they avoid to see more losses on their disposable income. The most important thing here is that individuals mostly tend to consider losses and gains in nominal dollars instead of real. This tendency called money illusion (Thaler, Benartzi, 2004, 170). For instance, in one study in a company, one group of the subjects were asked whether a 7% cut from their wages is fair when the inflation rate is zero. According to the results, 62% of the subjects considered the

action as unfair. The second group of subjects was asked that if a 5% raise on their wage is fair when the inflation rate is 12%. In this group, only 22% of the subjects considered the action as unfair although both options are factually equivalent. (Kahneman, Knetsch, Thaler, 1986 as cited in Thaler, Benartzi, 2004, 170).

Therefore both loss aversion and money illusion are important in saving behaviors. Thaler and Benartzi (2004, 170) state that:

> "The combination of loss aversion and money illusion suggests that pay increases may provide a propitious time to try to get workers to save more, since they are less likely to consider an increased contribution to the plan as a loss than they would at other times of the year"

If we go back to the program, the authors determine their target as helping employees who would like to increase their saving rates but cannot do because of lack of willpower. The aim of the program is increasing the saving rates simultaneously with the pay raises. It is important to make employees think that they do not have any loss on their disposable income and keep them at the same level of disposable income. The program has four components. As a first component, the workers are asked to increase their contribution rates a long time before they have their planned payment increase. The delay between the date of sign up and the date of start-up should last as long as possible due to the hyperbolic discounting. Secondly, if employees decide to join the plan, the plan should start with the first raised salary, they should not see any reduction in their disposable income. The psychological background of this element is eliminating perceived loss aversion effect. Third, the increases in saving rates should be continuous with parallel to the raise on the salary until the contribution reaches the predetermined upper limit level. This is important in terms of keeping employees on the plan with the help of status quo bias. The last component is that employees can leave the program whenever they want. Existence of quitting the plan is important since employees would not feel uncomfortable in the absence of an opt-out option (Thaler, Benartzi, 2004, 170-171).

Thaler and Benartzi (2004, 171-175) have important empirical findings from three implementations of the plan. In the first implementation which took place at a midsized manufacturing company in 1998 among 315 people, 286 people were selected to receive a recommendation from a financial consultant. However, 207 employees accepted to meet a financial consultant but did not accept any increases at their savings at that time. Of these 207 employees, 162 employees accepted the SMarT plan.

According to the results, with the help of the SMarT plan, in 4 years, the saving rate reached 13.6%, while it was 3.5% at the beginning of the program. In the second year only 3 employees, in the third year 23 employees and between the third and fourth year 6 employees canceled the plan. In total, 32 employees canceled the plan which means around 80% of participants from the first year stayed in the program. On the other hand, one group of participants who accepted a consultation from a financial consultant but did not participate in the SMarT plan had higher (4.4%) initial saving rates than the ones who accepted to participate SMarT plan. In the first salary raise, they increased their saving rates to 9.1% and it slightly dropped to 8.4% until the end of the 4th year. Thus, it can be expressed that the SMarT plan ended up with more successful results than the results from financial consultants: 13.6% for SMarT plan, 8.4% for consultation at the end of 4th year.

"The second implementation of the program took place in May 2001 at Ispat Inland, a large midwestern steel company." Since these employees received only one raise on their salary from the time that the SMarT plan started, the results can be viewed only from the initial one. The findings show that employees who participated in the plan increased their savings roughly 2% as expected. The saving rates could continue increasing as the first implementation if raises would be more than once. One of the most important findings of this implementation was the way of the plan. In this implementation, there were no assigned financial consultants who can meet with employees. Instead of this, a common letter was sent to all of the employees. Among employees who were already in a retirement plan, 615 employees (18.1%) and among employees who were not enrolled in any retirement plan 165 employees (8.2%) accepted to participate in the SMarT plan. Therefore, it can be stated that meeting with a financial consultant was more successful than invitation letters in terms of participation rates, considering the participation rate was about 80% in the first implementation (Thaler, Benartzi, 2004, 175-176).

"The third implementation of SMarT took place at two divisions (Divisions A and O) of Philips Electronics in January 2002, with the first saving increase taking place on April 1, 2002." The most important findings of the third implementation are the two divisions' saving rate was slightly higher than other divisions most probably since they were offered to have financial seminars. The saving rates were 3.12% in Division A and 3.74% in Division O, while it was 2.90 in the other 28 divisions. In division O, the

participation rates were higher than division A (60%-40%), presumably since in division O, financial education seminar was strongly encouraged. Moreover in Division O, there was an opportunity to meet on-one meeting with a certified financial planner. Hence, we can infer that a one-on-one meeting with a financial consultant increased the participation rates in the third implementation too (Thaler, Benartzi, 2004, 176-179).

In another example, in the application of driver licenses, the candidates were asked if they would donate their organs in the case of an accident which is resulted in death. The way of the question was framed in three different versions and presented randomly to the subjects as:

- **Opt-in condition:** The default is to "not to be" a donor. (For example, mark the checkbox if you accept to be a donor in case of your death)
- **Opt-out condition:** The default is to "be" a donor. (For example, mark the checkbox if you "do not" accept to be a donor in case of your death)
- **A neutral question format:** Would you like to be a donor? Yes or No

When the questions were presented as above to three different groups, the results remarked different levels of participation rates. In the neutral format, the participation rate was 79%. When the question was presented as the initial option, the participation rate was 42% and it was 82% when the question was framed as an opt-out condition. (Johnson, Goldstein, 2004, 1713-1716). The way of the presentation influenced the participation rates. Therefore, organ donations can be increased with small changes by the design of a form. It is important to determine a suitable default option.

After analyzing some applications of status quo bias, we would like to continue our study by analyzing the endowment effect and its applications in several areas.

3.3. Endowment effect

The endowment effect is the tendency of overvaluing the objects we own. More specifically, once people own an item, they tend to value it higher than other people who do not own it. Thus, it is possible to see a high level of difference between willingness to pay and willingness to accept. For instance, a person purchases a bottle of wine for $5. After some time, his wine merchant tells him that he would like to buy this bottle of wine for $100. This amount is indeed much higher than the price he

purchased the wine. However, he does not accept the offer and does not sell the bottle of wine even though the maximum price he has paid for a bottle of wine is $35 (Thaler, 1980, 43-44). As we stated before, we can relate this effect with loss aversion since they have a common psychological background: people do not like to lose; thus, they overvalue the objects they own.

Firstly, we would like to list some examples from Kahneman, Knetsch, and Thaler (1990, 1325-1349) who demonstrates the low volume of trading and clear differences between selling and buying prices in the presence of endowment effect. Before we start analyzing the examples, it is important to stress that some economists postulate that this tendency can disappear in the market environment. For instance, it was argued that this kind of tendency occurs due to some mistakes of individuals who usually do not act like this. Thus, a discrepancy between willingness to pay (WTP) and willingness to accept (WTA) occurs due to few thoughtless actions of individuals (Knez, Smith, Williams, 1985 as cited in Kahneman, Knetsch, Thaler, 1991, 194). Some scholars claim that this difference between selling and buying prices diminish with market experience (Coursey, Hovis, Schulze 1987 as cited in Kahneman, Knetsch, Thaler, 1991, 194).

To demonstrate if the endowment effect is valid in the real market too Kahneman, Thaler, and Knetsch (1990, 1324-1336) conduct some experiments at Cornell University with students. According to their results, when the object is a consumption good, the endowment effect was observable, but when a monetary value was the object of the experiment, there was no endowment effect. In their first experiment, they used induced value tokens as an object which can be turned into cash by the experimenters at the end of the experiment. The number of subjects was 44 and randomly half of them were assigned as buyers and half of them as sellers in three tokens markets. In this way, they created supply and demand curves for the tokens. As standard economic theories assume, the trading volume must be 11 between sellers and buyers considering there were 22 tokens in each market and they were distributed randomly. Moreover, median selling and buying prices must be equal too in each of the markets. The results in three different markets of tokens demonstrate that median buying and selling prices were equal to each other as expected (3.75, 4.75, 4.25). Also, the number of trades was within one unit of the estimated number (12, 11, 10). The results are almost how

standard economic theory would predict when induced value tokens were the object of the study (Kahneman, Knetsch, Thaler, 1990, 1331-1332).

To demonstrate if there is an endowment effect when a consumption good is used as an object of the study, some coffee mugs were distributed to half of the participants in the classroom. The market price for the mug was $6 at that time and all participants were invited to value the coffee mugs (either theirs or their neighbors'). Standard economic assumptions would expect the same tendency and results as previous experiments: half of the coffee mugs must be traded and median buying and selling prices must be equal. Later, experimenters started a trade process in four markets for the mugs: anyone who has the mug can sell it and anyone who does not have the mug can buy it from the mug owners. The participants were free to determine the level of the price they would like to buy or sell. Considering transaction costs are insignificant and the income effect is trivial, the standard economy would predict that half of the mugs must be exchanged. Because, the coffee mugs will be owned by the ones who value the mugs most. If we consider half of the participants who value the mugs most as "mug lovers" and half of them as "mug haters", since the mugs were distributed randomly, standard economic theory would predict that half of the mugs will be exchanged. More specifically, since half of the mug lovers will recieve a mug and half of them will not, half of the mugs must be exchanged between mug lovers and mug haters. Thus, the number of trades must be 11 since there are 22 mugs. However, the results showed that the number of trades was 4, 1, 2 and 2 in four mug markets. Another important finding was the differences between median selling and buying prices. The median selling prices were $5.25 and the median buying prices were either $2.25 or $2.75 in four markets for coffee mugs. The same procedure was followed for pens in four different markets and the results were similar. There were 22 pens and the number of trades was either 4 or 5 in four markets. Median buying prices were 0.75 in each market and median selling prices were $2.50, $1.75, $2.25 and $1.75 (Kahneman, Knetsch, Thaler, 1990, 1331-1332). The market behavior disappeared when the object was a consumption good.

In the token example, since it was not possible to use the tokens outside of the laboratory environment, people did not endow with the tokens and followed market principles. However, when consumption goods were the object of the study since it

was possible to use them outside of the experimental environment, most of the people endowed with them.

To observe if this low trade volume occurs due to reluctance to sell or buy, the authors ran another experiment and added "choosers" to the sellers and buyers. In this experiment, 77 students from Simon Fraser University assigned three different groups; sellers, buyers and choosers. Some coffee mugs with the university logo were randomly given to some of the subjects and later it was asked them if they would be willing to sell their mugs at prices between $0.00 to $9.25. Later, the ones who did not receive any mugs were asked if they would be willing to buy the same mugs at the same set of prices. The choosers who did not receive any mugs were asked whether they would choose a mug or the money equivalent to the mug at each set of prices. In this case, it can be said that choosers and sellers have an identical situation in terms of decision-making. They were both asked to decide at each price between the mug and the money equivalent to the mug. However, choosers behaved as buyers rather than sellers. The results are given on average for all three groups as sellers, $7.12; choosers, $3.12; buyers, $2.87. These results demonstrate that the low trading volume occurs due to the sellers' reluctance rather than buyers'. High prices which are suggested by sellers display their unwillingness to sell the mugs. As we discussed before, loss aversion is an important factor in the endowment effect. Losing a product is not attractive for individuals; thus, the sellers put a very high price to give up the goods (Kahneman, Knetsch, Thaler, 1990, 1338-1339).

In the following example, subjects were divided into three groups. The first group that consists of 76 participants were given coffee mugs which costs $6 in the market. In the second group, 87 participants were given 400 g Swiss bar chocolate that costs $4.95 in the market. As in the previous experiments, exchanging the goods were possible. The ones who would like to exchange their products would need to hold up a colored paper in which was written the word "trade". In the third group, the subjects did not receive any good and it was asked them to make a pure choice between a coffee mug and a chocolate bar. According to the results, in the third group, 56% of the participants chose the mug. However, only 10% of the chocolate bar owners were willing to exchange their chocolate bars in exchange for a mug in the second group. Also, only 11% of the mug owners were willing to exchange their coffee mugs to chocolate bars. Most of the participants were unwilling to trade their goods once they started to own

them. If we look at the third group, without any reference point, the preferences were much more different (Knetsch, 1989, 1278).

According to Carmon and Ariely (2000, 360-369), the endowment effect occurs because sellers and buyers look at the item from a different perspective; sellers look at it as something they should give up, while buyers focus on how much they must spend to get that item. In an experiment, the subjects were selected from hundreds of students who would like to take part in a lottery which determines who will be eligible to get a ticket for an important basketball game. After the lottery, people who received tickets were asked how much they would be willing to sell their tickets to the subjects who did not receive the tickets. Also, people who were not lucky and did not receive a ticket from the lottery were asked for how much they would be willing to buy a ticket from the ticket owners. According to the results, the median selling price was $2411 and the median buying price was $166. If we look at from rational perspective, the median buying and selling prices should have been similar since the expected utility from the game should not have been based on the result of the lottery.

As we know from microeconomics, indifferent curves never intersect with each other since indifferent curves are reversible. It means that if a person who is the owner of product A indifferent between owning and trading it with product B, then in the case of owning product B, he should also be indifferent between keeping or trading it for product A. However, according to Knetsch (1990), in the presence loss aversion, this theory will not be valid anymore. He empirically proves his theory. In a study, he divides the participants into two groups and one group of subjects receives $4.5 and the other group receives 5 pens. As a next step, some series of offers are made to the participants that they could accept or reject. In this way, the indifference curve could be constituted. For instance, it could be asked from a pen owner whether he would be willing to exchange his 1 pen for $1. To determine the participant's payment, one of the accepted offers was chosen randomly. Later, it was possible to draw an indifference curve for all subjects by drawing a line between accepted and rejected offers for both of the groups. It appears that the curves are very different: subjects who started with pens valued pens more than subjects who started with money. Therefore, the curves intersect (Knetsch, 1990, as cited in Kahneman, Knetsch, Thaler, 1991, 196-197).

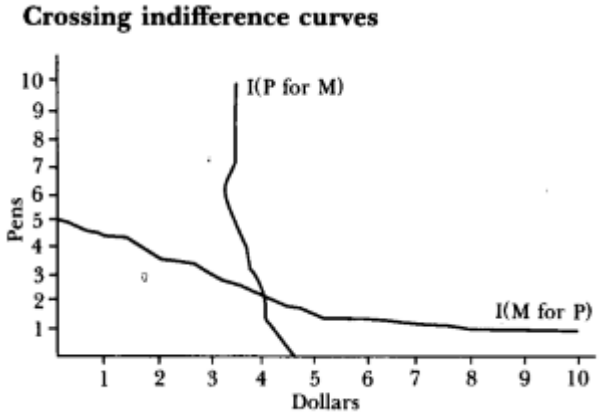

Figure 2: Crossing Indifference Curves

Knetsch, Jack L.1990. Derived Indifference Curves. **Unpublished Manuscript.** Canada: Simon Fraser University (as cited in Kahneman, Daniel, Jack L. Knetsch, Richard Thaler. 1991. Anomalies: The endowment effect, loss aversion, and status quo bias. **Journal of Economic perspectives.** vol. 5. No. 1: 193-206.

According to List (2004, 615-625), experienced consumers do not behave as prospect theory indicates in terms of the endowment effect. They rather behave as how standard economics theories assume. Therefore, he assumes that the prospect theory works on inexperienced consumers, but consumers who have enough knowledge about the market behave consistently with neoclassical statements. Moreover, according to him, the endowment effect occurs basically due to the result of some mistakes that are done by inexperienced consumers and by the time these consumers will behave more closely to neoclassical models. To show this, he conducts an experiment to explore the influence of market experiences in trading volume. He puts an announcement that invites people to take part in a survey in exchange for a mug or a bar of chocolate. Note that both of the goods have the same value in the market. The goods are distributed randomly to the subjects and when the subjects were about to leave, he informs them that it is possible to trade their gifts with the other subjects. To see if there is any difference between experienced and inexperienced people he conducts his experiment among dealers and nondealers. He describes dealers as people who trade 11 times or more in a typical month. According to the results, only %18 nondealers were willing to exchange their gifts, while 48% of dealers were willing to exchange their gifts. Therefore, dealers behaved as how neoclassical models would suggest: almost half of them were willing to exchange their goods. Therefore, he posits the view

that individuals who have enough market experiences follow neoclassical models while individuals who do not have enough market experiences follow prospect theory and fall into the endowment trap. However, these people also will learn how to overcome the endowment effect by having some experiences in the market and will behave consistently with neoclassical assumptions.

Norton, Mochon, and Ariely (2011, 1-22) analyze a notion that contributes to the endowment effect that is called the "Ikea Effect". Ikea effect represents the fact that when people are involved in the production process of an item, this can increase their endowment to the item. More specifically, when individuals put some effort into something, they tend to overvalue it. In the 1950s when instant cakes were presented, housewives started to complain since the cooking process is too easy and their efforts are undervalued. Manufacturers changed the recipe and to cook the instant cake, people needed to put an egg into the cake. This change resulted in an important amount of subsequent adoption to the cake (Shapiro, 2004 as cited in Norton, Mochon, Ariely, 2011, 3).

In another example related to the Ikea effect, in a university in the US, 52 participants were randomly assigned to two different groups: builders and nonbuilders. Builders were in charge of assembling a plain black IKEA storage box while nonbuilders were given a fully assembled box to only inspect them. The experimenters told the subjects that at the end of the experiment, the experimenters will draw a random price for the boxes. If subjects' willingness to pay would be equal to or above that price, they will be able to pay the experimenters that amount of money and take the box, while if their bid would be below that price, they will have to leave the boxes. The results revealed that builders were willing to pay $0.78 on average, while nonbuilders were willing to pay only $0.48 on average. Therefore, whereas all subjects had the chance to buy the same product, subjects who build their boxes were willing to pay a 63% premium compared to subjects who did not assemble the boxes. Later, it was asked from them to rank their boxes from 1 to 7. Builders ranked (3.81 on average) their boxes higher than nonbuilders (2.50 on average) (Norton, Mochon, Ariely, 2011, 6-8).

After analyzing the applications and empirical findings of the endowment effect, we will continue our study by analyzing the anchoring effect and its empirical findings from various areas

3.4. Anchoring Effect

Anchoring is a type of cognitive bias which leads individuals to take unrelated information and consider it as a reference point to form a judgment about unknown values. According to Tversky and Kahneman (1974, 1128), estimations of individuals in most cases start from an initial point and later this initial point is adjusted by them to yield a final estimation. For instance, some numbers in our daily life implicitly might be stuck in our minds such as a number of a building we just wrote down or a price of a product we just purchased in a shopping center (Wilson, Houston, Etling and Brekke, 1996, 388). These numbers might have a particular impact on our daily life decisions without our awareness.

For instance, to observe if the initial point is influential in estimations, Tversky and Kahneman (1974, 1128-1129) conduct an experiment. They asked one group of subjects to calculate calculate $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ in 5 seconds, while another group of subjects was asked to calculate $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ in 5 seconds. The mean of the estimations in the first group was 512, while it was 2250 in the second group (The correct answer in both questions is 40320). Presumably, most of the subjects made their estimations depending on the initial numbers. Therefore, since the initial numbers in the first group are much less than the initial numbers in the second group, the median of the estimations is much less in the first group.

The anchoring effect is very much influential in our lives and it can influence even important decisions. For instance, a file that tells a thief story of a woman was presented to 52 judges in Germany. After that, it was asked the judges to throw a pair of dices that was arranged as tricky since the dices were showing only 3 or 9. Later, they were asked if they would like to give the number from the dice as a punishment (as a month) to this woman or not. In the end, the judges who received number 9 expressed that they would like to give 8 months on average as a punishment while the ones who got number 3 was ready to give 5 months on average as a punishment. (Kahneman, Tversky, 2011, 118).

In another example, participants' willingness to pay at Bistro 97 restaurant was more than the restaurant at Bistro 17. With the same logic, in another study, the subjects estimated that the P97 model mobile phone is sold more than the P17 model across Europe (Critcher, Gilovich, 2008 as cited in Epley, Gilovich, 2010, 22). Presumably,

97 and 17 were taken as anchor values by the subjects although these numbers can not be informative in both cases.

Anchoring can be used as a shortcut to predict an unknown value or estimation by starting from a piece of information that is already known. Most of the findings claim that anchoring should be analyzed together with adjustment. Anchoring and adjustment work in a way that the anchors are accepted as a possible answer, then the adjustment process starts to make it available or acceptable in terms of the target value (Epley and Gilovich, 2001, 391). However, Kahneman and Tversky (1974, 1128-1130) state that individuals mostly make an insufficient adjustment when they form their judgments based on an initial value. The adjustment is not sufficient and it creates biased predictions and estimations toward the anchor.

"Anchoring has three steps: considering it as a possible answer, retrieval of target features and integration and adjustment process." (Wilson et al., 1996, 389)

Individuals might consider the anchor as a possible answer due to several reasons. For instance, experimenters might ask them to compare the anchor value with the target value. In this method, subjects are explicitly invited to benefit from the anchor value. For instance, the judges in the German court faced with this kind of procedure. As another example of this method, consider this famous experiment from Kahneman and Tversky (1974, 128) as follows:

The conductors asked students to spin a wheel fortune and write down the number they got, which is either 10 or 65 since the wheel fortune was arranged as tricky to not give any other results to the participants except 10 and 65. However, participants did not know that there can be only 10 or 65.

- Are the African nations among UN members higher than the number you just wrote down?
- What is your best guess?

Not surprisingly, participants who received number 10 from the wheel fortune estimated smaller numbers fort he question. Participants who received number 10 estimated the value on average 25%, and participants who received number 65 estimated on average 45%. The results reveal that a random and uninformative number easily influenced the predictions of the participants.

As another type, anchors can be informative. In this case, people most probably will consider the anchor value as a possible answer. But this can not represent an irrational way of thinking (Wilson et al., 1996, 388). In an example, the experimenter presented a couple of information about a local house to the subjects and asked them to estimate its appraised value. The listing price was (from low to high) one of the information that the experimenter provided to the subjects. The listing prices were taken as an anchor by the subjects. When the listing prices were low, estimations were low and vice versa (Northcraft, Neale, 1987 as cited in Wilson et al., 1996, 388). When there is an informative anchor, it is not surprising that people consider it as an anchor. Therefore, informative anchors are not the subject of our study.

As the most interesting type of anchoring, people might consider the anchor value as a possible answer even when the anchor is an arbitrary value and people are not asked to consider it as a possible answer or they are not explicitly invited to benefit from the anchor value. The authors determined their target as investigating these types of anchors (Wilson et al., 1996, 394). These types of anchors are called "incidental" anchors (Ünveren, Baycar, 2019, 2).

According to Chapman and Johnson (1995, 115-153)'s confirmatory search hypothesis, it is assumed that the anchoring effect occurs by activation of the knowledge. Decision-makers think that the anchor is a logical answer and to make it understandable and accurate in their logic, they might look for some reasons. More specifically, individuals focus on reasons why the anchor is similar to the target value more than why the anchor is different from the target value (Chapman, Johnson, 1995 as cited in Wilson et al., 1996, 388).

To conclude, several important findings of anchoring effect are listed below:

- Subjects were affected by anchor values even when the anchors were not informative and they were not asked to compare the anchor value with the target value.
- Anchoring effect occurs when individuals give sufficient attention to the anchor value. Also, when individuals have to pay more attention to the anchor value, the anchoring effect increase.
- When it was asked to the subjects how much their responses have been influenced by the anchor, they mostly expressed low numbers. Another finding

is that subjects mostly think that their answers are influenced by the anchor, less than the others.

- Another important finding is that although there were many warnings that reminded the subjects that there is an anchor and it influences their decisions, it was not enough to eliminate the effect of the anchor. “It is very difficult to fix a mental process that people cannot directly observe.”

Moreover, some results suggest that it is not possible to remove the anchoring effect by using prewarning manipulations (Wilson et al., 1996, 388-400).

Examples and Applications

Furnham and Boo (35-42) states that anchoring effect is observable in many areas such as probability estimations, legal judgments, negotiations, purchasing decisions, and general knowledge estimations. In our study regarding anchoring effect, we presented several examples from the marketing sector, WTP decisions, negotiations, consumer choices, real estate appraisals, estimations and predictions about unknown values such as global warming estimations.

As a first example, we would like to discuss a marketing strategy regarding the anchoring effect. For instance, in three supermarkets in Sioux City, it was tested if anchoring will be effective when the anchor value is served as a limit for purchasing a product. More specifically, the sellers put a limit on a product regarding the maximum amount each person can purchase in a day. The product is a Campbell’s Soup that has a 10% discounted price. When there was no limitation, purchase quantity per person was 3.3 on average while it was 7 on average when the limit was 12 per person in a day. Moreover, when there was a limit as 12, overall 188 soups sold, while when there was no limitation 71 soups were sold. Clearly, 12 was considered as an anchor value by the clients (Wansink, Kent, Hoch, 1998, 9-10).

As another WTP example, 370 adult volunteers from San Francisco Exploratorium visitors were asked to decide their WTP to help seabirds in the Pacific Coast. The full version of the question is presented as follows:

“WTP per year to save 50,000 offshore Pacific Coast seabirds from small offshore oil spills, until ways are found to prevent spills or require owners of tankers to pay for the operation.”

In fact, it was asked from the subjects to decide how much they would be willing to pay to rescue the seabirds from their difficult situations. In the calibration group (121 of them) the subjects were only asked how much they would be willing to pay without any anchor. The rest of the subjects, however were explicitly directed with a given anchor value as: "Would you accept to pay $400 for the seabirds?". According to the results, when there was no anchor value, the subjects' WTP was $64,25 on average. When $5 (the lowest anchor) was presented as an anchor value, this amount decreased to $20,30 on average while it increased to $143,12 on average when the anchor value was presented as $400 (the highest anchor) (Green et al., 1998, 96-97).

As an example of incidental anchoring, a photo of a football player was shown to the subjects and it was asked from them to guess the athletic success of the footballer. The same photo of the player was shown to the subjects but the jersey number was shown as 54 in one group while it was shown as 94 in another group. The jersey number is an irrelevant factor for the athletic success of the footballers. However, the results show that the numbers had significant effects on the estimations (Critcher and Gilovich, 2008 as cited in Ünveren, Baycar, 2019, 2).

Anchoring effect can be seen in real estate valuations too. Anchoring effect was visible in real property appraisals in the first cadastral survey in İstanbul which took place in 1875. It was empirically shown that door numbers of properties were served as an anchor to property valuations. More clearly, there was a positive correlation between the door numbers and property appraisals even when all physical factors which can influence the appraisals such as size, region, number of the rooms and rental prices were identical. The correlation coefficient between door numbers and property appraisals was found as 0.32 in terms of partial correlation (when the rent is isolated) and 0.46 in terms of zero-order correlation. This means, two neighboring houses with identical physical features would have a different verdict in terms of their values. More specifically, the house that has a higher door number would have a higher valuation although all possible physical aspects are identical including rental values. One of the important findings is that since property appraisals were used to calculate property taxes at that time (4%), anchoring had influences in tax rates too. A random number influenced even tax rates. Another important finding is that cognitive biases such as anchoring were effective even many years ago. Furthermore, since there were no

explicit directions to the anchor value, this is a suitable example of "incidental" anchoring (Ünveren, Baycar, 2019, 1-14).

Anchoring can be used as an effective tool to be superior in negotiations. The first offer might have huge impacts and negotiations might be toward this value. An experiment was done about negotiation among 76 (38 dyads) master's of business and administration students. In every dyad, there was one seller and one buyer. The negotiation was done in the purchase of pharmaceutical plants between sellers and buyers. Some general information about the product was given to both sellers and buyers. For instance, the plant was purchased 3 years ago for $15 million and one year later its value increased to $19 million. Moreover, a similar plant was sold for $26 million. This kind of general information was given to both sellers and buyers. Later it was asked them to negotiate with each other until the purchase occurs. The results showed that in general, the sellers made higher first offers ($26.6 million on average) than the buyers ($16.5 million on average). The final purchase prices occurred at $24.8 million when the first offer was from sellers and at $19.7 million when the buyers made the first offer. Furthermore, the first offers had a huge impact on the final purchase prices. The correlation was very high: 0.93 (Galinsky, Mussweiler, 2001, 660- 662).

Joireman, Truelove, and Duell (2010, 1-8) show that anchoring might influence global warming beliefs of individuals. Since global warming is a topic that highly discussed by the majority of people these days, there are many predictions and estimations about the degree of it. Also, there is a high degree of uncertainty about global warming and the predictions of people are based on their cultural backgrounds and heuristics. In the study, high and low anchors were presented to the subjects. The conductors hypothesize that participants who are given higher anchor in terms of increases in outside temperature would estimate a higher level of global warming. The experiment was conducted among 159 participants from marketing undergraduate students. The question was framed in two different ways and then presented to the subjects randomly. The questions are given below:

- "Do you believe the earth's temperature will rise by exactly 1 degrees Fahrenheit over the next 30 years?"
- "Do you believe the earth's temperature will rise by exactly 10 degrees Fahrenheit over the next 30 years?"

If they answer “no” to the first question, as a second question, their predictions about increases in temperature in the next 30 years were asked in each group. According to the results, in the first group, 30.7% of the participants replied as “yes”, while this rate was 54.9% in the second group. The average estimations of subjects who replied as no were 2.62 in the first group and 4.55 in the second group. The results revealed that higher anchor leads to higher predictions about global warming. Another part of the study demonstrated that subjects who have higher anchors were willing to pay on average higher taxes and prices for products and services that help to reduce global warming (Joireman, Truelove, Duell, 2010, 4-5).

To sum up, the decisions we take in our life might be biased too. Any number we hear or any object we see in our daily life might have an impact on our decisions without our awareness, considering even the fact that an irrelevant number from a dice influenced the decisions of the judges and a random number influenced the appraisals and tax rates of properties.

Now, let us continue our study by analyzing framing effect and its applications in several areas.

3.5. Framing effect

Framing effect assumes that decision-makers make their choices depend on how a set of identical choices presented (Gonzalez et al., 2005, 2). Individuals might act differently to the same things, events or situations when they are presented differently. Framing a glass as “half full” or “half empty” has different meanings and it might evoke different feelings.

Framing a situation, a problem or an outcome in many ways is mostly possible. From a rational perspective, decision-makers should be indifferent to all ways of framing as long as the choices are factually equivalent. Therefore rational choice claimes that the choice between a set of alternatives should not reverse when the choices are presented differently. However, some empirical findings have demonstrated that there are some systematic violations in individuals’ choices when the choices are framed differently. Individuals may be influenced by different frames of an equal outcome, partly due to the formulation of the problem and partly due to the habits and personalities of decision-makers (Tversky, Kahneman, 1981, 453).

For instance, a study demonstrates that the subjects reacted differently to the choices which are factually equivalent in the purchase of ground beef when they were presented differently. The choices were described as "75% lean" or "25% fat". When the beef was introduced as percent-lean (positive frame) rather than percent-fat (negative frame), subjects rated the taste of the meat higher. Some of the subjects were informed about percentages before they taste the meat and the rest were informed about the percentages after they tasted the meat. Later all subjects were asked to rate the taste of the meat from 1 to 7. (Levin, Gaeth, 1988, 374-378). The results are given below in table 2.

Table 2: Framing effect in marketing

	Positive frame (75% lean)	**Negative frame (25% fat)**
Taste before labelling	4.05 (21 subjects)	3.45 (24 subjects)
Taste after labelling	4.67 (22 subjects)	3.57 (21 subjects)

Levin, Irwin P., Gary J. Gaeth. 1988. How Consumers Are Affected by the Framing of Attribute Information Before and After consuming the Product. **Journal of Consumer Research.** vol. 15. no. 3: 374-378.

As the results show, positive frames brought better consumer satisfaction. Also, tasting after the labeling provided better results.

Since there is some confusion in the literature between framing effect and domain effect, it is important to distinguish them. Note that the domain effect is identical with the reflection effect which was presented by Kahneman (1979, 263-292) as we discussed before. The framing effect depends on the existence of the domain effect and domain effect has two parts: gains and losses. In the domain of gains, people tend to choose certain outcomes (risk-averse), while in the domain of losses they tend to choose gambles (risk seeker). Framing effect also deals with outcomes but in a different way. Framing effect concerns about the vantage point of the outcomes while domain effect deals with gains and losses. (Fagley, Miller, 1990, 497). "Presumably, the framing effect depends on the domain effect in that the frame affects the perceived domain of the outcomes, but there is a logical distinction" (Fagley, Miller, 1987, as cited in Fagley, Miller, 1990, 497). Since loss aversion occurs due to the existence of

reflection effect, loss aversion bias is related to the framing effect as well. For instance, it is possible to present an outcome as a loss or as a gain relative to the status quo (Kahneman, Tversky, 1984, 343).

Examples and Applications

Framing effect can be seen in several areas such as strategic choice decisions, risky choices, investment decisions, and political statements.

Tversky and Kahneman (1981, 453) provide some empirical findings that framing a choice as a gain or as a loss influence the decisions of the subjects. As a first example, we would like to discuss one of the most famous examples of risky choices. Consider an unusual Asian disease that will occur soon in a city of the U.S which is expected to kill 600 people. It was asked from the subjects to determine the best treatment strategy among the options which are presented below:

Problem 1 (N= 152)

- **Program A:** 200 people will be saved
- **Program B**: 33% probability all of 600 people will be saved or 66% probability no one will be saved.

The results: 72% of the participants chose option A.

Problem 2 (N=155)

- **Program C:** 400 people will die
- **Program D:** 33% probability no one will die, 66% all of 600 people will die.

The results: 78% of the participants chose option D.

As we can see A and C, B and D are identical regarding their outcomes. Hence, the subject must have been indifferent between these choices since they are identical in terms of their outcome levels. However, surviving and dying evoked different senses on people. Surviving as a positive domain is related to gains while dying as a negative domain is related to losses. Therefore, there is an obvious loss aversion effect too in this example. Because the choices are framed as gains in the first question and it was framed as loss in the second question. More specifically, the first question was formulated as ‘lives saved’ and the second question is formulated as ‘lives lost’ (Kahneman, Tversky, 1984, 346).

With the same logic, in a strategic choice question about cancer treatment patients gave different answers to the identical choices when they were framed differently. When a 90% survival rate was stressed, 82% of patients accepted surgery, while only 56% of them accepted the surgery when a 10% mortality rate was emphasized. These two pieces of information are factually equivalent; however, they are presented with different formulations (McNeil et al., 1982, 1259-1262).

Thaler and Sunstein (2009, 36) illustrate one good example which can be associated with the framing effect. Credit suppliers did a great manipulation many years ago after they introduced credit cards as a payment method. When credit cards became popular, fuel suppliers got annoyed since in every payment that is done by credit cards, credit suppliers used to take 1% as commission. Therefore, fuel suppliers had an attempt to make a raise when clients do their payments by credit cards to cover this 1% commission. To prevent this, credit suppliers attempted to find a solution for this problem to have a win-win situation. They aimed to keep this commission somehow. Therefore, instead of using the word ‘’raise’’ on credit cards, they suggested fuel suppliers make a “discount” when clients do their payments by cash. In this manner, credit suppliers had their commission again, and fuel suppliers did not have any loss. Shortly, they explored a solution as presented below:

- Normal price: when they pay by card.
- Discounted price: when they pay by cash

Another example of framing effect was discovered on a conference registration among PhD students (junior) and faculty members (senior). The early-registration fee was $195 for faculty members and $145 for PhD students, and the late-registration fee was $245 for faculty members and $195 for PhD students. The purpose of the study was testing the reactions of the participants when the registration is framed in two different ways. To test this, they randomly sent to different emails to the subjects. First group received the email as:

“We take this opportunity to remind you that the discounted conference fee for early registration is available until 10 July 2006.”

Second group received the email as:

“We take this opportunity to remind you that the conference fee will include a penalty for late registration after 10 July 2006.”

93% of Ph.D. students (junior) registered early when a penalty fee for late registration was emphasized while only 67% did so when this was presented as a discount for earlier registration. As we discussed before, people do not like to lose. When the issue is framed as a "loss" issue, presumably people take the issue more seriously, and react immediately (Gächter et al., 2009, 1-5).

As another example of a reward-penalty effect, instead of giving a bonus to people, giving a tax was a more effective policy to decrease the level of disposable bag usage. In her research, the author was trying to determine the best policy to reduce the usage of disposable bags, thus she tried both tax and bonus policies. The results have demonstrated that, when $0.05 bonus was stressed, the usage of disposable bag decreased by only 2% (from 84% to 82%), while a penalty (5 cents) was stressed, the reduction was 40% (from 82% to 42%) in Montgomery Country in the U.S. This might help to save 18 million disposable bags per year. However, according to standard economic theory, the results must have been the same under the tax and bonus policies (Homonoff, 2015, 1-33). Note that this is also consistent with loss aversion.

According to Tversky and Kahneman (1981, 349), a negative issue can be presented as either loss or cost. Their assumption is based on the fact that people are more averse to losses compared to costs. This is a case of mental accounting too since presumably, people put costs and losses to different categories in their minds. In fact, because of the existence of loss aversion, loss evokes a stronger feeling than cost. To show how people react when a negative issue is framed as a cost versus as a lost, they conducted an experiment and offered subjects two risky choices. The choices are presented below:

- "Would you accept a gamble that offers a 10% chance to win $95 and a 90% chance to lose $5?"
- "Would you pay $5 to participate in a lottery that offers a 10% chance to win $100 and a 90% chance to win nothing?"

Although it can be easily confirmed that these two outcomes are factually equivalent, among 132 participants, 55 subjects preferred different options when the options were presented as above. Also, 42 subjects rejected the gamble in the first option but accepted in the second option. In the second one, presumably, $5 was considered as a

cost, while this amount was considered as a loss in the first one by the subjects since it is part of the probabilistic issue.

The framing effect is observable in several political statements too. Politicians might influence the citizens by framing a situation differently. In one study, subjects' preferences were influenced by the way of the presentation of the outcomes; either employment or unemployment. For instance, two different programs were presented to the subjects below:

Problem 1

- Program J consists of 10% unemployment rate and 12% inflation rate,
- Program K consists of 5% unemployment rate and 17% inflation rate.

The results: Among 126 subjects, 36% of them chose program J, while 64% of them chose program K.

Problem 2

- Program J consists of 90% employment rate and 12% inflation rate,
- Program K consists of 95% employment rate and 17% inflation rate

The results: Among 133 subjects, 54% of them chose program J, and 46% of them chose program K.

Program J and program K in both problems are factually equivalent. Because a 10% unemployment rate is equal to a 90% unemployment rate and a 5% unemployment rate is equal to a 95% unemployment rate. Moreover, the differences between both problems regarding employment (unemployment) rate and inflation rate are the same (5%). Presumably, subjects were more sensitive when the unemployment rate was stressed. Hence, politicians mostly emphasize the employment rate rather than the unemployment rate. (Quattrone, Tversky, 1988, 727-728).

Moreover, the results represent a psychophysical effect that the authors call it the ratio-difference principle. The ratio-difference principle refers to the fact that the differences between the two numbers have more impact regarding their ratios when the numbers are smaller. For instance, the difference between $100 and $200 represents the ratio as 2, while the same level of differences between $200 and $300 represents the ratio as 1.5. If we go back to our example, in problem 1 the ratio between 5% and 10% is 2, while it is 1.05 between 90% and 95% in problem 2. Hence, the sensitivity of people

is visible here as well according to the results. Program K was more attractive in problem 1 while program J was more attractive in problem 2. Note that, the only difference between the two questions was presenting the unemployment rate in problem 1 and the employment rate in problem 2 (Quattrone, Tversky, 1988, 728).

There are more dramatic examples of the ratio-difference principle. Following example represents this fact:

A country named Delta is planning to reduce crime rates among the immigrants who live in the country. They received $100 million for constituting a program to reduce the crime rates within youth immigrants. There are 2 immigrant communities whose names are Alphan and Betan community. According to the data, 3.7% of Alphans have no criminal record by the age of 25, while this amount is 1.2% of all Betans. Two different programs that allocate $100 million budget among Alphans and Betans were presented to the subjects:

Problem 3:

- **Program J:** $55 million to Alphans and $45 million to Betans
- **Program K:** $65 million to Alphans and $35 million to Betans

The results: Among 125 subjects 41% of the subjects chose program J, while 59% of them chose program K.

Problem 4: The same allocations are given to 126 subjects with different information design. In this problem, the subjects were informed as follows:

According to the data, 93.6% of Alphan youngsters do not have any criminal record until the age of 25, while this percentage is 98.8% among Betan youngsters.

The results: 71% of the subjects chose program J, while 29% of the subjects chose program K.

As we can see, both options are identical. However, presumably in problem 3, the existence of ratio-difference principle made people think Alphans are much more criminal than Betans in problem 3 since the ratio is almost 3, while they are considered as a bit noncriminal in problem 4 in terms of the ratio. Hence, in problem 3, fewer subjects chose program J, while most of the subjects chose it in problem 4 (Quattrone, Tversky, 1988, 728-729).

As another political framing example, in the middle of the 1970s, 48% of Americans did “not allow” communists to make a speech, while 22% of Americans “forbid” them to make a speech. The meanings are the same but probably forbidding seemed more negative than not allowing (Schuman, Presser, 1981, 277 as cited in Druckman, 2001, 229-230).

Framing effect can influence investment decisions too. In a study, participants were asked to invest in two different types of funds: growth funds and income funds. The experiment was done among investors who live in Bursa, Turkey. Firstly, the conductors tested if past performances of investments have an impact on investment decisions. According to the results from 371 participants, they found a significant relationship between past performances of investments and investment decisions. As a second and third hypothesis, they tested if the participants can be influenced when the information about past performances of investments is framed in different shapes. According to the results, 17.90% of the participants chose growth funds when the information about past performances was given by a line chart, while they preferred income funds when the information was given by a bar graph. From a rational perspective, the preferences of individuals should not have been affected by the way of presentation since the information in both options are the same. (Alper, Ertan, 2008, 174-184).

3.6. Mental accounting

Mental accounting is a cognitive mental activity that is based on categorization, organization, and evaluation of the financial activities of the human brain (Thaler, 1999,183).

According to Tversky and Kahneman (1981, 456), “mental account is an outcome frame which specifies the set of elementary outcomes that are evaluated jointly and the manner in which they are combined and a reference outcome that is considered neutral or normal.” Hence, mental accounting can be considered as a frame for assessment (Thaler, 1999, 186).

According to mental accounting, households categorize their income; such as food, rent education, etc. A story from facmous actors Gene Hackman and Dustin Hoffman is a great example of this statement. Hoffman asks some money from Hackman as a

loan during their starving artist days. After giving some money to Hoffman, Hackman visits his friend's home and sees some jars in his kitchen. Each jar is labeled with different names such as "rent" or "utilities" and in some of the jars, there was some amount of money that Hoffman could use. When Hackman asks why he wants to borrow money from him although he has money, Hoffman points out the empty jar that is labeled as "food" (Thaler, Sunstein, 2009, 53-54). Individuals tend to not to mix the account in their mental categories.

An unexpected income might lead individuals to spend more than they usually spend. As an example of this statement, Thaler tells a fishing story about Mr. and Mrs. L and Mr. and Mrs. H. They go fishing and at the end of a successful day, they collect a high amount of salmons. Later, instead of carrying all the fishes they caught, they decide to send them to their home by an airline company. However, the fishes lost on the way because of the mistake of the airline company, thus they received $300 from the company. After receiving this amount of money the couples decide to eat outside at a restaurant. They spent $225 for the dinner although they had never spent this amount of money for a dinner before. Presumably, they decided to make an exception by spending this amount of money for the dinner because they created a different mental accounting process on their minds for this dinner. Because they did not spend from the 'food' category or 'eating outside' category. They spent from 'fishing' or 'money from the airline company' category. They would feel guilty if they would spend this much money from their normal accounts such as their salary or any regular income. However, after receiving the payment from the airline company, they created another mental account that makes them feel good when they spend this much money to eat outside at a restaurant (Thaler, 1985, 199).

Mental accounting might lead individuals to make irrational decisions. For instance, consider a couple who have saved $15.000 to buy a vacation home that they were dreaming to buy for a long time. The saving earns 10$ per year and their target is buying the home in 5 years. Later, they decided to buy a new car for $11.000 with a three-year loan whose interest rate is 15%, instead of using their savings to buy the car. There is an obvious mental accounting issue here. The interest rate is higher than the saving rate and just to not touch the ‘’home’’ money, they decided to take a loan whose interest rate is higher than their saving's interest rate (Thaler, 1985, 199).

Mental accounting might occur due to a set of emotional associations with the money. People might spend the money based on the source of it. When some financial values earned easily, they can be spent easier than other types of money. For example, when individuals earn some money from gambling, it becomes easy for them to spend this money since it is in 'money that we earned from gambling' account. It is said that mostly the gamblers put the money they earnt in a different pocket than the money they brought with themselves. They call the money they have earnt from the gambling as 'house money' since a casino is considered as a house for the gamblers. Gamblers generally do not mix this money with their 'normal money' (Thaler, Sunstein, 2009, 51). With the same logic, an income from the lottery also can be considered as an "easy" income. However, in terms of rational behavior, the source of money must be an irrelevant factor when individuals decide how they would like to spend that money.

According to Thaler (1999, 184), there are 3 different compononets of mental accounting:

- **Evaluation of outcomes:** This component consists of perception and evalution of the outcomes.
- **Assignment of financal activities:** This component assumes that each financial activities are assigned to a particular account in individual's brain. For example, rent account, education account, food account, health account etc.
- **Evaluation period:** This component refers to the frequency of evaluation of the financial activities such as daily, weekly, monthly or annualy.

Mental accounting matters because the term 'fungibility' is violated in the presence of mental accounting. Fungibility of money assumes that the same amount of money should be perceived in the same way by individuals. For instance, every $100 must be evaluated and perceived in the same way by individuals regardless of the story of $100 such as from where this money comes and how this money was earnt, etc. However, this statement is violated when there is mental accounting. Because in the presence of mental accounting, some amount of money in one account can not be perfectly substituted by the same amount of money in another account. In prospect theory, the decisions do not depend on the outcomes, rather it depends on how the individuals evaluated the outcomes regarding losses and gains, thus mental accounting is

consistent. Therefore, mental accounting is consistent with prospect theory. “Hence, the role of the value function in mental accounting is to describe how events are perceived and coded in making decisions.” (Thaler, 1999, 184-185).

Other important terms in mental accounting are “opening” and “closing” the accounts. To explain this Thaler (1999, 189) illustrates one example. Consider someone buys 100 shares of stock that each of them costs $10. In total, he invested $1000. When the prices change, he has “paper” gain or loss, but when he sells the stocks he has “realized” gain or loss. This is exactly what we discussed under the disposition effect. According to mental accounting, closing an account at loss is painful, therefore it assumes that investors postpone realizing their losses and selling the investment since realizing the loss is the admission of loss and it is painful. Hence, the investors might tend to keep the account open until the point that they think they do not have any loss anymore. In the presence of mental accounting, investors might persist not to sell a losing investment since they have to admit the fact that they failed. Admission of such behaviors are painful for individuals, therefore they tend to keep the losing investment by keeping the account open. As a result, loss aversion contributes to mental accounting too.

Thaler (1999, 192) discusses another important term that is related to mental accounting that we find worthy to discuss: payment decoupling. Paying in advance for an item or service separates or “decouples” the purchase from the consumption. In this manner, it might decrease the perceived cost of each item or service. Prepayment can mostly bring this perspective even though it is not the only example of payment decoupling. For example, as many of the resorts, Club Med resorts (it is more like a global resort hotel) have a smart way of pricing policies. They have a fixed payment method for the vacations which includes many facilities that the clients can benefit from. This way of pricing is profitable for the sellers for some reasons. First of all, the cost of the vacation will be perceived as smaller by including other things such as accommodation, food, and flight. Secondly, if these facilities of the vacation would be sold separately, the price of each service would seem relatively higher. For instance, the clients might prefer paying a fixed cost for $1000 for the vacation instead of paying $400 for the flight and $200 for the accommodation seperately. When the clients see the salient prices, it may make them change their idea about purchasing the vacation (Thaler, 1980, 54). Piece-rate pricing links the purchase and the particular

consumption very clear and clients do not like to see salient prices. Therefore, usually, restaurants that serve dinner with several courses at a fixed price avoid pricing each food separately since each price might look salient (Thaler, 1999, 192).

Health clubs are another example of the prepayment method. They charge the clients monthly or annually instead of charging them per-use to decouples the usage and the payment. In this manner, they might make the clients feel that the marginal cost of the per visit is zero. Therefore, sunk cost also occurs since the clients have already paid for the service. The existence of sunk costs might increase the participation rates of the clients to such beneficial clubs. It is a good strategy to encourage individuals who have self-control problems (Thaler, 1999, 192).

Presumably, the best decoupling tool is credit cards. Credit cards decouple the shopping from the payment in some ways. It is a well-known fact that credit cards postpone the payment for a while after the purchase is done. Due to this fact, it is possible to consider the payment as separated from the purchase. This delayed payment might seem attractive for individuals who are not patient enough to wait or liquidity constrained. Secondly, when the payment day rolls around, the purchase is mixed with many other purchases. In this way, the payment seems relatively smaller in a big portion. When there is a big portion, each payment will lose its salience and will not look as clear as the case when each payment is done separately (Thaler, 1999, 193). Therefore, it has been widely accepted that paying by credit card increase individuals' willingness to spend more. For example, people who have more credit cards usually spend more (Hirschman, 1979, as cited in Prelec, Simester, 2001, 5). According to another finding, it was shown that credit cards increase the willingness to pay by 50% to 200% compared to the control group by creating a special experimental design (Feinberg 1986, as cited in Prelec, Simester, 2001, 5). However, paying by credit card or cash should be an irrelevant factor for purchases from a rational perspective. This also violates the fungibility of money.

According to Thaler (1999, 188-189), there are two kinds of utilities that people perceive: acquisition utility and transaction utility. "Acquisition utility is a measure of the value of the goods obtained relative to its price, similar to the economic concept of consumer surplus. Conceptually, acquisition utility is the value the consumer would place on receiving the good as a gift, minus the price paid." Transaction utility is the value that is perceived from the deal, namely the price which is paid for an item minus

the ‘reference price’. Reference price refers to the usual price that a consumer expects to pay for a good. Transaction utility can influence willingness to pay of individuals (and therefore demand). Thaler (1985, 206-207), demonstrates the importance of transaction utility with one example. A scenario was presented to some beer drinkers on a questionnaire form and it is given below:

Consider you are having a vacation and resting in a seaside. You are thirsty and you desperately need a drink. A friend of you will order a beer from the only place around you: either a fancy resort hotel or a small, run-down grocery store. Your friend asks your willingness to pay for a beer and he states that he will consider it as a reference price. More specifically, if the salesman says a number above your price, your friend will not buy it. What price would you tell your friend?

The question was presented in two different ways to the subjects: one used fancy resort hotel, while the other one used a small, run-down grocery store. According to the results, the median buying prices of the two questions were different: $2.65 (resort) and $1.50 (store). The willingness to pay off the subjects depended on the place where the beer was ordered. However, in standard economic theories, the place must be an irrelevant factor for the purchase.

Related to transaction utility, individuals might buy a product only because it is a good “deal”. Consider someone who does not need a sweater but tend to buy it since there is a discount on this sweater. The discount might make the price of the sweater below his reference point. Therefore, he may tend to buy it since it is a good deal. Therefore, sellers might push the clients to buy the product by stressing how much profit they might make if they buy the product (Thaler, 1999, 189)

As an example of a deal issue, Thaler (1999, 184-185), tells a story about his friend who would like to buy a bedspread for her double bed. When she arrives at the store, she realizes that there is a discount on the bedspreads and each sizes’ prices are $150. Normally, the store has three different prices for three different sizes of bedspreads: double size is $200, queen size is $250 and king size is $300. After seeing the discount, she decides to buy king size although it is bigger than her double bed. She is happy with her choice even though she needed a smaller one. In her purchasing decision, instead of focusing suitability of the bedspread, she focused on how much profit she could make by choosing the most expensive one although it is not a suitable choice for

her bed. She made her choice based on the discount, therefore we can relate this to transaction utility since there is a 'deal' issue.

According to Thaler (1999, 193), mental accounting consists of categorization or labeling processes. Individuals categorize the money into three groups: expenditure, income and wealth. Expenditures can be labeled as food, rent, entertainment, etc. Although everyone might have a different process of labeling, most of the individuals do not save small and routine expenditures such as buying a cup of coffee or a chocolate bar during the day. Sellers might benefit from this character of individuals. For instance, if a membership to service costs $180 per year, the company might frame it as $1 per day for the customers. This strategy effective because when the purchase is framed as $1 per year, it is considered in the petty cash category by individuals. Therefore, the customers might compare it with other unbooked small expenditures such as buying a bar of chocolate or a cup of coffee. However, when it is framed at $360 per year, it may be compared with other big budgets such as rent or groceries. This works reversely too. For example, a drug that helps people to quit smoking might be framed in the opposite direction by the sellers. The sellers can stress how much individuals can save per year ($1080) if they quit smoking instead of stressing it per day (i.e. $3). Shortly, many sellers aware of mental accounting and they create different strategies depending on the context. (Thaler, 1999, 193)

Now, let us continue with the empirical findings of mental accounting.

Examples and Applications

The existence of mental accounting allows individuals to categorize their money. Although it might be useful in some cases, it may result in biased and irrational decisions. Several examples are listed below to show how mental accounting creates irrational behaviors.

As we discussed before, a mental account is a frame for assessment. According to Kahneman and Tversky (1984, 346), the outcomes can be framed by individuals as minimal, topical or comprehensive accounts. The following experiment is able to explain these three accounts. A scenario was presented to 88 subjects as:

Problem 1

> "Imagine that you are about to purchase a jacket for $125 and a calculator for $15. The calculator salesman informs you that the calculator you wish to buy is on sale for $ 10 at

the other branch of the store, located 20 minutes drive away. Would you make a trip to the other store?"

The results: 68% of the subjects decided to go to the further place to benefit from the reduction in the price of the calculator.

The minimal account consists of a comparison of two possible outcomes and the features of the outcomes are an irrelevant factor for the minimal account. Therefore, in the minimal account, the profit of going to the further place is framed as a $5. The main concern of topical account is the assessment of the outcomes to a reference point which is determined by the context. Therefore, in the topical account, the reference point to buy the calculator is determined as $15. Moreover, in the topical account, the issue is framed as a reduction of the price from $15 to $10 if individuals decide to buy from the further store. The price of the jacket is an irrelevant factor in the topical accounts. The price of the jacket, however, is included in a comprehensive account that assumes that the profit that comes from the reduction should be evaluated in terms of the relativity of the saving with monthly expenditures.

When the question was reframed as a reduction in the price of the jacket, the results were quite different. In this framing, there is a $5 discount on the price of the jacket, namely the price of it $120. In this case, only 29% of 93 subjects were willing to go to further store to benefit from the reduction. This result demonstrates the importance of topical accounts since comprehensive and minimal accounts are identical in each problem. Hence, Kahneman and Tversky (1984, 346) assumes that:

> "The topical organization of mental accounts leads people to evaluate gains and losses in relative rather than in absolute terms, resulting in large variations in the rate at which money is exchanged for other things, such as the number of phone calls made to find a good buy or the willingness to drive a long distance to get one"

Most importantly, most of the subjects were willing to benefit from the discount when the reduction was from $15 to $10, while most of them were unwilling when the reduction was from $125 to $120. The amount is the same, thus people must have behaved similar from a rational perspective. Note that these findings are consistent with also ratio-difference principle as we discussed in framing effect. Reduction from $15 to $10 represents a higher ratio than reduction from $125 to $120. Thus, more people were willing to benefit from the discount in the initial problem.

With the same logic of fungibility of money, economists argued that time also should be fungible. If individuals are rational, they should be indifferent between the same amount of time in any context. More specifically, the marginal value of any extra time must be equal in all cases. In the previous example, most of the subjects were willing to save $5 in exchange for spending extra 20 minutes on a small amount of purchase, while most of them refused in a larger amount of purchase. It might work oppositely too. To demonstrate this, a group of subjects was asked how much they would sacrifice to avoid waiting in a ticket line for 45 minutes. Their findings reveal that to avoid waiting for 45 minutes, subjects were willing to pay two times more when the tickets were more expensive ($45, $15) (Leclerc, Schmidt, Dube, 1995 as cited in Thaler, 1999, 195). This shows that the value the subjects put on the time changed when the financial amount changed.

As another example of topical account, a famous example in behavioral economics is illustrated below by Kahneman (1984, 347-348):

Problem 1 (N =200)

"Imagine that you have decided to see a play and paid the admission price of $10 per ticket. As you enter the theater you discovered that you have lost the ticket. The seat was not marked and the ticket cannot be recovered. Would you pay $10 for another ticket?"

- Yes (46%)
- No (54%)

Problem 2 (N = 183)

"Imagine that you have decided to see a theater game where the admission is $10 per ticket. As you enter the theater you discovered that you have lost $10. Would you still pay $10 for a ticket for the play?"

- Yes (88%)
- No (12%)

It is not difficult to notice that the problems are factually equivalent. In both cases, subjects needed to pay an extra $10 to see the play. However, as the results show, individuals might perceive and assess the same amount of money in different ways

when it is presented differently. According to the authors, the inconsistency of the preferences of the subjects occurred due to the existence of the topical organization of mental accounts. Different frames evoked different accounts for people. Although the losses are factually identical, subjects did not treat all losses in the same way. When the ticket was lost, since buying the second ticket increases the cost of seeing the play, the majority of the subjects found it unacceptable. Presumably, when the bill was lost, the cost of the cash was not linked to the account of the play, it was rather linked to the account of cash or a general account. Therefore, most of the subjects find it acceptable. This problem consists of a framing effect too since in both cases people needed to pay an extra $10 to see the play.

According to Thaler (1999, 194-195), the nonfungibility of money can influence consumption. Individuals are careful not to mix the different budgets. It works the same way in organizations too: while one department might have used its all budgets; another department might still have a lot of unspent funds. For instance, in one study, two groups of subjects were asked if they would be willing to go to a basketball game. One group of subjects was informed that they already had spent $50 to go to a basketball game (same budget), while the other group of subjects was told that they had a parking ticket (different budget) that cost them $50. The results demonstrated that people who already went to a game were significantly less likely to go to the game compared to the other group of subjects who paid $50 for a parking ticket (Heath, Soll, 1996, 43).

As it was discussed before, treating money based on its source is a typical character of mental accounting and it creates irrational decisions. For instance, O'curry (1997) investigates this notion and he explores that individuals categorize both income and expenditure on a serious-frivolous scale. For instance, some amount of money which is earned in a competition is frivolous while an income that comes from a tax refund is perceived as serious. On the other hand, eating at a restaurant is frivolous whereas paying the bills is perceived as serious (O'curry, 1997 as cited in Thaler, 1999, 196-197). As an example of this statement, WTP of individuals for a vacation was more when they get $2000 as a gift than when they get the same amount of money as a work bonus (Henderson, Peterson, 1992 as cited in Heath and Soll, 1996, 41). Also, the likelihood of buying frivolous goods was more when individuals win some money from the football pool than when they received the same amount of money from the

extra work that they do at their job (O'curry, 1996 as cited in Heath, Soll, 1996, 41). As another example of this statement, Kooreman studies the spending behavior of families who receive money from the Dutch government for their children. When the financial aid by government was labeled as "children aid" the probability of using this money for children clothing is ten times more than other types of money. Presumably, the parents felt ethical responsible to use this money for children once the government tagged it as "children aid" (Kooreman, 2000, 571-583).

However, as we stressed many times in this study, the source must be an irrelevant factor for spending.

After analyzing applications of mental accounting in several areas, let us continue our study by analyzing sunk cost fallacy.

3.7. Sunk cost fallacy

When individuals attempt to make rational decisions, they should consider the future utilities of outcomes. Past costs must be an irrelevant factor for future decisions. However, individuals may tend to stick to losing investments or plans not to 'waste' their past costs and efforts. They might calculate how much investment and effort they put before and the past cost will be wasted if they would give up on their plans. Therefore, it may be painful for individuals to admit that they lost.

"The sunk cost effect is manifested in a greater tendency to continue an endeavor once an investment in money, effort, or the time has been made." Individuals may maintain these kinds of investments or efforts since they heavily weight past costs (Arkes, Blumer, 1985, 124). A cost can be considered as sunk when it is not possible to recover it. From a rational perspective, when a cost is sunk, it does not influence the marginal return of future decisions; thus, it does not have any impact on rational choices (Friedman et al., 2004, 79).

Loss aversion and sunk cost fallacy might bring explanations of some irrational behaviors of individuals and governments. Having a sunk cost might lead them to think that 'they had too much invested to quit'. Governments might persist in maintaining a policy which is already at lost, just to recover the sunk cost and avoid closing the account at loss (Jervis, 1992 as cited in Levy, 1996, 189). For instance, the military actions of the U.S. in the Vietnam War are good examples of this statement. U.S. forces

invested too much money and military forces into the Vietnam War. Although it was understood that finishing the war is more profitable than maintaining, many people supported the idea of maintaining the war until the great victory comes. Instead of stopping the War, the U.S. put more soldiers to the area and sustain the war. Later, they realized their mistakes and stopped the war. However, in the end, they had a bigger loss. They could take this decision much earlier to save a lot of money and lives (Arkes, Blumer, 1985, 126). As another government action and 'too much invested to quit' example, there is a memorable story in history. An aircraft project was constituted in 1956 by the British government and it was named 'Concorde' after the French government joined in 1962. Thus, it became a common project between the governments. After some time, it was understood that there are some problems with the project and it is better to quit. However, the governments continued investing in the project since they have already invested too much. (Teger, 1980 as cited in Arkes and Ayton, 1999, 591). Later these kinds of behaviors were called 'Concorde fallacy' (Dawkins, Carlisle, 1976, 892-896). It is very difficult to ignore sunk cost fallacy and choose a rational action by ignoring the past investment. Individuals and governments may be too sensitive about their past investments.

The sunk cost is in fact, the result of prospect theory and loss aversion. People do not like to close an account at a loss as we discussed on mental accounting. When people are at loss, they are risk seeker and they would like to try their chance by maintaining a past investment to not to close their account at loss. Therefore, the existence of sunk cost contributes to the disposition effect too. Keeping the losers and hoping that they might increase in value in the future is the main reason why investors maintain a losing investment.

Sunk cost fallacy occurs due to certainty effects too. For instance, when the sunk cost is included in a set of choices, it might lead individuals to choose the risky option (maybe it will cover its past costs and will become profitable in the future) over a certain option (stop investing the project). Certainty favors the initial option in this case. Stopping an investment or a plan is percieved as an acceptance of failure by individuals and the governments. The psychology behind "throw good money after bad" is that individuals tend to postpone admission of failure, and instead of stopping, they might foster this failure by investing more money (Arkes and Blumer, 1985, 132).

There are two psychological reasons which make people stick to their choices even if the choices include sunk costs: self-justification and loss aversion. Self-justification refers to the fact that just to avoid the unpleasant situation of admission of wasted resources, individuals might tend to invest more in a losing investment by hoping that the cost will be turned into profit in the long term by some additional investment. Loss aversion also contributes to sunk cost fallacy as we discussed before. Therefore, a combination of these notions creates sunk cost fallacy. Gambling might be one of the good examples of this statement. Individuals do not get over their loss easily and they give themselves more chances and reasons to correct all the mistakes they did by sticking to their investments, plans or choices (Friedman et al., 2004, 83).

Now, let us continue our study by discussing the applications of sunk cost fallacy.

Examples and Applications

Sunk cost fallacy is a very common fallacy in our daily life. Maintenance of an activity or a plan which is in loss and does not bring any positive outcomes anymore just because of past costs is a good example of sunk cost fallacy. It can be a book, a movie, a marriage, a career plan or an investment. We listed several examples of sunk cost fallacy regarding investment decisions and consumer choices.

Arkes and Blumer (1985, 129) observed sunk cost fallacy among the subjects in an investment decision. The following scenario was presented to the subjects:

Question 1: Consider yourself as a president of an airline company. You have already invested $10 million for a research project. The purpose of this project is building a radar-blank plane. When the project is completed 90%, you realized that another firm started building a radar-blank plane which is economically cheaper and faster than your project. Would you continue to invest the rest 10% for your research?

The result: 41 people replied as yes, 7 people replied as no.

Question 2: Consider yourself as a president of an airline company. You have been suggested to invest $1 million to build a radar-blank plane by your emplyoyees. However, after receiving this suggestion, you realized that another company has just begun to build a faster radar-blank plane with a cheaper cost. Should you invest the last one million dollar of your research funds to build the radar-blank plane?

The result: 10 people replied as yes, 50 people replied as no.

As the results show, more subjects were willing to continue the investment in the first question. This difference can be explained by the existence of sunk cost fallacy. In the

first question, the money is already invested: the cost is already sunk. In the second question, the money has not been spent yet. Therefore, the subjects reacted differently. However, economically, in both cases, there is no reason to continue this investment project.

As another example of sunk cost fallacy, the following scenario was presented to 87 subjects:

Consider you buy a portion of fast food on your way back home and you buy it for $3. After your arrival, you decided to invite your friend to accompany you. Once your friend says yes, you decided to buy the same food for your friend too, therefore you go back to the same place to buy it. However, the salesman tells you that there was a discount on this food when you bought it, but now the discount is over. Now, to purchase the food you need to pay the regular price that is $5. You decide to buy it anyway, but when you arrive home your friend tells you that he must cancel the meeting due to a compulsory reason. Considering you can only eat one of the portions since both of them are very big, which one would you eat?

According to rational choice, individuals should be indifferent between each portion since they are identical and the utility will be the same in each of them. Thus, the price of each portion should be an irrelevant factor in this case. However, the results showed that among 87 participants 66 people were indifferent between the choices, 21 subjects chose the one which costs $5 and only 2 subjects preferred the one that costs $3. Hence, 76% of the subjects were indifferent between the choices but this percentage must have been %100 from a rational perspective (Arkes, Blumer, 1985, 133).

Sunk cost fallacy may lead individuals to choose an option they would enjoy less than other options. The following question was presented to the subjects:

Consider you purchased a ticket for a ski trip to Michigan for $100. Later you found a better ski trip for $50 in Wisconsin and you purchased a ticket for this trip too. Later you noticed that the trips are overlapped. Considering you can only go to one of them, which one would you choose?

- $100 ski trip to Michigan
- $50 ski trip to Wisconsin

In the question, it was stated that the ski trip to Wisconsin is more attractive and the subjects will perceive more pleasure if they choose it. However, only 46% of the subjects chose this option, while the rest of them preferred to go to the one in Michigan. Past costs must be an irrelevant factor for future decisions. Therefore, it is expected

that all subjects will choose the one in Wisconsin considering the subjects will perceive more utility in this one. Paying for Michigan trip more than Wisconsin should not have influenced their decisions (Arkes, Blumer, 1985, 126-127).

In another example of sunk cost fallacy, it was investigated if the amount of payment will influence people's attendance to a series of theater games. The theater tickets were sold for a season in Ohio University Theater for 1982-1983 season. The sellers sold the tickets randomly at three different prices to the subjects: $15, $13 and $8. According to the attendance numbers, the ones who purchased the tickets at normal prices participated in theaters more than the other two groups of subjects in the first semester. However, from a rational perspective, the participants should have been equally likely to attend the plays regardless of the prices they have paid. The price of the tickets must have been an irrelevant factor for attending the play. In the second semester, there were no significant differences between the groups regarding the attendance rate. Presumably, the subjects ignored the sunk cost by time (Arkes, Blumer, 1985, 127-128).

Sunk cost fallacy was the last cognitive bias that we decided to analyze in this study. We will continue our study by analyzing the empirical findings from the experiments we conducted with students at Yıldız Technical University and the University of Wroclaw.

4. APPLICATIONS OF ANCHORING EFFECT AND LOSS AVERSION

In this section of our study, we will analyze two important cognitive biases that we selected from seven cognitive biases and heuristics that we analyzed in the previous section of this study. One of the cognitive biases we decided to analyze is the anchoring effect. We chose the anchoring effect because it is a quite influential bias and according to Furnham and Boo (2011, 35), it is one of the most robust ones. Also, as we discussed before, the findings of Wilson et al (387-402) demonstrated that individuals might be influenced by the anchor values even when there are prewarning manipulations. Moreover, it is quite interesting that an arbitrary number can influence the estimations and decisions of individuals even in important areas as we discussed under the anchoring effect title. Furthermore, anchoring is the only cognitive bias in our study that is not related to loss aversion. Therefore, we decided to choose the anchoring effect as one of the cognitive biases that we would like to analyze in this study.

For the second study, we decided to choose loss aversion. Loss aversion is important because it contributes to many cognitive biases and heuristics as we stressed several times in this study. Also, it is one of the most important results of prospect theory and its value function. Therefore, we can consider the study of loss aversion as a representation of other biases and heuristics that we analyzed in this study, except anchoring effect. With this motivation, as the second study, we decided to analyze loss aversion.

To conduct our experiments, we chose college students as sample sizes, and therefore we conducted our experiments in classroom environments. Some scholars argued that college students tend to display different behaviors than other late adolescents during the experimental process such as stronger cognitive skills and greater tendency to follow the authority (Sears, 1986, 521). On the other hand, Druckman and Kam (2009, 3) argues that Sears (1986, 515-529) does not provide any empirical findings that support his idea that student subjects pose a problem for experimental researches. According to him, using students as subjects does not create a problem for researches' external validity. "External validity refers to the extent to which the causal relationship

holds over variations in persons, settings, treatments (and timing), and outcomes" (Shadish, Cook, Campbell, 2001, 83 as cited in Druckman, Kam, 2009, 3). External validity investigate generally if this result happens in the outside of the experimental environment, namely in other experiments with different experimental designs. Internal validity of an experiment, however, refers to the design of the experiment. More specifically, it mostly investigates if the experiment is consistent and valid in itself and is there any causal relationship between the dependent and independent variables. This causal relationship is important regarding the internal validity of the experiment. Moreover, it also investigates if there is any biases in the experimental design such as omitted variable bias or a biased estimator (Druckman, Kam, 2011, 2).

An experimental design which is applied to both student and non-student samples demonstrated that there is no significant difference between the samples. In general, the means of the answers of the subjects were quite similar in the experiment that is about some topics related to politics such as partisanship, ideology, and political information, etc. Therefore, they could not find any significant difference between student and non-student samples (Kam, 2005 as cited in Druckman, Kam, 2011, 39).

Druckman and Kam (2011, 4-6) argues that there are many other dimensions of the external validity except for the characteristic of the sample such as settings, timing and the way of the employment. For instance, the same experimental research might provide different results in different time contexts. This might happen due to the nature of the world at that time. The authors conclude that especially political scientists are obsessed with the sample by ignoring other important dimensions of the external validity. When questioning the external validity of an experimental research, they must include all the dimensions of the external validity. They also conclude that during the evaluation of external validty, experimental realism is important and using students as subjects does not reduce the experimental realism (Druckman, Kam, 2011, 23-24). Moreover, as we stressed before, according to the authors, using students as subjects does not pose a problem for experimental researches.

After discussing our preferences for our studies, let us continue our study by analyzing each experiment that we conducted with students and their empirical findings. We will start with anchoring effect and later, we will analyze loss aversion.

4.1. An Application Example of Anchoring Effect

As we discussed before, anchoring is a type of cognitive bias which leads individuals to take unrelated information and consider it as a reference point to form a judgment about unknown values. One of the first examples of anchoring effect was illustrated by Tversky and Kahneman (1974, 1124-1131). In their first study regarding the anchoring effect, they asked subjects to estimate the number of African members in the UN after they spin a wheel fortune. As we analyzed before, the numbers the subjects received from the wheel fortune, influenced their estimations significantly (Tversky, Kahneman, 1974, 128). Moreover, we illustrated several examples of anchoring effect on the marketing sector, WTP decisions, negotiations, consumer choices, real estate appraisals and estimations, predictions about unknown values such as global warming beliefs and punishment decisions of judges.

To see if the anchoring effect will be observable in our example, we conducted an experiment at the University of Wroclaw in Poland with overall 90 undergraduate Law students. 56 of these students were male and 34 of them were female. There were 30 students in the first group, 29 in the second, and 31 in the third group. I decided to choose this sample size since I used to be an exchange student at the University of Wroclaw at that time. It is a natural process for researches to choose the place as a research field they belong to. For instance, one of the most important behavioral economist, Dan Ariely, who is a professor at Duke University, analyze several experiments that he conducted at Duke University (Ariely, 2009,1-242). Therefore, I chose the University of Wroclaw as a research field to conduct the experiment regarding the anchoring effect.

Now, let us analyze the design of the study.

4.1.1. Design of the Study

As a first task, in order to overcome the language barrier, I chose English classes for my study. Thus, subjects were able to understand English. Moreover, I kindly asked professors to translate the questionnaire forms into Polish to be sure that the subjects understood their tasks.

As a design of the study, the subjects were randomly assigned to three different groups. The first group of subjects was asked to estimate the number of cities in Turkey without

any information. Therefore, we can consider this group of subjects as a control group. In the second group, we asked a piece of additional information from the subjects. We asked them to write the last two digits of their phone number to the questionnaire paper that we distributed them. They received the same question as to the previous group of subjects. In this manner, we aimed to test if the subjects will be influenced by the last two digits of their phone number when they estimate the number of cities in Turkey. Therefore, this value must be considered as an arbitrary number since the last two digits of their phone number can not give any information about the number of cities in Turkey. Hence, in the second experimental design, we can consider the last two digits of students' phone numbers as 'incidental anchor'. To further our study, we aimed to test what will happen if we explicitly direct them to use this value when they estimate the target value. More specifically, we explicitly asked them if they can consider this number as a possible answer to estimate the target value. In this case, we expected from the subjects to be influenced by the anchor value more than the second group.

The questionnaire forms that we randomly distributed to the subjects are presented below:

Group 1

- What is your best guess about the number of cities in Turkey?

Group 2

- Please write the last two digits of your phone number.
- What is your best guess about the number of cities in Turkey?

Group 3

- Please write the last two digits of your phone number.
- Is the number of cities in Turkey less or more than the number you wrote above? What do you think? Less or more?
- What is your best guess about the number of cities in Turkey?

In this study, we aimed to test following two hypotheses:

- ***H_1:*** *An arbitrary or uninformative number can influence the estimations of people on average when they need to estimate an unknown value.*
- ***H_2:*** *When the subjects are explicitly directed to the anchor value, the influence of the anchor value in the estimations of the subjects will increase.*

To sum up, we aimed to compare the mean of the predictions of the subjects in each group. In the second group since the subjects wrote down the last two digits of their phone number, we expected from them to be influenced by this number on average. With the same logic, in the third group since we explicitly invited the subjects to use the anchor as a possible answer, we expected from them to be influenced more than the subjects in the second group, on average. In this manner, it will be also possible for us to compare the influences of incidental anchor (second group), and the anchor we aimed to create by inviting them to use (third group).

4.1.2. Method of the Study

To interpret our results, we used the SPSS program. We calculated the mean of the estimations and the standard deviations of each group. Moreover, to see if there is a significant correlation between the anchor values and estimations, we calculated the correlations in the second and the third group. Anchors might influence the decisions of individuals even when they are uninformative (Wilson et al., 1996, 388-400). In our experiments, we did not find a significant correlation between the anchor values and estimations of the subjects. However, since our main purpose was determining if there are any significant differences between the mean of the estimations when we present anchor values, we continued our study by comparing the mean of the estimations of each group. We expected to find a significant effect size between the groups. To calculate it, we used Cohen's d effect size. Cohen's d effect size is one of the most common effect size calculator. Therefore, we will use it to determine whether our results are meaningful.

Cohen's d effect is one of the most common effect size calculator. Cohen (1988, 20) formulated it as follows:

$$Cohen's\ d = \frac{M_2 - M_1}{PooledSD}$$

Moreover, since our sample sizes are less than 50, we needed to use a correction factor. (Hedges, Olkin 1985, as cited in Durlak, 2009, 919).

$$Correction\ Factor = \frac{N-3}{N-2.25} * [\sqrt{\frac{N-2}{N}}]$$

Now, let us continue our study by presenting the results from three different groups.

4.1.3. Results

First of all, we determined 5 outlier estimations in the study in three group of subjects (2 in the first group, 1 in the second group, and 2 in the third group). Therefore, we made our statistical analysis among 85 subjects overall. In the first group, since we did not present any anchor value, we only have estimations of the question. According to the results, the subjects estimated the number of cities in Turkey as 1181 on average. In the second group, they estimated this value as 838 and 411 in the third group on average. More detailed results are presented below.

Table 3: Results of the Experiments

	Last two digits of students' phone number on average (Approx)	**Estimations of students on average (Approx)**
Group 1		1181
Group 2	59	838
Group 3	52	411

A multiple line graph of the number of cities over the case number can be plot for the statistical analysis where the lines represent the groups.

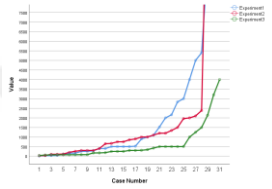

Figure 3: Distributions of the Estimations

- In Group 1, 17 subjects estimated the number of cities to be less than 500 and then it gradually increased.
- In Group 2, 26 subjects estimated the number of cities to be less than 2000 and then it gradually increased.
- In Group 3, 26 subjects estimated the number of cities to be less than 5000 and then it increased remarkably.

Table 4: Basic Statistical Analysis of the Experiments

	Group 1	Group 2	Group 3
Mean (Approx)	1181	838	411
N	28	28	29
Standard Deviation	1510	680	485

The statistical analysis states that the standard deviation and the mean of the estimations is the highest in group 1, lower in group 2 and the lowest in group 3. Since group 3 has the smallest standard deviation, it can be said that the data is closer to the mean value on average relatively to the other groups.

Table 5: Correlation Analysis of the Second Group

		Last two digits of phone number of students (Approx)	Estimations of students
Last two digits of phone numbers	Pearson Correlation	1	,037
	Sig. (2-tailed)		,850
	N	28	28
Estimation of students	Pearson Correlation	,037	1
	Sig. (2-tailed)	,850	
	N	28	28

The correlation between the last two digits of the phone number of students and the mean of the estimations regarding the number of cities in Turkey is very low (0,037) and since our 2-tailed significant level (0,850) is higher than our p-value (0.01), the results are statistically not significant. Therefore, there is no significant correlation between the last two digits of the phone number of students and the estimations regarding the number of cities in Turkey in the second group.

Table 6: Correlations Analysis of the Third Group

		Last two digits of phone number of students (Approx)	Estimations of students
Last two digits of phone numbers	Pearson Correlation	1	-,112
	Sig. (2-tailed)		,564
	N	29	29
Estimations of students	Pearson Correlation	-,112	1
	Sig. (2-tailed)	,564	
	N	29	29

The correlation between the last two digits of the phone number of students and the mean of the estimations regarding the number of cities in Turkey is very low (-0,112) and since our 2-tailed significant level (0,564) is much higher than our p-value (0.01),

the results are statistically not significant. Therefore, there is no significant correlation between the last two digits of the phone number of students and the estimations regarding the number of cities in Turkey in the second group, according to the statistical results. Moreover, the correlation is negative but it is not at a significant level.

To sum up, we could not find a significant correlation between the anchor value and the estimations in group 2 and group 3. However, we assume that there must be a significant effect size between the groups due to high differences in the estimations in each group. There are remarkable decreases between the estimations of groups on average. More specifically, since the mean of the estimation is highest without an anchor value, when there is an arbitrary anchor it is getting closer to the anchor value and when the subjects were explicitly directed to the anchor value it is getting much closer to the anchor value, we must calculate the effect sizes between group 1-2 and group 2-3.

4.1.4. Effect Size Calculation and Discussion

Since our main purpose is comparing the anchoring effect between the groups and observe if they are influenced when we increase the level of anchoring, we would like to maintain our analysis with the calculation of Cohen's d effect size to compare the means of the estimations. Cohen's d effect is one of the most common effect size calculator. Cohen (1988, 20) formulated it as follows:

$$Cohen's\ d = \frac{M_2 - M_1}{PooledSD}$$

$$PooledSD = \sqrt{\frac{1}{2}(SD_1^2 + SD_2^2)}$$

To calculate the formula, we must calculate all the indicators which are given in the formula. The components of the formula are:

- **M_1** = The mean of group 1
- **M_2** = The mean of group 2
- **SD_1** = The standard deviation of group 1
- **SD_2** = The standard deviation of group 2

We know all of the indicators that are given in the formula from the Table 4. Therefore, we can calculate Cohen's d effect size easily. Let us calculate it:

$$\frac{M_2 - M_1}{\sqrt{\frac{1}{2}(SD_1^2 + SD_2^2)}}$$

$$\frac{1181 - 838}{\sqrt{\frac{1}{2}((1510)^2 + (680)^2)}} = 0.29$$

Since our sample is smaller than 50, we need to use a correction factor (Hedges, Olkin 1985, as cited in Durlak, 2009, 919).

$$Correction\ Factor = \frac{N-3}{N-2.25} * [\sqrt{\frac{N-2}{N}}]$$

Since in both group 1 and group 2 the sample sizes are equal (28), we can put it on the formula. After making a proper calculation, we can find the correction factor as follows:

$$Correction\ Factor = \frac{25}{25.75} * [\sqrt{\frac{26}{28}}$$

$$Correction\ Factor = 0.92$$

If we multiply correction factor with 0.29, we can find Cohen's d effect size as follows:

$$Cohen's\ d\ (1,2) = 0.29 * 0.92 = 0.26$$

According to Cohen (1988, 25-27), effect sizes are described as small if Cohen's d = 0.2, medium, if it is equal to 0.5, and large if it is equal to 0.8. Since 0.5 > 0.26 > 0.2 we can say that there is a small effect of the anchor value in the estimations of the second group. More specifically, the effect of the anchor value in the second group is significant since our effect size is meaningful.

After calculating effect size between group 1 and 2, let us calculate it between group 2 and group 3 as well. If we do the same calculation as we did in previous example we can find it as:

$$\frac{838 - 411}{\sqrt{\frac{1}{2}((680)^2 + (485)^2)}}$$

$$\text{Cohen's d} = 0.72$$

We need to use the correction factor here as well since our sample sizes in each group are smaller than 50. We will use the sample size of the second group in the formula to calculate the correction factor since it is our control group compared to the third group. Also, our sample sizes are almost the same considering in the third group there is only one more participant.

$$Correction\ Factor = \frac{N-3}{N-2.25} * [\sqrt{\frac{N-2}{N}}]$$

$$Correction\ Factor = \frac{25}{25.75} * [\sqrt{\frac{26}{28}}$$

$$Correction\ Factor = 0.92$$

$$Cohen's\ d\ (2,3) = 0.72 * 0.92 = 0.66$$

Since 0.8 > 0.66 > 0.5, there is medium size effect between the second and the third group. From the first group to the second group, since the level of anchoring effect increases from zero to a significant level, and it also increases from the second group to the third group in a significant level according to our results from the Cohen's d calculations, we can say that our hypotheses are correct and we can not reject them.

After interpreting our results, let us continue our study by the discussion of the results. The predictions are high on average in general if we compare them with the anchor values and the real answer to the number of cities in Turkey (81). Also, we could not observe a significant correlation between the anchors and the estimations. However, it drew our attention to why the predictions are this much high. We kindly asked one of the students about the number of cities in Poland after the experiment to see if their answer was under the influence of the number of cities in Poland. Because individuals tend to find an anchor to make their estimation about an unknown value even in the absence of an anchor value. The student said that there are around 900 cities in Poland. To be sure, we searched it and found out that there are more than 900 cities in Poland. According to the results, the mean of the estimations in the first group is1181. Considering we did not give any anchor value in the first experiment, presumably, the

subjects considered the number of cities in Poland as an anchor value. Since they do not know the number of cities in Turkey, presumably they adjusted the number of cities of Poland to their estimations regarding the number of cities in Turkey. In the second group, the estimations are lower on average than the estimations of the first group and number of cities in Poland. This can tell us that the anchor is at least particularly influenced by the estimations of the subjects on average since we found out a small effect size. We consider this anchoring effect in the second group as an incidental anchor since the anchor value is not informative. In the third group, since the level of anchoring increases when we explicitly directed them to use the anchor value as a possible answer for their estimations, the mean of the estimations decreases on average compared to the second and the first groups. The influence increased when we increased the level of the anchoring effect, but the correlation is still very low between the numbers and estimations. The mean of the estimations in the second group is more or less twofold of the third group.

We can also infer that since effect size between the third and the second group (0.66) is higher than the effect size between the first and the second group (0.26), inviting the subjects to use the anchor value was more effective than the incidental anchor according to our results. The impact of the anchoring increased when we increased the level of anchoring.

In our study, we tested the general knowledge of the subjects by asking them about the number of cities in Turkey. In anchoring literature, general knowledge estimations are one of the most commonly studied subjects. For instance, Epley and Gilovich (2001, 391-396), asked several estimation questions such as “How many states were in the United States in 1840?” or “What is the freezing point of vodka” to the subjects. In another study of them, Epley and Gilovich (2005, 199-212) tested the general knowledge of the subjects with several questions such as “What is the population of Chicago” or “What is the height of Mount Everest”. The famous example of Tversky and Kahneman (1974, 1124-1131) who asked the subjects to estimate the number of African nations in the United Nations is another estimation example in the anchoring literature.

One of the most valuable features of our study was the way of determining the anchor values. In our study, the anchors were determined by the subjects in the natural environment of the experimental design. Therefore, the anchors were both random and arbitrary. However, we still observed a significant change at overall group estimations

considering our effect size calculations between the groups were significant (0.26 between the first and the second group and 0.66 between the second and the third group).

In most of the studies about the anchoring effect, the anchor values were not determined randomly. More specifically, the anchors were given by the experimenters instead of a random selection process. In many of them, there were low and high anchors that were given by the experimenters. As the next step in a typical anchoring effect analyzes, the mean estimations of low and high anchors are compared to measure the anchoring effect. In this manner, the comparison can help us to measure the impact of anchoring. Many psychological indicators can be demonstrated experimentally but most of them are hard to be measured. Fortunately, it is possible to measure the anchoring effect. An anchoring index can be calculated and easily interpreted. Anchoring index is very easy to calculate. The formula of anchoring index is given as follows:

$$\frac{\text{Median (High Anchor)} - \text{Median (Low Anchor)}}{High\ Anchor - Low\ Anchor}$$

As we can see in the formula, to calculate the anchoring index, we must know the high and low anchors. We must also know the mean estimations of individuals who received high and low anchor values. An anchoring index should be between 0 and 1. Zero anchoring index means there is no anchoring effect while one represents the average predictions by the participants match up with the value which they took as a reference (anchor) to shape their decisions (Kahneman, Jakowitz, 1995, 1162).

For example, we can calculate the anchoring effect in the German judges' example that we discussed before under the title of anchoring effect. When the anchor value was 3, the median of the answers were 5 (months), when the anchor value was 9, the median of the answers were 8 (months). Therefore, our calculations regarding anchoring index will be as follows:

$$\frac{8 - 5}{9 - 3} = 0.5\ or\ 50\%$$

In another example of low and high anchors, the participants were asked to estimate the annual mean temperature in Germany. The subjects were exposed to two different anchors: low anchor as 5 degrees or high anchor as 20 degrees. The ones who were exposed to a higher anchor estimated the annual mean temperature in Germany

approximately 2 degrees more than the ones who were exposed to low anchor (Mussweiler, Englich, 2005, 135-136). The WTP decisions of the subjects to rescue the seabirds that we analyzed under the anchoring effect title is also an example of low and high anchors. The low anchor was presented as $5 and the high anchor was given as $20 in the study (Green, Jakowitz, Kahneman, McFadden, 1998, 96-97). Also, estimating African nations in the UN with a low anchor (10) and high anchor (65) is another example of this type of anchoring.

As another form of anchoring design, Strack and Mussweiler (2000, 495-518) represented low and high anchors in a plausible anchoring form (an anchor that can be a possible answer of the question), or in an implausible anchoring form (an anchor that can not be considered as a possible answer) to the subjects. They asked the subjects to estimate the age of Mahatma Gandhi when he died. In the implausible anchoring form, the subjects were given 9 (low anchor) and 140 (high anchor). In plausible anchoring form, the subjects were given 61 (low anchor) and 86 (high anchor). 61 or 86 can be possible answers since it can be expected from a human being to die in this range of age, while 9 or 140 does not seem possible answers for the estimation question.

Epley and Gilovich (2001, 391-396) analyze several examples about creating an anchor value by the type of question. For instance, in one study the subjects were asked to estimate in what year George Washington was elected as a president. Most of the subjects know that the U.S. gained its dependence in 1776, therefore the presidency of George Washington must be after this period. Therefore, the subjects could make their estimation by taking this date as a reference and adjust it to a reasonable answer. In this example, 1776 was a natural anchor and therefore these types of anchors were called self-generated anchors. In their study, the main purpose was comparing the results of self-generated anchors with a given anchor by the experimenters. According to their results, self-generated anchors led the subjects to explain their estimation process with anchoring and adjustment significantly more than the ones who were given an anchor value by the experimenters. However, this is still completely different than our selection process of anchoring.

In one of the exceptional study that was conducted by Ariely, Loewenstein, and Prelec (2003, 73-103) to test the impacts of anchoring effect in WTP decisions, the anchor values were determined randomly. It was asked the subjects to write the last two digits of their social security numbers in a paper. In this way, they attempted to analyze if

these anchor values will be any influence on the WTP decisions of the subjects. Next, a bunch of products (computer accessories, wine bottles, luxury chocolates, and books) was shown them. Later, they were asked if they would be willing to pay the numbers they wrote down on their paper as a dollar for these products. The first question consists of acceptance or rejection. As a second question, the students were asked how much they would be willing to pay (maximum) for each product. To interpret the results, social security numbers of students were divided into 5 categories. For instance, the highest anchors are from 80 to 99 and the lowest is from 1 to 20. The results revealed that the higher the anchors are, the higher the willingness to pays were. For instance, the students with the lowest-ending social security numbers were willing to pay $11.73 for rare wine while the students with highest-ending social security numbers were willing to pay $37.55. The results were similar for each product. "Overall, subjects whose social security numbers above the average refers values from 57% to 107% more than did subjects whose social security number below the average". In general, in 5 different categories regarding the anchor values and in 6 different products, the authors determined a significant correlation between the anchor values and WTP of the subjects. The correlations were found between 0.3 and 0.5 at 6 different products. (Ariely, Loewenstein, Prelec, 2003, 75-76). In their study, instead of fewer or more options, the conductors asked the subjects if they would be willing to pay the same amount with the anchor value to several products. More specifically, the subjects were asked to accept or reject to pay the same amount with the anchor value. However, our issue was required a less or more question since it was based on an estimation problem instead of WTP decision. We can state that the third group in our study was inspired by this example. In their study, instead of fewer or more options, the conductors asked the subjects if they would be willing to pay the same amount with the anchor value to several products. More specifically, the subjects were asked to accept or reject to pay the same amount with the anchor value. However, our issue was required a less or more question since it was based on an estimation problem rather than a WTP decision.

Nevertheless, as we stressed before, our main target was not based on the observation of the correlation between the anchor values and the estimations. We aimed to observe the degree of anchoring between the mean estimations of each group. Therefore, we attempted to observe the impacts of different levels of anchoring effect in the

estimations of the subjects. In the second group, we removed the fewer or more question that we presented in the third group. In this way, it became possible for us to make an observation regarding the impacts of different types of anchoring by comparing the estimations of the subjects on average in each group. To observe this impact we used Cohen's d effect size calculator and calculated it easily.

In the anchoring literature, we could not find any study that compares the different types of anchors regarding the estimations of the subjects on average in different groups. Considering we created three different groups and estimated the mean estimations of all groups, our study allowed us to compare different levels of the anchoring effect. In this manner, we hope that we made a small contribution to anchoring literature by conducting this study about the anchoring effect.

After discussing the results of the anchoring effect, we would like to continue our study by analyzing the loss aversion example that we conducted with students at Yıldız Technical University.

4.2. An Application Example of Loss Aversion

In this section, we will analyze loss aversion and its empirical findings from the experiment that we conducted. As we discussed, loss aversion contributes to many cognitive biases and heuristics and it is one of the most important results of the prospect theory value function. Moreover, we listed several examples regarding loss aversion in some important economic behaviors such as consumption, saving and investment behaviors. With this motivation, we conducted an experiment with undergraduate students from the Political Sciences department and the Business Administration department at Yıldız Technical University. The experiment was conducted in classroom environments with 111 undergraduate students under the permission of the professors of the courses. There were only 7 students from Business Administration Department and the rest of the students were from the Political Sciences Department. 47 of the subjects were male and 64 of them were female. We collected the data from 3 different courses.

We set our aim to investigate the main explanation of loss aversion: individuals evaluate losses and gains differently; in the case of gains they are risk-averse, whereas in the case of losses they are risk-seeker. For our study, we selected an example from

Kahneman and Tversky (1984, 344) and replicated it in our experiment. Firstly, we would like to give the example from the authors to see the design and the results of their study. Later, we will present our example.

The authors conducted the experiment with 150 subjects. The subjects were asked the following questions that each of them consists of 2 available options.

"Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer."

Choose between:

- **A.** a sure gain of $240
- **B.** 25% chance to gain $1000 and
  75% chance to gain nothing

Choose between:

- **C.** a sure loss of $750
- **D.** 75% chance to lose $1000 and
  25% chance to lose nothing

The results: The experiment was conducted among 150 students. Option A is chosen by 86% of the subjects while B is chosen by 14% of the subjects. Also, C is chosen by 87% of the subjects while D is chosen by only 13% of the subjects.

Firstly, let us calculate expected utility of each outcome to analyze the results.

$$EU\ (A) = EU(240) = \$240 \text{ (Gain)}$$

$$EU(B) = 1000 \times 0.25 + 0 \times 0.75 = \$250 \text{ (Gain)}$$

$$EU(C) = \$750 \text{ (Loss)}$$

$$EU(D) = 1000 \times 0.75 + 0 \times 0.25 = \$750 \text{ (Loss)}$$

We could expect from the subjects to choose B over A since its expected utility is higher. Also, we could expect from them to be indifferent between C and D since their expected utilities are the same. Therefore, there is a clear violation of EUT in both gains and losses.

Moreover, the results demonstrate a typical loss aversion effect. In the domain of gains, most of the subjects were risk-averse, thus they chose a certain option while

in the domain of losses most of them were risk seeker, therefore they chose the gamble.

4.2.1. Design of the Study

To make our study more suitable and meaningful for our conditions, instead of dollar, we decided to use Turkish lira. Moreover, we deleted the zeros at the end of each numbers in the example. Hence, our experimental design that is inspired and replicated by the study of Kahneman and Tversky (1984, 341-350) is given below:

"Imagine that you face the following pair of concurrent decisions. First examine both decisions, then indicate the options you prefer."

Choose between:

- **A.** a sure gain of 24 Turkish lira
- **B.** 25% chance to gain 100 Turkish lira and
  75% chance to gain nothing

Choose between:

- **C.** a sure loss of 75 Turkish lira
- **D.** 75% chance to lose 100 Turkish lira and
  25% chance to lose nothing

We asked the questions to the subjects at this format. Now, let us present the results of the study to see if they are risk averse in the domain of gains and risk -seeker in the domain of losses.

4.2.2. The results, Statistical Analysis and Discussion

The numbers and percentages of the subjects are presented next to each options. The results reflect a typical characteristics of loss aversion. In the domain of gains, most of the subjects were risk averse, while they were risk seeker in the domain of losses. However, in the domain of gains, the differences were not too big.

- **Option A** was chosen by 62 subjects (56%)
- **Option B** was chosen by 49 subjects (44%)

- **Option C** was chosen by 24 subjects (22%)
- **Option D** was chosen by 87 subjects (78%)

First of all, we should calculate the expected utility of each outcome to analyze the results.

$$EU\ (A) = EU(24) = \$24 \text{ (Gain)}$$

$$EU(B) = 100 \times 0.25 + 0 \times 0.75 = \$25 \text{ (Gain)}$$

$$EU(C) = \$75 \text{ (Loss)}$$

$$EU(D) = 100 \times 0.75 + 0 \times 0.25 = \$75 \text{ (Loss)}$$

According to EUT, in the domain of gains, since EU(B) is higher than EU(A), we could expect that the subjects will prefer B over A. In the domain of losses, since EU(C)= EU(D), we could expect from the subjects to be indifferent between the choices. According to the results, there is a violation of EUT in both gains and losses. More subjects preferred A over B, and the subjects were not indifferent between C and D in the domain of losses.

Moreover, the results demonstrate a typical loss aversion effect. In the domain of gains, most of the subjects were risk-averse, therefore they chose a certain option while in the domain of losses most of them were risk seeker, therefore they chose the gamble.

As a more detailed analysis, 71% of the subjects who preferred option A in the first question, preferred also D in the second question. In fact, this is the sample we aimed to investigate. Because this also means that 71% of the subjects are risk-averse when they face with positive outcomes (gains), while they are risk-seeker when they face with negative outcomes (losses). As we discussed while analyzing prospect theory and loss aversion, this is the definition of loss aversion. Therefore, this sample is a crucial sample for our study.

As we discussed before, the main reason why loss aversion occurs is reflection effect. According to the reflection effect, similar gains and losses are percieved and evaluated differently. More specifically, individuals are risk-averse in the domain of gains, while they are risk-seeker in the domain of losses. We would like to list a few examples regarding reflection effect.

Problem 1 (N= 66)

- $3.000 with 0.90 probability (86%)
- $6.000 with 0.45 probability (14%)

Problem 1' (N= 66)

- -$3.000 with 0.90 probability (8%)
- -$6.000 with 0.45 probability (92%)

Problem 2 (N= 66)

- $3.000 with 0.002 probability (27%)
- $6.000 with 0.001 probability (73%)

Problem 2' (N= 66)

- -$3.000 with 0.002 probability (70%)
- -$6.000 with 0.001 probability (30%)

As we can see from these examples Kahneman and Tversky (1979, 363-391), Kahneman and Tversky (1984, 341-350) illustrated several types of loss aversion. In these four examples, most of the subjects violated the principles of EUT. In problem 1 and problem 2, although expected utility of the prospects are the same in each option, most of the subjects preferred the more certain option over less certain option in the domain of gains, therefore they were risk-averse. However, they preferred the less certain option over more certain option in the domain of losses, therefore they were risk-seeker. This is a typical characteristics of loss aversion bias.

In general, if we compare our results with the study of Kahneman and Tversky (1984), especially in the first question the percentage of subjects who preferred A is much less than their study considering this percentage is 86% in their study. Therefore, we could not observe a high level of tendency to risk-averse behavior in the domain of gains. In the second question, however, our results are similar to their results since option D was chosen by 78% of the subjects considering this percentage is 87% in their study. Moreover, we found another similarity between our study and their study. In their study, 73% of the subjects preferred A and D. In our study, this percentage is 71 as we discussed before. The numbers are very similar to each other. Therefore, we must stress again that 71% of the subjects

were risk-averse in the domain of gains and risk-seeker in the domain of losses in our study. Hence, we can conclude that this sample size was replicable in our study if we compare it with the results of Kahneman and Tverksy (1984). As another conclusion, seeking risk in the domain of losses is higher than averseness of gains considering 78% of the subjects were risk seeker in the domain of losses and 56% of the subjects were risk-averse in the domain of losses.

We believe that loss aversion is a crucial cognitive bias considering we found many implications of it in important areas of economics such as investment, consumption and saving behaviors. Moreover, loss aversion is one of the main reasons for many cognitive biases and heuristics such as status quo bias, endowment effect, sunk cost fallacy, and even mental accounting as we stressed many times in this study. Furthermore, it is able to explain the equity premium puzzle that can not be explained by standard models in economics. Also, it is the main reason for the disposition effect and ikea effect. Therefore, the findings of loss aversion are important due to the fact that it has many implications in several areas in economics and it is able to explain some inconsistent behavior of individuals that standard models are not able to explain.

We would like to give one implication example of loss aversion to stress its importance one more time. There is some evidence that the endowment effect and therefore loss aversion can influence the real estate markets. Some data from Boston real estate market in 1990 during an economic recession demonstrates that householders ask higher selling prices than the market prices since they were not willing to sell their houses lower than their buying prices. For a rational person, market prices should be important rather than buying prices. In Boston housing markets at that time, sellers behaved as opposed to this statement. When the prices of houses decrease after a boom, since owners have higher reference points to sell their houses, their loss aversion coefficient becomes higher. Thus, they make extra efforts and work to sell their houses at higher prices than the market. Yet, instead of this reference point, if they would be rational, they would ignore this reference point and adjust their reference to the market prices. The data from the Boston real estate market shows that the householders asked 25-35% more than the market prices at that time. As a result, they earned 3-18% more than the market prices. According to the results, the correlation between price and volume

in real estates is positive and this is consistent with prospect theory (Genoseve, Mayer, 2001, 1233-1260).

In this section of our study, we analyzed the anchoring effect and loss aversion bias with their empirical findings from classroom experiments that we conducted.

5. CONCLUSION

The rationality principle in economics is discussed and questioned over the last decades. Because experimental findings strongly claim that some real-life examples of the economic behavior of individuals demonstrate systematic deviations from rationality. Hence, the critics of rationality or rational choice theory argue that rationality must be questioned due to many examples of violations of rationality in real life. More specifically, since the economic theory is not consistent with some real-life examples, rationality must be questioned. Therefore, describing individuals as rational must be replaced by so-called bounded rational. Bounded rationality is a term that claims that the rationality of individuals is limited because of several factors such as environmental limitations, time constraints and cognitive limitations of the human brain.

As a result of bounded rationality, cognitive limitations of individuals remark many cognitive biases and heuristics that individuals display during their decision-making process under risk and uncertainty. Especially prospect theory and its value function demonstrate some important cognitive biases and heuristics. The most important finding of prospect theory is loss aversion and its interpretations explain much inconsistency in the economic behavior of individuals. Cognitive biases and heuristics are important because their analysis can provide meaningful explanations to the inconsistent economic behavior of individuals. Therefore, we aimed to analyze seven important cognitive biases and heuristics in this study: loss aversion, status quo bias, endowment effect, anchoring, framing effect, mental accounting and sunk cost fallacy. Later, we presented the empirical findings of anchoring effect and loss aversion from the experiments that we conducted.

The most general economic analysis of cognitive biases and heuristics comes from behavioral economics. Behavioral economics is a branch of economics which attempts to reunify economics and psychology to explain the economic theory in a better way. While providing a psychological basis to economic theory, behavioral economics does not reject all of the standard economic assumptions. They continue using standard

methods in economics while attempting to explain economic behavior more comprehensively. Moreover, bounded rationality is firstly emphasized by Herbert Simon in 1955, who is one of the most important behavioral economists.

In this study, we aimed to discuss rationality principles in economics. Later we attempted to show empirical findings of cognitive biases and heuristics among several types of economic behaviors; such as consumer choices, individual decisions in risky choices, investment decisions, saving behaviors, willingness to pay, public policies, saving behaviors, negotiations, and real estate appraisals. We believe that cognitive biases and heuristics are quite important since they can provide strong explanations to several economic behaviors that it is not possible to understand by standard economic assumptions. In the last part of our study, we presented empirical findings from two important cognitive biases: anchoring effect and loss aversion. Our findings also provided inconsistency of an individual's behaviors although these inconsistencies are not as big as the findings that we provided from the literature.

We believe that understanding cognitive biases and heuristics is crucial since they can provide meaningful explanations to some inconsistent behavior of individuals and governments where standard economic assumptions are not able to explain. Also, they can be used to provide better results in some problematic issues in the society. For instance, status quo bias is able to increase the retirement saving rates and organ donations. To conclude, understanding cognitive biases and heuristics is crucial and more experimental studies are required in this field.

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