INVESTIGATING SELECTED BEHAVIORAL BIASES IN TURKEY: AN ANALYSIS USING SURVEY DATA

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

GÖRKEM TURGUT ÖZER

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION
IN
THE DEPARTMENT OF BUSINESS ADMINISTRATION

Approval of the Graduate School of Social Sciences

_____

Prof. Dr. Meliha Altunışık
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Business Administration.

_____

Assist. Prof. Dr. Engin Küçükkaya
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Business Administration.

_____ _____

Assoc. Prof. Dr. Özlem Yılmaz
Co-Supervisor

Assist. Prof. Dr. Adil Oran
Supervisor

Examining Committee Members

Assoc. Prof. Dr. Uğur SOYTAŞ	(METU, BA)	_____
Assoc. Prof. Dr. Özlem YILMAZ	(METU, BA)	_____
Assist. Prof. Dr. Adil ORAN	(METU, BA)	_____
Prof. Dr. Ramazan SARI	(METU, BA)	_____
Prof. Dr. Ali ALP	(ETÜ, BA)	_____

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name : Görkem Turgut ÖZER

Signature :

ABSTRACT

INVESTIGATING SELECTED BEHAVIORAL BIASES IN TURKEY:

AN ANALYSIS USING SURVEY DATA

ÖZER, Görkem Turgut

MBA, Department of Business Administration

Supervisor : Assist. Prof. Dr. Adil ORAN

Co-Supervisor: Assoc. Prof. Dr. Özlem YILMAZ

May 2011, 192 pages

It has been widely accepted that people do not always behave rationally when making decisions. However, cognitive biases are still of interest to a relatively small group (mostly working in the area of psychology) even though they have been introduced to a wider audience by Tversky and Kahneman's article in Science in 1974. It has already been shown that behavioral biases affect most decisions of people; therefore, they have an important role in a wide range of fields, from financial marketing to

gambling. The purpose of this study is to investigate some cognitive biases (anchoring, reference point, probability judgment and risk propensity) in Turkey. In brief, anchoring bias is the fallacious effect of anchor values on decision making process, the presence of reference point bias proves that people are excessively affected by comparisons, probability judgment bias is the erroneous evaluation of probabilities, and risk propensity bias is the fallacious effect of the risk propensity levels on decision making processes. The relationships of these biases with individual cognitive ability levels and socioeconomic variables are also inspected. The data are collected by using a survey that is composed of the related measures which are taken from previous surveys in the literature. The sample is composed of a large number of participants (1575) from a wide range of socioeconomic statuses, from students to working professionals to retired individuals. The results lend support to the presence of a reference point bias, and an effect of risk propensity levels on decisions. However, an evidence which supports anchoring and probability judgment biases are failed to be found at a significant level. A significant relationship between cognitive ability level and risk propensity level is found. Moreover, demographic variables are also found to have an effect on the selected biases and cognitive ability.

Keywords: Cognitive biases; anchoring; reference point; probability judgment; risk propensity.

ÖZ

SEÇİLEN DAVRANIŞSAL SAPMALARIN TÜRKİYE'DE İNCELENMESİ:
ANKET VERİSİ ÜZERİNE BİR ANALİZ

ÖZER, Görkem Turgut
MBA, İşletme Bölümü
Danışman : Yrd. Doç. Dr. Adil ORAN
Eş-Danışman: Doç. Dr. Özlem YILMAZ

Mayıs 2011, 192 sayfa

Günümüzde artık insanların karar verirken her zaman optimizasyon yapan rasyonel bireyler (homo economicus) olarak davranmadıkları kabul edilmektedir. Algısal sapmalar (cognitive biases), 1974 yılında Science dergisinde yayınlanan bir makaleyle Tversky ve Kahneman tarafından daha geniş kitlelere tanıtılmış olmasına rağmen hala nispeten küçük bir topluluk tarafından (daha ziyade psikoloji alanında çalışan bir kesim) incelenmektedir. Egemen görüş olmamakla birlikte, bazı davranışsal

modeller ekonomi ve finans alanlarına zamanla nüfuz ederek literatürde kendilerine daha geniş yer edinmektedir. Gelişmiş ülkeler dışında bu tür algısal sapmalar üzerine yapılmış kısıtlı sayıda çalışma olduğu için, bu çalışmada literatürde yaygın olarak rastlanan bazı algısal sapmaların (çıpalama, referans noktaları, yanlı olasılık değerlendirme ve risk eğilimleri) gelişmekte olan ülke statüsündeki Türkiye'de varlığı araştırılmıştır. Çıpalama karardan bağımsız bir değişkenin, referans noktası algısal yanılgısı ise kıyaslamaların karar süreci üzerine hatalı etkilerini ifade etmektedirler. Yanlı olasılık algısı, olasılık değerlendirmelerinde geçmiş sonuçların gelecekteki beklentiyi (birbirlerinden bağımsız olmalarına rağmen) etkiliyor olmasıdır. Risk eğilimi algısal yanılgısı ise insanların mevcut risk eğilimlerinin bağımsız kararlar üzerindeki hatalı etkisidir. Çalışmada kullanılan veri, anket yöntemiyle toplandı. Literatürdeki anketlerden alınan ölçeklerle oluşturulan anket üniversite öğrencilerinden başlayıp, çalışanlara ve emeklilere kadar uzanan geniş bir yelpazeden 1575 kişiye uygulandı. Bu geniş kapsamlı anketin sonuçları analiz edildiğinde katılımcıların anlamlı oranda basit çıpalama ve yanlı olasılık değerlendirme algısal yanılgıları göstermediği, fakat referans noktası etkisinin daha güvenli ya da daha riskli bir alternatifin varlığında mevcut seçeneği teşvik edici yönde olduğu ve risk eğiliminin kararlar üzerinde oldukça etkili olduğu bulunmuştur. Çalışmada bilişsel yeteneğin algısal sapmalar üzerindeki etkisi de incelenmiş ve risk eğilimi ile anlamlı ilişkisi olduğu bulunmuştur. Ayrıca,

demografik değişkenlerin de seçilen algısal sapmalar ve bilişsel yetenek üzerinde etkili olduğu tespit edilmiştir.

Anahtar kelimeler: Algısal sapmalar; çıpalama; referans noktası; olasılık yargısı; risk eğilimi.

To Steve Jobs

ACKNOWLEDGMENTS

The author wishes to express his deepest gratitude to his supervisors Assist. Prof. Dr. Adil Oran and Assoc. Prof. Dr. Özlem Yılmaz for their guidance, advice, criticism, encouragements and insight throughout the research.

The author would also like to thank Prof. Dr. Ali Alp for his suggestions and comments.

The moral support of Duygu Dağlı is gratefully acknowledged.

The author appreciates the valuable support of The Scientific and Technological Research Council of Turkey by the grant code 2228.

TABLE OF CONTENTS

LIST OF TABLES

TABLES

1. INTRODUCTION

Behavioral finance is the study of financial decision making behavior. It also examines the cognitive and emotional factors on economic decisions, which makes it an area that is closely related to disciplines of psychology and economics. That's why it is sometimes called behavioral economics. Shefrin (2005) defines behavioral finance as "the study of how psychological phenomena impact financial behavior." Behavioral finance emerged as an alternative to traditional finance which is based on neoclassical paradigm. Forbes (2009) states that behavioral and traditional approaches differ in the abandoned acknowledgement of the necessity in basing theory of financial decision making on the firm control of factual decision making processes. Neoclassical economics assumes all human beings as rational; however, it does not define the *rational behavior*. According to Becker (1962), rational behavior could be defined as the constant maximization of a well-ordered function. This definition can be expressed as the evaluation of alternatives according to their expected values and offer the selection of the alternative with the highest expected value. The definition also requires this evaluation and selection process to be in effect continuously. Therefore, it is possible to conclude that two keywords of the Becker's definition are *constancy* and *well-ordered*. Becker (1962) further states "strong and even violent differences developed, however, at a different level." The author also mentions critics who declare that decision makers do not seem to maximize their expected values consistently, choices are not well planned, and the

theory does not properly explain behavior, revealing the fact that neither consistency nor well-ordered functions are present in real life situations.

The efficient markets hypothesis (EMH) has been the fundamental theory of finance for almost thirty years, and if efficient markets hypothesis holds, the market has all necessary information for the best decisions (Shleifer, 2004). Since the aim of behavioral finance is to investigate the facts behind irrational behaviors of the decision makers on financial decisions, it may also be an explanation to inefficiency in financial markets. Back in history, Selden (1912) wrote *Psychology of the Stock Market*, explaining the mental attitude of investing and trading. From 1912 to 1973, there are a few publications on the subject; however, after the article *Availability: A Heuristic for Judging Frequency and Probability* by Tversky and Kahneman (1973), the subject became highly popular and it is now one of the main research interests of scholars from not only finance but also economics discipline.

The focus of behavioral finance is mostly the investigation of behavioral biases. Since 1973, many articles and books have been written on these behavioral biases (e.g. Tversky and Kahneman, 1974; Cervone and Peake, 1986; Johnson and Schkade, 1989; Jacowitz and Kahneman, 1995; Wilson, Houston, Etling, and Brekke, 1996; Mussweiler and Strack, 1999; Chapman and Johnson, 1999; Ariely, Loewenstein, and Prelec, 2003; Oechssler, Roider, and Schmitz, 2009; and Kudryavtsev and Cohen, 2010). In fact, there are various behavioral biases and some of them became a part of

behavioral finance literature, such as anchoring, reference point, probability judgment and risk propensity. These four biases are also at the focus of this thesis study. In brief, studied biases can be defined as follows:

Anchoring: Anchoring can be simply defined as the tendency to overweight some pieces of -sometimes even totally irrelevant- information (anchor) when making decisions, i.e. financial decisions in this context.

Reference Point: Reference point is the basis level or starting point of the evaluation of a product. Keeping the real product value constant, a change in the references makes the product perceived more or less valuable, depending on the case.

Biased Probability Judgment: People are naturally inclined to make probability judgments under the influence of previous outcomes of the same or a different event, even these events are independent from the one that is judged. Biased probability judgment is observed long ago, first in 1820, by Laplace.

Risk Propensity: Brockhaus (1980) defines risk propensity as the tendency to make decisions based on the perceived probability of positive or negative outcomes of a choice beforehand.

There are several studies on anchoring, reference point, probability judgment and risk propensity biases in literature (e.g. Tversky and Kahneman, 1974; Cervone and Peake, 1986; Johnson and Schkade, 1989; Jacowitz and Kahneman, 1995; Wilson, Houston, Etling, and Brekke, 1996; Mussweiler and Strack, 1999; Chapman and Johnson, 1999; Ariely, Loewenstein, and Prelec, 2003; Oechssler, Roider, and Schmitz, 2009; and Kudryavtsev and Cohen, 2010, Kahneman and Tversky, 1972; Camerer, 1987; Clotfelter and Cook, 1993; Dohmen, Falk, Huffman, and Marklein, and Sunde, 2009). In general, each of these biases has been studied alone and their relationships with demographic factors such as gender have been taken into account mostly by the contribution of homogenous participant pools. These participant pools are composed of either only students or only professionals. Therefore, one of the essential aims of this thesis study is to form a participant pool which is composed of both students and professionals. Moreover, the survey which is the backbone of this thesis work is conducted in an advanced emerging market, Turkey. This is also an important contribution to the literature because these biases have been investigated mostly in highly developed countries until today. The study might reveal possible differences between what has been found in developed countries and what are found in an advanced emerging market. Last but not least, a relatively large sample consisting of 812 students and 669 professionals (a total of 1575 subjects of which 47 are unemployed non-students) participated in the survey. This large sample may lead more representative results which are based on more accurate measures. In

addition, the relationships between some demographic measures and the selected behavioral biases are investigated.

Gender difference in decision making process has been a subject of focus for a long time. However, recently, the focus of the studies has been especially the differences in financial decision making processes. Jianakoplos and Bernasek, for instance, ask the question "Are women risk averse?" and answer it positively for single women (1998). It is certainly important to find out whether women are more risk averse; however, it is also crucial to decide whether the answer changes by demographic profiles of the participants. Besides, as stated above, any possible differences among the attitudes of people from different social statuses towards financial decisions under the effect of various behavioral biases are investigated.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This chapter reviews the existing research on selected cognitive biases. These biases are anchoring, reference point, probability judgment, and risk propensity. In addition, the hypotheses which are tested in this thesis study are developed throughout this chapter in corresponding chapters.

2.1. ANCHORING

Andersen (2010) defines anchoring as "a term used in psychology to describe the common human tendency to rely too heavily (anchor) on one piece of information when making decisions." Anchoring is sometimes referred to as focalism, and it describes the tendency of human mind to give a certain criteria more importance than it should do. Tversky and Kahneman (1974) mention anchoring in their famous article by explaining adjustment. They define the role of initial value in estimations and state people's inability for adjustments, concluding that people are biased towards initial values. Anchoring has been studied in several different contexts such as real estate pricing (Northcraft and Neale, 1987), on-line auctions (Dodonova and Khoroshilov, 2004), entrepreneurship (Simon, Houghton, and Aquino, 1999), or customer inertia (Ye, 2004). In finance context; however, there are many more discourses. For instance, anchoring is shown to be strongly related to *disposition effect* in the context of financial markets (Shefrin and Statman, 1985). Disposition effect is the tendency of selling *winner* assets and holding

loser assets. The reason of this irrational behavior is found to be the anchor price which is the initial buying price in this case (Khoroshilov and Dodonova, 2007).

Tversky and Kahneman (1974) start the discussion by asking the question "How do people assess the probability of an uncertain event or the value of an uncertain quantity?" The purpose of the article is to define three heuristics that are used to evaluate probabilities and to predict values. One of these heuristics is presented under the title of *Adjustment and Anchoring* on page 1128 in which it is stated that "in many situations, people make estimates by starting from an initial value that is adjusted to yield the final answer." After concluding that adjustments are usually insufficient (Slovic and Lichtenstein, 1971) (i.e. "different starting points yields different estimates, which are biased towards the initial values"), they define this observed phenomenon as anchoring. To further investigate the proposed effect, Tversky and Kahneman (1974) ask their subjects "to estimate various quantities, stated in percentages (for example, the percentage of African countries in the United Nations)." From 0 to 100, a number is chosen randomly by the rotation of a wheel of fortune just in front of the participant. The participants are then asked to evaluate whether this random number is above or below the numeric answer to the focal question and afterwards they are asked to anticipate the correct percentage by increasing or decreasing the randomly chosen number. The random numbers are shown to affect the outcomes. It seems unbelievable; however, this effect of

anchoring has been confirmed by further studies afterwards (e.g. Cervone and Peake, 1986). Tversky and Kahneman (1974) conclude their article by emphasizing that anchoring is typically applicable to numerical prediction and leads to systematic and predictable errors. They encourage further study, claiming that it might contribute to the literature by improving judgments and decisions that are based on uncertain variables.

Cervone and Peake (1986) do not use a wheel of fortune as Tversky and Kahneman do; however, study anchoring effect by using randomly chosen cards in their article *Anchoring, efficacy, and action: The influence of judgmental heuristics on self-efficacy judgments and behavior*. Although their essential aim is to investigate the relationship between anchoring and self-efficacy, they initially test anchoring in two experiments. 62 Stanford University undergraduate students, of which half are males, participate in the first experiment. The second experiment is conducted by a completely different participant pool. 23 junior-year high school students, who are expected to be less experienced in solving cognitive tasks, participate in the second experiment. In the end, both experiments support the findings of Tversky and Kahneman. They find significant anchoring effect on both the level of self-efficacy and the level of task persistence. Cervone and Peake (1986) claim that two studies result in an obvious effect of the anchor value although the used anchor is completely random. The effect is significant both in the context of performance capabilities and in the corresponding

observed actions. Anchoring effect influences participants' abilities to make decisions about problem-solving tasks.

Later, in 1989, Johnson and Schkade study anchoring bias in utility assessments and one of their motivations is to find out whether explicit anchors can change the size and the direction of the bias. The authors conduct three experiments which are all based on Hershey and Schoemaker's model[1] and the purpose of the study is to further investigate the reasons and the generality of the effect. The conclusion of the research has an impact of modifying the description of the anchoring bias and therefore the study inspects a different self-generated anchor theory. For an efficient investigation, process-tracing data are also gathered by the help of the verbal reports and by the help of the observation of information flow. In the end, possible explanations for the anchoring bias are studied. 36 junior and senior undergraduates participate in the first experiment and are paid. 99 junior and senior business majors participate in the second experiment and are rewarded with course credit. The second experiment is just a replication of the first one, except that there are explicit anchors in the second experiment. Johnson and Schkade (1989) conclude that anchoring has a large and significant effect on bias and it is sufficient, if not necessary, to cause bias. By tracing the process data, it is also found out that anchoring effect is significant and the practice of heuristic strategies, including anchoring and reframing, is a possible cause of the bias.

[1] The procedure: "Hershey, J. C., and P. J. H. Schoemaker, "Probability vs. Certainty Equivalence Methods in Utility Measurement: Are They Equivalent?" Management Sci., 31 (1985), 1213-1231"

An important contribution to the literature is made by Jacowitz and Kahneman (1995). In their article which is titled as *Measures of Anchoring in Estimation Tasks*, three roles of anchoring effect in quantitative judgment are defined. The first one is the role of initial adjustment value, the second one is the conversational hint during experiments, and the third one is the suggestion or the prime. A critical question is asked after the fact "anchoring effects are generally believed to be large and reliable" is confirmed: "How large is large?" The purpose of the study is to answer three substantial questions: a) To what extent does anchoring affect the estimation of uncertain amounts?, b) What are the roles of the anchoring effect when the anchor is higher or when it is lower compared to the estimates on which the anchor is based?, and c) How does the size of anchoring effect relate to the confidence of the participants in their judgments? The study presents a model for the evaluation of the possible effects of anchoring in estimation tasks. Three different groups of subjects are chosen from the same population to test the procedure. One of them is a calibration group, members of which are faced with uncertain decisions without anchors. Other groups are made to decide between alternatives after deeming an anchor. Basically, anchors are determined by the estimations of the calibration group and presented to other two groups. Besides, an anchoring index (AI) is developed to be able to analyze the effect quantitatively. 156 University of California, Berkeley students participate in the study by completing a questionnaire as a course requirement of psychology class. 53 of them participate in the study as the calibration group and the rest contribute as

the experimental subjects.15 questions are asked to all participants, varying from length of Mississippi River to the number of Lincoln's presidency. 15th percentiles of the calibration group's estimates for each question are used as low anchors and 85th percentiles are used as high anchors. As a result of this study, the effect of the high anchors is found to be significantly larger than those of the low anchors. An important conclusion of Jacowitz and Kahneman (1995) is the following. The anchoring effect is measured by an anchoring index and the overall mean of the anchoring effect is calculated as .49, meaning that the median subject moves almost 50% towards the anchor value comparing to the result without anchors. This conclusion supports the strength of anchors.

Wilson, Houston, Etling and Brekke (1996) start their article by asking the question of "How many physicians practice medicine in your community?" The paper starts with this query and questions whether someone's answer to this question might differ if one writes down arbitrary numbers on a piece of paper before answering it. The authors aim to find out whether the estimate as an answer to this question is influenced by an arbitrary number which is written down by the respondent. In sum, the purpose of the article is to find out whether a random number in short term memory influences an unrelated judgment. Is it mandatory to ask participants explicitly to compare the anchor to the number of physicians or is it enough to make participants write down the anchor? Four hypotheses developed by the authors are the following:

> "(1) Basic anchoring effects will occur, such that a number that is completely uninformative will influence people's judgments, even when people are not asked to compare this number to the target value.
> (2) People who are knowledgeable about the target question will be less influenced by arbitrary anchors.
> (3) People must pay sufficient attention to a numerical value in order for basic anchoring effects to occur. If a number is considered only briefly, anchoring will not occur.
> (4) Anchoring processes are unintentional and non-conscious; therefore, it is very difficult to avoid anchoring effects, even when motivated to do so and forewarned about them."

116 students from undergraduate classes of several disciplines at the University of Virginia participate in Study 1 to check Hypotheses 1 and 2. The questionnaire is presented like a quiz and the participants are first asked to choose an arbitrary number from a container. The numbers are arranged to be distributed by a wide range. Then, the subjects are asked to make a decision on whether the number they pick is greater than, equal to, or less than the correct answer of a question which does not require particular knowledge. There are control and anchor groups, and both of these groups are asked to relate the picked number to both relevant and irrelevant questions [2 (control vs. anchor) X 2 (relevant vs. irrelevant) design]. The last two questions of the so-called quiz show measure the knowledge level of the participants in the number of countries in United Nations (which is the essential, relevant question) and the confidence level of the participants by a 9-point scale. The results of the quiz show that the first and the second hypotheses are confirmed by a significant anchoring effect. Additionally, four more similar studies are conducted. The results of Study 2, 3, 4 and 5 confirmed the remaining two hypotheses. As the third

Hypothesis proposes, sufficient attention to the anchor value is required and as the fourth hypothesis proposes, it is very difficult to avoid anchoring effect.

Mussweiler and Strack (1999) writes *Comparing Is Believing: A Selective Accessibility Model of Judgmental Anchoring*, putting all previous related work together and proposing a new model, called *selective accessibility model*. In this article, under the *The Anchoring Phenomenon* subtitle anchoring is classified into two main types according to its resulting effect. In this definition, it is proposed that an anchor may be numeric or non-numeric, corresponding decision may be categorical or conclusive, and the consequential effect may be adjustment or contrast. Contrast anchoring is defined by an example: "a target stimulus is judged to be lighter in the context of a heavy stimulus than in the context of a light stimulus (Helson, 1964)." Both the focus of the article by Mussweiler and Strack and the focus of this thesis study is assimilation anchoring which is based on estimations in the presence of an arbitrary number. Mussweiler and Strack (1999) classify assimilation anchoring in the same way as Jacowitz and Kahneman (1995) did: *Insufficient adjustment, conversational inferences, and numeric priming.* Mussweiler and Strack (1999) refer their previous studies in this article, examining the change both in the judgmental dimension and in the judgmental target. They define their journey in the following sentences: There are two contextual alterations studied in this paper. The first one is the alteration of the estimation aspect. The authors question whether the

anchoring effect is still effective when the anchor is judged against estimation aspect but not against the one used in conclusive estimation. The second alteration is the change of the estimation target. The authors aim to reveal whether the anchoring effect is still in action when the anchor is judged against an object which is different from the conclusive estimation. The conclusion of the study is the following: With the intention of examining recent anchoring models, assessing their suitability and developing a possible explanation for the anchoring effect, the study presents a s*elective accessibility* paradigm which is a combination of hypothesis-consistent testing and semantic priming. The main result of the Mussweiler and Strack's article shows that the developed paradigm is effective in explaining assimilation anchoring. Besides, it supports the conception of the strength of anchoring effect and proposes the means to decrease the effect. *Selective accessibility* model is not included in this review in detail since it is out of the scope of this thesis study.

Again in 1999, Chapman and Johnson further study the anchoring effect and the activation account of anchoring in their article *Anchoring, Activation, and the Construction of Values*. Anchoring as activation is defined in this article by "the notion that anchors influence the availability, construction, or retrieval of features of the object to be judged." It is, in brief, the judgment of decision makers whether the anchor and target are similar and to what extent they are similar. Regarding to anchoring as activation view, anchors are effective if decision makers think that they are similar to the target

value. The method used by Chapman and Johnson to test the activation account of anchoring is as follows: Five experiments are carried out to further investigate the activation account of anchoring. The first experiment tests the feature prompt prediction and process measure signal of activation. The second experiment tests belief judgments by imitating the first experiment. The third experiment shows the significant anchoring effect by completely random variables which are used as anchors. The fourth experiment reproduces the setting of observational prompt effect with completely random anchors. The fifth experiment presents the fact that anchoring is intensified when target characteristics are more accessible to priming. 24 college students from Philadelphia are paid $6,00 per hour and in return asked to price 12 apartments by indicating their maximum offers for rent of each apartment. The apartments are evaluated by the attributes of distance to campus, appearance, and safety. The data are collected by Mouselab Software Package (Johnson, Payne, and Bettman, 1988). The results of the first experiment are the following: The study finds out that the activation of target characteristics which are consistent with the anchor value results in anchoring effect. The experimental setting of the study clearly shows that the anchoring effect and the prompt manipulation of the study remove the anchoring effect. Making the participants to notice the most different characteristic of the target boosts the awareness of differences, eradicating the anchoring effect. On the other hand, making them to notice the most similar characteristic to the anchor does not have an impact on the anchoring effect. The second experiment is conducted by

the subjects of 172 students from University of Illinois at Chicago (UIC), the third one is conducted by the contribution of 50 students from UIC, the fourth one and the fifth one are conducted by the contribution of 234 students from UIC. All remaining four experiments are based on paper-based questionnaires consisting of various questions with and without anchors. In short, the elimination of the bias is proved not to be successful by the application of unacquainted nature of anchors in the third and fourth experiments. On the contrary, the first, the second and the fourth experiments suggest a way to avoid the anchoring effect.

Ariely, Loewenstein, and Prelec (2003) define a new term *coherent arbitrariness* in their article *Coherent arbitrariness: Stable demand curves without stable preferences*. This article is a fresh look at the anchoring subject. The paper aims to present that the valuations of experience goods are actually unexpectedly arbitrary, the relative valuations of various quantities of the goods seem to be in order, and the valuations, as a result, show a combination of arbitrariness and coherence, referred to as *coherent arbitrariness* by the authors. Six experiments are conducted to test coherent arbitrariness. In the first experiment, six products (computer accessories, wine bottles, luxury chocolates, and books) are presented to 55 students from the first class meeting of a market research course in the Sloan School MBA program. After a brief mention of product descriptions, subjects are asked whether they accept to buy these products for an amount numerically equal to their last two digits of social security number. Consequently,

subjects are asked to make an offer for each product in a real transaction environment (every participant is able to purchase at most one product if s/he makes the highest bid). In an experimental setting, in which the products and the consequent transactions are real, social security numbers of the participants have a significant effect on declared willingness-to-pay prices. For instance, the participants who have above-median social security numbers declare bids which are 57 to 107 percent greater than the ones who have below-median social security numbers do. In other five experiments of Ariely, Loewenstein, and Prelec, the anchoring effect is still significantly in action, confirming the finding of the first experiment. Additionally, the sixth experiment of the study reveals that the pattern of anchoring is not limited to the judgments about money.

Oechssler, Roider, and Schmitz (2009) study three well-known behavioral biases and whether they are related to cognitive abilities. Three biases studied in this inspirational article are conjunction fallacy, conservatism and anchoring. The purpose of this article is to find out the relationship of the mentioned three biases with cognitive abilities with respect to risk and time preferences. The participants of the online questionnaire are 564 respondents. Three questions which measure cognitive ability are randomly spread into questions of the survey (the test used for measuring cognitive ability is *cognitive reflection test* (Frederick, 2005) which is explained later in the literature review). A total of ten measurement questions are asked to the participants in addition to the personal background information

questions. The participants are contacted by emailing. Their email addresses are acquired by the help of the economic experimental laboratories in Bonn, Cologne, and Mannheim. They are people who state their interest in contributing to economic experiments. 90% of the participants are comprised of university students, 25% of them have economics or business degrees, and 46% of them are female. The average age of the all participants is 24. An internet-based experiment is conducted by a large-scale contribution of the participants. The purpose of the study is to reveal the relationship between cognitive abilities and behavioral biases, if there is any. People with low cognitive abilities are found to be more prone to make biased decisions than the ones with high cognitive abilities. On the other hand, anchoring is found to be significantly effective through all subjects; however, the effect of cognitive ability on anchoring bias is shown not to be significant across two CRT groups. Even though the study reveals a significant relationship between cognitive abilities and behavioral biases, it also points out that all studied biases exist also in high cognitive ability levels.

In 2010, Kudryavtsev and Cohen's article aims at analyzing both the role of anchoring bias in the context of economic and financial information and the effect of previous knowledge on this role. The study inspects basic anchoring but not standard anchoring as the article of Tversky and Kahneman (1974) does. Basic anchoring does not require direct comparison of anchor with the target and it is also the type of anchoring which is studied in this thesis

study. Kudryavtsev and Cohen (2010) run an experiment with 67 MBA students of the Technion, Israel Institute of Technology, and the University of Haifa. 40 males and 27 females with a mean age of 33.5 participate in the experiment, 26 of them at the Technion and 41 at the University of Haifa. The mean used to collect data is a paper-based questionnaire with a total of 21 questions. The participants are separated into two groups; control group and anchoring group. In the control group, the respondents are asked to estimate a number of recent economic and financial indicators. In the anchoring group, the respondents are asked the same questions; but in this setting, before the questions are asked, they are confirmed with unrelated indicators for each question. The measurement method is parallel with the one in the article of Jacowitz and Kahneman (1995). The results are the following. It is found that the effect is demonstrated by the result of the participants and for almost every question in the questionnaire. The effect is more substantial for women and for older participants. The hypothesis which is developed throughout the study is supported by the results of the conducted experiments. The participants of the experiments are shown to be more biased for *difficult* than *easy* questions. The variation seems to be valid for all groups of the subjects in the sample. The effect of random anchors on decision making process is proved to be significant and it is stronger if people know less about the target.

2.1.1. HYPOTHESES ON ANCHORING

The effects of anchoring have been tested in several contexts by various experimental arrangements and surveys. Although almost all previous studies find anchoring bias significantly effective, the degree and the form of its effect on different types of decisions change; therefore, it is crucial to define the context and the corresponding experimental setting first. In this thesis study, the effect of *basic anchoring* is tested as it is also tested in the article by Wilson, Houston, Etling, and Brekke (1996). According to Wilson, Houston, Etling, and Brekke, basic anchoring effects are valid even though the anchor is totally uninformative and the participants are not asked to associate the anchor with the focal product. The results of the study show that the anchoring effect is significantly present in the defined setting. This is the demonstration of basic anchoring for the first time in the literature and here in this thesis study, the purpose is to hypothesize the basic anchoring effect with the expectation of a significant *basic anchoring effect.* In a larger sample this is the effect of anchoring notwithstanding the anchor is not compared to the value of the focal product, and it is random, uninformative, and irrelevant.

Hypothesis 1

$H1_0$: The participants with higher last two digits of phone numbers will not tend to bid higher amounts for the focal product (the engraving).

$H1_1$: The participants with higher last two digits of phone numbers will tend to bid higher amounts for the focal product (the engraving).

2.2. REFERENCE POINT

Tversky and Kahneman describe their reference-dependent model as the evaluation of a choice relative to its reference points. They find out that different reference points lead to different preferences for the same choice (1996). Reference point is a basis level or starting point of the evaluation of a product. Keeping the real product value constant, the change in the reference points of the product makes it perceived to be more or less valuable depending on the case. The comparison is the main point of the articles by several authors such as Chatterjee and Heath (1996), Hsee and Leclerc (1998), and Zhang and Mittal (2005). Like the effect of anchoring, the effect of reference points has also been studied in various contexts. Price evaluation (Howard and Kerin, 2006), fundraising (Berger and Smith, 1997), risk decision making (Kameda and Davis, 1990), brand choice (Dhar and Nowlis, 2004), and nutrition labeling (Barone, Rose, Manning, and Miniard, 1996) are some examples of these different contexts.

The starting point of the literature review for reference point bias is again from Tversky and Kahneman. Tversky and Kahneman (1991) state "much experimental evidence indicates that choice depends on the status quo or reference level: changes of reference point often lead to reversals of preference." In this article, *reference dependence* is defined as the valuation of alternatives relative to a reference point. The purpose of the article is to study not only reference dependence but also risk propensity. In this part,

reference dependence model is examined in detail. According to reference dependence chapter of their article, the aim of the analysis is as follows: Reference-dependent preference has two basic questions to be answered. The first one questions the definition of reference state. The second question is as follows: What does the effect of reference state on choices? The authors presume that decision makers have an absolute reference state, and examine its effects on the choice between alternatives. Loss aversion and diminishing sensitivity are defined in the context of reference dependence. Letting losses be outcomes below the reference state and gains be outcomes above the reference state, losses are perceived greater than gains. This is loss aversion. "Because a shift of reference can turn gains into losses and vice versa, it can give rise to reversals of preference, as implied by the following definition:" Diminishing sensitivity is the decreasing perceived marginal value as the distance from the reference point increases. "For example, the difference between a yearly salary of $60.000 and a yearly salary of $70.000 has a bigger impact when current salary is $50.000 than when it is $40.000." Loss aversion and diminishing sensitivity which are two different effects of reference dependence are found to be significant biases. As a conclusion, the authors state that it is not possible to generalize an explanation for the normative status of loss aversion and other reference effects; however, they propose that it is very possible to inspect the normative status of all these effects in the context of specific situations. This article will be reviewed later again in the risk propensity section of this literature review.

A year later, in 1992, Simonson and Tversky publish their article *Choice in context: Tradeoff contrast and extremeness aversion*. As mentioned in the title of the article, two reference based contextual effects on decision making process are studied in this article; tradeoff contrast and extremeness aversion. Tradeoff contrast is the tendency of choosing an alternative which is encouraged as compared to other favorable or unfavorable alternatives in the same choice set. Extremeness aversion is the perceived attractiveness of an alternative depending on its position in the same choice set; intermediate options are perceived as more attractive; on the other hand, extreme options are perceived as less attractive. In perception and decision making processes, contrast effects are ever-present. For instance, in a well-known visual expression, two equal-radius circles appear as if they have different diameters. This is because smaller circles surround one of them and larger circles surround the other one. In the same manner, the same product may be perceived as very desirable when it is next to a less desirable alternative or it may be perceived as very undesirable when it is next to a more desirable alternative. The inspection of decision making processes has led to the revelation of one main effect: Choices which are below the reference point (referred to as losses) are perceived stronger than choices which are above the reference point (referred to as gains). The study extends this finding to investigate the impact of extremeness aversion phenomena by presenting other advantageous and disadvantageous alternatives rather than a neutral reference point. The main purpose of the study is to check whether tradeoff

contrast and extremeness aversion are in effect. For this purpose, 22 consequent experiments are conducted and 100 to 220 subjects participate in each of these experiments. Approximately half of the subjects are women. About two-thirds of the subjects are comprised of business administration students and the rest are psychology students. Both undergraduate and graduate students from three different West Coast universities contribute to the experiments. Moreover, several questions are replicated with executives. In each of the studies, a paper-based questionnaire titled as *Survey of Consumer Preferences* is distributed to the students in classrooms. Each questionnaire consists of 3 to 14 choice problems and the survey takes 5 to 25 minutes to be completed. The questionnaires measure personal preferences by asking questions which do not have any correct or incorrect answers. During the experiments, the alternatives for choices are tried to be demonstrated to the subjects in a realistic manner. For instance, a choice of paper towels is presented with the real samples of paper towels and the participants are asked to evaluate the quality of towels by their senses. In the instances, in which it is not possible to use real products, colored brochures of the products from the Best General Merchandise Catalog are shown to the participants. In several studies, participants are informed that some of the presented materials would be randomly given to them according to their choices. In this study of tradeoff contrast and extremeness aversion, which are both reported to be observed significantly in several contexts, it is confirmed that both reference point effects are present. The following conclusions are drawn accordingly: The tradeoff contrast theory enriches the

contrast concept with the comparison of tradeoffs. The theory explains the symmetric dominance effect (Huber, Payne and Puto 1982) by proving the positive impact of an inferior option on a better choice. Moreover, the study investigates more general types of tradeoff contrast which are referred to as enhancement and detraction. In these two latter types of tradeoff contrast, radical tradeoffs or absolute inferior alternatives are not present. As an extension to the loss aversion theory, the extremeness aversion theory proposes that disadvantages are more visible than the relevant advantages. The authors state that this explains the compromise effect (Simonson 1989) by showing that a radical alternative increases the share of the middle option comparing to the other radical alternative. Therefore, it is shown that extremeness aversion has a symmetric structure, affecting both attributes. Usually, extremeness aversion affects only one attribute, referred to as polarization. Polarization is observed in choices between price and quality. In these *polarized* choice sets, introducing a middle option makes the higher price and quality option more attractive than the lower price and quality option. Moreover, an implication of people's behavior towards these context effects is also an important contribution to the literature. Simonson and Tversky indicate that people are sometimes aware of these reference point effects and use them intentionally to justify their choices (for instance, the choice of the middle option among alternatives). In other cases, they are unaware of these reference point effects as they are generally unaware of priming and anchoring.

Hsee and Leclerc (1998) ask the question "Will products look more attractive when presented separately or together?" and examine "whether each of two different options of comparable overall quality will be perceived more positively when presented in isolation and evaluated separately (separate evaluation) or when juxtaposed and evaluated side by side (joint evaluation)" to answer their question. The main hypothesis of the study is as follows:

> "There will be an interaction between the options-reference relation and the evaluation mode. The options-reference relation will have a greater effect on the attractiveness of the stimulus options in separate evaluation than in joint evaluation."

A special case of the main hypothesis is as follows:

> "If both A and B are better than R, then they will look more attractive in separate evaluation than in joint evaluation."

Another special case of the main hypothesis is as follows:

> "If both A and B are worse than R, then they will look more attractive in joint evaluation than in separate evaluation."

Three hypotheses are tested by six studies. The differences of six studies are in product categories used for evaluation, methods to manipulate the reference information of these products (*externally given* or *naturally evoked*), and dependent variables (*willingness to pay* or *choice*). Each pair of studies (1&2, 3&4 and 5&6) use identical procedures. Paper-based questionnaires are used for all of the studies and in the last four studies participants are given a candy bar as compensation. Participant pools which are used by the study pairs are as follows: 1&2; 142 unpaid M.B.A. students from managerial decision-making and organizational behavior classes at a

Midwestern university. 3&4; 157 students who are recruited in the dining halls of a large Midwestern university. 5&6; 232 unpaid students who are recruited in the dining halls of two large Midwestern universities. The highly consistent results of the study are as follows: The fascinating results show that in the instance that the main product is better than its reference product, it is perceived more attractive and it is more probable to be bought when presented alone than when presented together. On the other hand, in the instance that the main product is worse than its reference product, it is perceived more attractive and more probable to be selected when presented jointly than when presented alone. In sum, reference effects are found to be significant and highly predictable also according to this study.

Brenner, Rottenstreich, and Sood (1999) start with the question "How does the attractiveness of a particular option depend on comparisons drawn between it and other alternatives?" Grouping and preference are also investigated in the context of comparison, which is a direct reference relationship. Comparison rarely results in only advantages or only disadvantages for an option. Most of the time, both advantages and disadvantages are present for each option and comparative loss aversion takes the stage. According to the proposition of the authors, the attractiveness of any option decreases as it is compared to any other options (i.e., when a reference point exists). The first experiment of the study is conducted to test this prediction by the contribution of 343 participants. The participants are visitors of a popular science museum and

they are paid $2 in return for filling in a pack of several unrelated questionnaires. The questions are related to three categories of consumer goods and services, each category including four items. One of these categories is composed of the 1-year subscriptions of Time, People, Business Week, and The New Yorker magazines. The second category consists of the videotapes of Speed, Braveheart, The Lion King, and Forrest Gump movies. The third category includes the round-trip flights from the San Francisco Bay Area to Seattle, Los Angeles, Las Vegas and San Diego. As a manipulation, three different assessments are used during the evaluation process. An isolated assessment requires participants to state highest price they are willing to pay for each product, an accompanied assessment requires them to do the same for all four products of only one group and a ranked assessment requires them to not only do same for all four products of only one group but also rank the items. The degree of the comparison increases from the former assessment task to the latter assessment task. All of the participants complete the isolated assessment task but only some of them carry out the second and the third assessment tasks, evaluating all of the products in the end. The results are the first experiment support that comparisons hurt: "Across all items, the mean isolated price, $59, is substantially greater than both the mean accompanied price, $49, and the mean ranked price, $46." In the second part of the article, another prediction on grouping is tested, starting with the following reasoning: Comparative loss aversion theory states that if the within comparisons in a group increase, the desirability of each item in the group decreases sharply.

Nonetheless, since the comparisons between groups are lesser, the desirability of the single option does not decrease as much. Therefore, it is proposed that grouping has a negative effect on the perceived attractiveness of an item in the context of choices between alternatives. An alternative is expected more likely to be selected when alone than when in a group. The second experiment is conducted to test this prediction by the participation of students at Stanford and San Jose State universities. Nine grouped choice problems with four options are presented to the participants, each participant being confronted with different sets of problems. Experimenters ask the participants to make a decision between the lone option and one of the three grouped options, informing them beforehand about the random grouping of three options in each question. Participants who prefer grouped options are not further asked to make a unique choice in the group. Four different formats of every question are asked, with a different lone option in each of them. Half of the participants are faced with the lone option first, and the remaining half are confronted with the group first. The participants who prefer single option are referred to as *lone-option choice share.* In order to measure the effect of grouping, lone-option choice shares of each problem in the questionnaire are summed in all four problem formats. The sum is named as the letter S. In this summation, no grouping effect on an alternative means that S is 100%. The hypothesis claiming a consequential effect chain from grouping to comparison and from comparison to comparative loss aversion proposes that an alternative is less desirable when it is in a group of alternatives than when it is alone. Thus, a bias in

this consequential chain means that S exceeds 100% for the summation of lone-option choice shares. According to the results of the second experiment, the second prediction is also supported. The average S is 116%, which is significantly greater than 100%. The pattern is compelling since S is observed to be greater than 100% also by using two other variations of the presented experimental method.

The effect of explicit reference points on consumer choice and online bidding behavior is published in 2005 by Dholakia and Simonson first. It is important to understand what the explicit reference points are; therefore, Dholakia and Simonson define explicit reference points as the reference points which are suggested by a third party. Implicit reference points, on the other hand, are spontaneously used by the consumer without an external stimulus (without the encouragement a third party). The purpose of the study is to examine the impact of explicit comparisons on choice behavior and on online bidding behavior. The main proposition of the study is that the attitude of consumers towards making a decision between alternatives is more risk-averse and cautious when they are guided explicitly to make certain comparisons. The reason is that consumers are triggered to realize that the choice results in gain or loss (loss having a greater impact because of loss aversion) when they confront with explicit guidance of comparisons as explicit reference points make comparisons more remarkable. The authors make a second proposition which is based on the main one: "Explicit reference points lead to more risk-averse, cautious behavior in the context

of online auctions." The authors then test these predictions in three studies including a pilot study. In the pilot study, assuming that "adjacent auction prices serve as implicit reference points for the focal auction," authors list twenty-five music compact discs (CDs, from a best-seller 200 list) on eBay, placing each of them in two experimental listing conditions by the same seller to suppress the effects of the username which is an important variable on eBay. The first one is single-auction listing condition and the second one is paired-auctions listing condition. In the former, a single CD is listed alone and in the latter a CD is listed together with two identical CDs adjacent to each other. These two conditions are created separately with at least one week break. The results of this pilot study show that the average final price of the CD in the paired-auctions condition is significantly higher than the average final price of the CD in the single-auction condition. This result supports the assumption that adjacent auction prices are perceived as implicit reference prices, influencing the final (winning) price.

In the first study, to test explicit reference points in order to compare with the effects of implicit reference points which is tested by pilot study, a similar environmental setting is prepared by using top 30 CDs of the same best-seller 200 list. 30 CDs are listed under five experimental conditions, and again listed by the same seller. A benchmark condition is created by listing a single CD without any explicit instructions and an explicit comparison condition is created by listing the CD with two adjacent CDs and adding "Don't miss a bargain! Compare the price of this CD with the prices of similar CDs listed next to this one" sign to the middle option in bold,

large-font-size letters. The results of the first study are as follows: In the journey of examining high and low reference price stages, contrasts are used in the experiments of this study. Auctions which are conducted in high reference price level environments result in higher closing offers in the application of implicit comparisons than in the application of explicit comparison. Mean closing offers in the implicit reference price group are found to be significantly lower when compared to explicit reference price group. A comparison of closing prices in both comparison settings reveals that the adjacent prices of other listings have a significant effect on closing offers in the implicit comparison setting; however, they have no effect in the explicit comparison setting.

The second study is designed to examine the first study and address possible alternative explanations for its results. In a laboratory choice experiment, 365 students, who receive course credit or monetary compensation, are asked to make choices and evaluate alternatives. A control group is created and the environmental settings of both implicit and explicit comparison conditions are set up. As a result, the second study supports the findings of the first study and has more implications as follows: the second study shows that the results are not limited to online auctions but can be generalized to other applications of consumer decision making process. Besides, since the effect is confirmed by the use of such a different methodology in the study, it is possible to say that explicit reference points stimulate a more risk-averse attitude in the context of consumer decision making process. In sum, the study concludes that explicit reference points

stimulate people to be more risk-averse and cautious as compared to implicit reference points.

In 2009, Kwon and Lee study reference points together with knowledge and risk propensity. In this article, the effects of not only reference point but also risk propensity are investigated. For the purpose of this part only the first hypothesis of the article and the results of it are reviewed here. The other hypotheses of this article follow later in this literature review in the corresponding part. The first hypothesis inspects the effects of a reference point which is provided for the comparison of the final financial product with riskier or safer alternatives. This naturally results in a trade-off and specifically in this case, results in a comparison of return on investment and accessibility (or lack of accessibility) to the investment fund. The first hypothesis of the study by Kwon & Lee is as follows:

> "A safer reference point with a low return will increase the attractiveness of a financial product, while no such effect will occur with a riskier reference point with a higher return."

An internet-based experiment is conducted by the contribution of the participants who are recruited by an announcement which is posted on the main page of a large credit union in United States. 322 voluntary participants contribute to the experiment in the end. Three reference states are shown to the subjects randomly by the computer. The computer randomly assigns one of the three reference states when a subject logs into the study environment. The participants are asked to evaluate a new certificate of deposit (CD) without an early withdrawal option. The details of

the new certificate of deposit are presented to the participants in three different ways. In the first one, the participants see the new certificate of deposit without any other information below it. In the second one, the participants see the new certificate of deposit together with a riskier reference point which is another certificate of deposit with a higher interest rate, a longer maturity and no withdrawal option. In the third case, the participants evaluate the new certificate of deposit with the presence of a safer reference point which is another certificate of deposit with a lower interest rate and the same maturity but with withdrawal option. Answers from only 247 subjects are analyzed according to their performance on qualification check questions which are used to test whether the answers are reliable. 247 participants contribute to the study. The demographic characteristics of the participant pool are as follows: Age of *35–49* (40.8%) or *50–64* (24.6%); Caucasians (87.8%); education of *some college* (36.8%) or *bachelor's degree or more* (53.3%); marital status of *married or living together* (68.3%). The income distribution is as follows: $25,000 or below (7.9%); $25,001–$50,000 (18.7%); $50,001–$75,000 (26.6%); $75,001–$100,000 (22.2%); $100,001–$200,000 (23.0%); and $200,001 or more (1.5%). The distribution of total financial assets is as follows: $5,000 or below (19.5%); $5,001–$25,000 (16.0%); $25,001–$50,000 (7.5%); $50,001–$100,001 (12.0%); $100,001–$200,000 (13.4%); and $200,001 or more (31.6%). The results of the experiment show that a safer reference point increases the attractiveness of the focal product but a riskier reference point does not appear to have a significant effect on the evaluation of the

same focal product. The study proposes that a financial product is perceived more attractive when it is compared to a safer (lower return) product. This particular finding has a direct practical application in marketing new financial products. It is obvious that the marketing strategies of financial products might be improved if the risk attitudes of the consumers are taken into account. More from this study follow later in this literature review.

2.2.1. HYPOTHESES ON REFERENCE POINT

The prospect theory suggests that loss aversion implies a risk-averse attitude in the settings of positive domain and risk-seeking attitude in the settings of negative domain (Kahneman and Tversky, 1979). The effects of reference point have been investigated in different contexts by various experimental settings as seen above in the review. Defining *loss* as a lower level of property than current monetary condition, some of the previous researches have focused on the investment decisions which naturally have a risk of loss or limit accessibility to invested funds. They propose that these features of an investment decision trigger a risk-seeking tendency according to the prospect theory. Kwon and Lee (2009) design one of their hypotheses based on this proposition and predict that a safer and correspondingly lower return reference point has the effect of making the focal product more appealing in the context of an investment decision. This is because the focal product is perceived as a more risk and more return alternative compared to its perception when there is no a reference point. On the other hand, a

riskier and correspondingly higher return alternative as a reference point is not expected to have the same effect. Kwon and Lee (2009) propose that the comparison of the focal product to such a riskier alternative does not produce a risk-seeking tendency since the focal product is perceived more certain in this second comparison. Similar to the hypothesis of Kwon and Lee, the second and third hypotheses of this thesis study are the following:

Hypothesis 2

$H2_0$: In the evaluation of a financial product, providing a safer (and lower return) reference will not make the focal product more attractive.

$H2_1$: In the evaluation of a financial product, providing a safer (and lower return) reference will make the focal product more attractive.

Hypothesis 3

$H3_0$: In the evaluation of a financial product, providing a riskier (and higher return) reference will not have an effect on the evaluation of the focal product.

$H3_1$: In the evaluation of a financial product, providing a riskier (and higher return) reference will have an effect on the evaluation of the focal product.

2.3. PROBABILITY JUDGMENT

Encyclopædia Britannica defines probability theory as "a branch of mathematics concerned with the analysis of random phenomena." Moreover, it defines *independence*. According to *Encyclopædia Britannica* "the events A and B are said to be (stochastically) independent if the probability of B is not changed by knowing that A has occurred" (Siegmund, 2011). As the two definitions state, probability is the measure of random outcomes and independent events have unrelated probabilities. Kai Lai Chung (2001) answers his own question of "Do independent random variables exist?" with the following: Toss of a coin comes up with two possible outcomes; heads or tails. If these results are recorded as 0 and 1, these new variables are random variables and the probability of each is certainly ½. If the coin is tossed several times, a sequence of outcomes appears, every time the probability being ½ (and being independent from a previous toss). Afterwards, a card may be drawn from a pack or a ball may be picked from an urn. In this little story of the author, it is easy to evaluate the possibilities of the corresponding outcomes separately and it is easy to see that the possibility of an event does not affect each other. The author states that "indeed it would take more imagination to conceive the opposite!" Apparently, the requirement is not imagination, as stated above, to think events as dependent although independent (to judge probability under the effect of the bias). People are naturally inclined to make probability judgments under the influence of previous outcomes of the same or a

different event, even these events are independent from the one that is judged. This is biased probability judgment and it is first observed as long ago as in 1820, by Laplace. Biased probability judgment has been studied in several contexts such as medicine (Redelmeier, Koehler, Liberman, and Tversky, 1995), human decision processes and mood effects on them (Yates, et al., 1989; Wright and Bower, 1992), or psychology (Blackmore and Troscianko, 1985).

The investigation of biased probability judgment starts with the article *Subjective probability: A judgment of representativeness* by Kahneman and Tversky (1972). Kahneman and Tversky focus solely on the representativeness bias in this article. They start the article by emphasizing the importance of subjective probabilities in human life. Since most situations in daily life have uncertainties, people usually face with decisions which are based on insufficient information. In most of these cases, people are inclined not to follow the principles of probability theory but to follow the representativeness heuristic (Heuristic refers to experience-based techniques for problem solving, learning, and discovery). This heuristic has an effect on the people's evaluation capabilities of the probabilities of uncertain events in two different ways. The evaluation is inaccurately associated, first with the similarity of the uncertain event to its parent population in fundamental properties, and second with the most important features of the process by which it is generated. The authors predict that whenever A is more representative than B, event A is judged as if it is more

probable than event B. The study is based on a survey which is conducted in Israel by the contribution of 1500 respondents. The participants are students in grades 10, 11, and I2 of college-preparatory high schools (ages 15-18). To be sure about the motivations of the students for completing the survey questions, the authors conduct the surveys as a quiz in classroom setting, collecting the names of each respondent by answer sheets. Each respondent answers 2 to 4 questions, using at most 2 minutes time for each question. During the oral instructions that are given before the survey, the respondents are told that the survey is about the intuitions of chance. By the way, to confirm the results and to remove any possible effects of school or age, the survey is replicated with university students (20 to 25 years old) and the results of the two populations are found to be very similar. As a result of the study, representativeness is found to be significantly present in several contexts and the other results are as follows. The study aims to investigate the probability heuristic further in order to find out the degree to which the probability of an uncertain event is evaluated based on its representativeness of the population from which it is drawn. The instances in the experimental settings are chosen to be simple and concrete samples in which the unbiased probability can be easily calculated. However, the authors propose that the same effect of the probability heuristic will be observed also in those distinct situations. As a last comment, the authors note that the representativeness is not the only way of the establishment of an intuitive judgment of probability, stating the presence of *availability heuristic* and comparing it with representativeness heuristic.

Tversky and Kahneman (1974) start their second article on the same subject by the subtitle of Representativeness. In this section of the fascinating article, they question the types of probabilistic questions and how people deal with these questions. Tversky and Kahneman conclude that people have the tendency of estimating probability of representative option higher. A personal definition in their first example is as follows. "Steve is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail." When people are asked to chose the occupation of Steve on a list given, *librarian* becomes the most popular answer. Although there is no real connections between the given characteristics and any occupation, people are inclined to think Steve as a representative of the stereotype of a librarian. This is called representativeness. Representativeness is studied in six different subfields, each being a different practice of representativeness. *Insensitivity to prior probability of outcomes* is the first one of these six practices. This is the tendency to neglect prior probability because of the representativeness effect. In the experiments, although a probability is given for definite variables beforehand; people are inclined to neglect it by the effect of unrelated representativeness. *Insensitivity to sample size* is the second practice. This part of the study explains the relationship between populations and samples, giving examples on how people fallaciously think a sample as the representative of the population and calculates probability by this way. The third one is *misconceptions of chance* and this is explained

later in detail since this thesis study also focuses on this aspect. The fourth one is *insensitivity to predictability.* For instance, when people are told that a stock market company has a favorable story, they are inclined to make a positive prediction about its profitability even though they do not know anything about its financial status. *Illusion of validity* is the fifth one of the practices. This one is about irrelevant consistent patterns and how they influence the confidence of people on their predictions. The last practice studied is *misconceptions of regression.* This very common fallacy shows the fallacious conclusions of people about regressions and correlations although these regressions and correlations are erroneous or even they are not present. *Misconceptions of chance*, the third practice, is a focus of this thesis work. Tversky and Kahneman (1974) define this fallacy as the people's inclination to think that a series of events which is generated by a random process represents the fundamental properties of the process even though the series is short. They explain this fallacy by a coin experiment:

> "In considering tosses of a coin for heads or tails, for example, people regard the sequence H-T-H-T-T-H to be more likely than the sequence H-H-H-T-T-T, which does not appear random, and also more likely than the sequence H-H-H-H-T-H, which does not represent the fairness of the coin."

In Bayesian view, the tosses in three series of results have exactly the same probability distribution; however, what people think is different because of the representativeness effect. Gambler's fallacy, for instance, is people's unrealistic high expectations for a black number after a series of red numbers on a roulette wheel. Law of small numbers, as another example, is the fallacy that "even small samples are highly representative of the

populations from which they are drawn." This leads, in the academic research area for instance, to the selection of samples of inadequate size and to the over interpretation of findings.

In 1987, Camerer asks the question "Do biases in probability judgment matter in markets?" in his article. Since the fundamental dispute over biased probability judgment is whether individuals properly follow the laws of probability, Camerer conducts a set of complicated experiments to find out the answer. The participants are composed of undergraduate men and women, who are students of quantitative methods and economics classes at the Wharton School. Statistics and economics are two courses that all the subjects have taken. To the first and the tenth experiments, only the participants who do not have any experience of market experiments contribute. The subjects that participate in experiments one to ten (already experienced subjects) contribute to five other experiments; namely, the experiments from 11x to 15x (x is used to mark the subjects who are experienced). Three-hour and two-hour sessions are carried out. The participants use francs as their currency throughout the experiments and they are converted to dollars in the end. Contributors are given 10,000 francs initially and two certificates in each trading period.[2] In the experimental environment, a primitive style of early stock markets are replicated. Buyers and sellers shout out their expected prices for the desired assets. When there is a matching bid and offer, the transaction is completed

[2] Please have a look at the full article for more details of the complicated experimental setting.

and the bid and the offer history of the corresponding transaction is erased. All bids, offers and transactions are recorded on a publicly visible table for only concurrent period.[3] The results of the study are as follows. Before Camerer's work, many studies confirm that people do not follow the laws of probability, especially the Bayesian reasoning. Most of these studies conduct experiments by the contribution of the participants which are composed of unpaid and inexperienced subjects. However, traders in markets have incentives and experience, being good at making decisions about probabilities. By a series of experimental markets, the study examines whether behavioral biases have a significant effect on market outcomes in financial markets. If all traders behave like Bayesians, there should be a predictable pattern of prices and distributions in the markets. However, if traders overestimate during the experimental setting, in which the market is represented by an exactly matching sample that is composed of the contents of a bingo cage, then there should be various prices and distributions. The author states that this theory is named as *exact representativeness.* The eight experiments designed by Camerer show that the price selections of the inexperienced subjects' tend to have a Bayesian pattern although some exact representativeness bias is observed. However, the observed bias is small and gets even smaller as subjects become more experienced. In addition, Bayesian theory predicts prices well for the cases in which the exact representativeness theory is not applicable.

[3] Please have a look at the full article for more details of the complicated experimental processes.

There are two popular consequences of biased probability judgment and one of them is studied by Clotfelter and Cook in 1993. Clotfelter and Cook focus on gambler's fallacy in their article, by defining the term first. *Gambler's fallacy* is the fallacy which makes people think that the probability of a completely independent event is less than the Bayesian probability of the event since the same event has occurred recently. Gambler's fallacy is called also as *negative dependence* and the authors examine whether this negative dependence influences people's choices of numbers played in state lotteries. The study is based on the data analysis of Maryland lottery game, in which players choose digits and bet on them. There are several betting options on the numbers drawn; however, the two common types of bets are the straight bet and the box bet. The analyzed data are composed of a sample of 52 consecutive winning numbers in the three-digit game. This series of 52 winning numbers correspond the results of the lottery from the beginning of March to the end of April, 1988. A relative frequency of each winning number is recorded "for the day before it is drawn, the day it is drawn, and for the first, second, third, seventh, 28th, 56th, and 84th days after it is drawn." The results of the study are as follows. The evidence provided by the study demonstrates that certain numbers are started to be bet on less right after they hit at any time, and after a while their frequency is return back to usual levels again. The clear explanation is that the bets which are made on those numbers are transferred to the other numbers or not made at all for a while in the post-hit period. Since all the drawings are random and the change in the betting behavior is significant, the explained

consequence is a certain result of the previous hit of those numbers. Gambler's fallacy is the fallacy that the probability of a number to win is negatively correlated with the number's previous success. In brief, gambler's fallacy is found to be significantly present in the numbers play, i.e. the lottery according to the study.

Rabin (2002) investigates a different type of gambler's fallacy in his article *Inference by believers in the law of small numbers.* Law of small numbers, as mentioned also in the article of Tversky and Kahneman (1974) and as initially demonstrated by them in 1971, is people's unrealistic exaggerations of taking a small sample as a representative of the population from which it is drawn. It can also be defined as the fallacy of "thinking early draws of one signal increase the odds of next drawing other signals." After defining the laws of small numbers, Rabin (2002) defines his purpose as to model the behavior and to make the predictions based on this model. To model the behavior, the author first assumes that the behavior is significantly present, i.e. "a person exaggerates the likelihood that a short sequence of independent and identically distributed signals resembles the long-run rate at which those signals are generated." After stating the purpose of the study, Rabin (2002) "reviews in some detail the psychological evidence that people systematically depart from Bayesian reasoning in ways that resemble the law of small numbers, the gambler's fallacy" in the second part of the article. After, in the third section, the author presents the model which directly leads him to gambler's fallacy. After applying the model to the cases

presented in the sections four, five, and six of the study, Rabin (2002) concludes that the model which is developed throughout the study explains several different applications of the same behavioral bias, combining the degree of the bias, the relation of gambler's fallacy to over-estimation, the focus of the bias, and the other inspections together. The author thinks that the constricted form of the model makes it so specific and questionable that he encourages further studies based on the model to see whether it is applicable to the relevant economic conditions. In conclusion, after questioning his model for the significance of gambler's fallacy, Rabin also confirms the presence of other *pattern-recognition biases* and defines *hot hand fallacy* as the people's tendency to expect an outcome more probable (positive autocorrelation) although the signals are independent and identically distributed. The author finalizes his study by questioning whether gambler's fallacy is in contradiction to hot hand fallacy, and concluding that it is not, hot hand fallacy being more common when streakiness is plausible.

In 2005, a fascinating article which is based on complete reality is published. Croson and Sundali (2005) focus on both two most popular biased judgments of probability: Gambler's fallacy and hot hand fallacy. They define these biases as random intuitive ideas which depart systematically from the laws of probability. The importance of this study is that the authors gather real-life empirical data from casinos to investigate these biases further in a naturalistic setting. In short, gambler's fallacy is the belief of a negative autocorrelation and hot hand fallacy is the belief of a positive

autocorrelation although there are not any real correlations. In this article, Croson and Sundali points out a proposition in contrary to common belief. They argue that these two biases are not contradicting and they are not opposite of each other. The authors differentiate two biases by defining the role of gambler's fallacy in the outcomes like heads or tails and the role of hot hand fallacy in the outcomes like wins and losses. Therefore, they conclude that the same person might be affected by both gambler's fallacy and hot hand fallacy (after five flips of tails, heads maybe due; however, after five successful guess of tails, tails maybe due). The discussion leads to a differentiation in perception of the answer to the question "What is hot in hot hand fallacy?" The authors state that a particular person (and his/her accuracy in choices) is hot, but it is not the actually outcome that is hot; therefore, hot hand fallacy does not contradict with gambler's fallacy. The purpose of the study is to reveal more information on two biases of probability judgment by real-world casino data and this differentiates the study from previous experimental studies in three ways: uses an environment of surely random processes, inspects real decisions with real money and conduct tests by the contribution of a more sophisticated and motivated participant pool. The data gathered for the study correspond to the bets placed on the roulette game [4]. This particular game is chosen for the study because it comprises of a series of completely independent and uncorrelated events. Roulette is a best choice to observe behaviors in this empirical study, compared to the other games like blackjack or baccarat in

[4] "Roulette is a game played with a wheel and a betting layout. The wheel is divided into 38 even sectors, numbered from 1 to 36, plus 0 and 00 (in Europe, the wheel is divided into 37 sections, 1–36 plus 0)."

which there is a stimulating connection between preceding and possible future outcomes. The origin of the data is a large casino in Reno, Nevada. The data are supplied by management in security videotapes which have 18 hours record of play for a single roulette table. 18 hours time consists of three separate six-hour time blocks over a 3-day period in July of 1998. The videos have an overhead view of the roulette area, including clear views of the roulette table, the roulette wheel and the dealer. The methodology of using security videotapes as the data source of the study provides a clear view of the gambling environment, including all bets made by each player. On the other hand, since the camera objective is placed at a ninety-degree position vertically, it is not possible to count the amounts betted on each particular roulette number. Therefore, the authors decide not to record the amounts betted. 904 spins of the roulette wheel (each taking around 1 minute) are included in the videos, by 139 players placing 24131 bets. The conclusion which is based on concrete results is as follows: The data show significantly that gamblers make their bets under the effect of gambler's fallacy; if a specific outcome hits five or more times, the roulette players make their bets against that outcome but not with that outcome. The data also show that not only gambler's fallacy but also hot hand fallacy affects the gamblers so that they place more bets after they win than after they lose. The results are highly consistent with the previous studies which are based on laboratory experiments. The authors also question their study and define some limitations, encouraging further research which might combine empirical data and laboratory data.

Published by Dohmen, Falk, Huffman, Marklein, and Sunde (2009), the final article of the review for biased probability judgment has a direct focus on the subject. The article starts with a fact about economic decisions. Stating that economic decisions involve uncertainty, the authors aim to investigate the process of the formation probability judgments in detail. The study has also a purpose of exploring gambler's fallacy and hot hand fallacy. The difference of this study from the article of Croson and Sundali (2005) is that Dohmen, Falk, Huffman, Marklein, and Sunde (2009) consider gambler's fallacy as the direct opposite of hot hand fallacy. In a toss of a coin ending with straight three heads, gambler's fallacy is the belief of a more than 50% probability for the next coin to be tails, and hot hand fallacy is the belief of a less than 50% probability for the same result. According to the viewpoint of the authors, someone could only be biased towards either way for a given sequence but not towards both ways. The study mainly contributes to the literature by analyzing two most popular probability judgment biases on a representative sample of the population of Germany. This approach allows the authors to draw conclusions on cognitive biases for German population. The data are gathered from a survey to which 1012 respondents contribute. The participant pool is a representative sample of the population living in Germany who are 16 years or older. A professional interview group, TNS Infratest collects the data in June and in July 2005 by conducting interviews on households. *Random Route Method* of Fowler (2002) is used for sampling procedure and only one person per household is surveyed. *Computer Assisted Personal Interview (CAPI)* method is used for the interview by the

help of a notebook computer. The following survey question is asked to evaluate probability judgment bias:

> "Imagine you are tossing a fair coin. After eight tosses you observe the following result: tails - tails - tails - heads - tails - heads - heads - heads. What is the probability, in percent, that the next toss is 'tails'?"

In the question, the sequence of tosses is chosen in a way that the probability of the incidence is 50% also in the sample. This is on purpose to avoid any possible doubts about the fairness of the coin. The answer scale is from 0% to 100% and there is an option of "I don't know." Besides the focal question, demographic questions are also asked and answers to several variables such as education, age, gender, income and wealth are collected. Last but not least, the survey also measures the cognitive abilities of the participants. A remarkable result shows that "a significant gender effect that persists even if we include age, cognitive ability and years of schooling in the regression. According to the estimates, the probability of giving the correct answer is almost 10 percentage points lower for women." The study also investigates two or more cases based on the same data. The first one is the job search actions by an unemployed person and the second one is the consumption decisions by a cash-constrained consumer. The results are as follows: Specifically, the effect of gambler's fallacy is proved to exist in the context of financial decision making processes and the effect of hot hand fallacy is proved to exist in job search decisions. This is an important contribution to the literature since the study clearly shows that it is crucial to evaluate probability judgment bias by depending on the context. In

conclusion, the article is an investigation of three different topics. The first one is about how people make simple probability judgments. It is confirmed by the collected data, more than a third of the participants are biased in probability judgment calculations even the case is an extremely simple one. Being the tendency to evaluate the probability of an event more than its Bayesian probability although it is random, gambler's fallacy is found to be by far the most frequent probability judgment bias in this research environment. The second one is about the investigation of the determinants of biased probability judgment. The results show that "education (years of schooling) and a knowledge based measure of cognitive ability are positively related to performance in the probability judgment task." The third part of the paper investigates the probability judgment bias in two different contexts, the first one being job search and the other being financial decision making. As a result, hot hand fallacy, which is the tendency of overestimation, is shown to be significantly related to a higher possibility of long-term unemployment. On the other hand, gambler's fallacy, which is the tendency of underestimation, is found to be significantly related to a higher possibility of an overdrawn bank account. In short, the study is a great exploration of two representativeness biases; gambler's fallacy, and hot hand fallacy. In short, both biases are found to be significant in different contexts.

2.3.1. HYPOTHESES ON PROBABILITY JUDGMENT

As mentioned in the review in detail, there are two main possible biases of probability judgment. Gambler's fallacy is the belief of self-correction in independent and identically distributed (i.i.d.) events. It is a fallacy which is in complete contradiction to the probability theory, i.e. the principle of independence among random outcomes. The second bias is hot hand fallacy, which is considered to be the opposite of gambler's fallacy in many of previous researches. Hot hand fallacy is the belief of continuation in a series of random events, being also in contradiction to the probability theory. Dohmen, Falk, Huffman, Marklein, and Sunde (2009) define gambler's fallacy as the opposite of hot hand fallacy. They design a probability task by representing eight tosses of a fair coin, and ask the participants to predict the next toss. Although Dohmen, Falk, Huffman, Marklein, and Sunde's study investigates probability judgment bias in the contexts of job search decisions and consumption decisions, the nature of the bias is evaluated based on the question which presents a toss of a coin. In this study, a possible bias in the judgment of probability is also inspected in the same manner and by the same method, proposing that there will be a significant difference between gambler's fallacy and hot hand fallacy:

Hypothesis 4

$H4_0$: There will not be a significant difference between gambler's fallacy and hot hand fallacy.

$H4_1$: There will be a significant difference between gambler's fallacy and hot hand fallacy.

2.4. RISK PROPENSITY

Brockhaus (1980) defines risk propensity as "the perceived probability of receiving the rewards associated with success of a proposed situation, which is required by an individual before he will subject himself to the consequences associated with failure, the alternative situation providing less reward as well as less severe consequences than the proposed situation." For the purpose of this study, it is also possible to define risk propensity in short as the willingness to take more risk for more gain or to follow a safer option for a lesser gain. Sitkin and Pablo (1992), for instance, define risk propensity as "the tendency of a decision maker either to take or to avoid risks." Among the inspected behavioral biases of this thesis study, risk propensity is by far the most frequently investigated subject in numerous contexts. Firm performance (Walls and Dyer, 1996), information systems management (Keil, Wallace, Turk, Dixon-Randall, and Nulden, 2000), management (Brown, 1970), healthcare (Harrison, Young, Butow, Salkeld, and Solomon, 2005), biodiversity conservation (Sharma and Nguan, 1999), consumer switching behaviors (Massad and Reardon), military (Killgore, Vo, Castro, and Hoge, 2006), injury risk management (Hatfield and Fernandes, 2009), entrepreneurship (Palich and Bagby, 1995; Miner and Raju, 2004), national level strategy (Huth, Bennett, and Gelpi), or consumer behavior (Hamilton and Biehal) are some examples of the different contexts in which risk propensity is studied previously.

Kahneman and Tversky (1979) are again on the stage for a comprehensive analysis of risk perception and risk evaluation. The study defines the expected utility theory and asks why it may not be applicable to many cases. The authors state that "choices among risky prospects exhibit several pervasive effects that are inconsistent with the basic tenets of utility theory." The study demonstrates several cases which are incompatible with the expected utility theory and uses a survey based experiment to test several applications of utility based choices. In brief, the purpose of the study is to develop and support an alternative theory to the expected utility theory called *prospect theory.* According to the expected utility theory, the utilities of outcomes are weighted by their probabilities but in practice the situation is different since people usually follow a different pattern. Kahneman and Tversky say "in particular, people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty" and investigate this prediction and its extensions further by an experiment. The mean used for data collection is paper-based questionnaire and the participant pool is composed of students and university faculty. Participants are asked preference based questions that have two alternative choices, one of which has a certain outcome. During the instructions given before the survey, the respondents are asked to imagine the outcomes as if they are real. The respondents are also informed that there are no correct answers and the purpose of the study is to discover how people make decisions among risky alternatives. The questionnaire includes at most 12 questions per booklet. In order to be sure that the

questions are ranked in a random order, several different booklets are prepared. Moreover, in every question, alternatives are randomly placed in different forms of the questionnaire. In order to prevent any undesired biases and to check the reliability of the results, some of the questions are also asked to students and faculty at the University of Stockholm and at the University of Michigan. The pattern of the results is found to be identical to the results of the original survey to which Israeli respondents participate. Several different practices of the prospect theory such as reflection effect, probabilistic insurance, isolation effect are tested during the experiment. Based on the analysis of the experiment, the authors conclude that "the preceding discussion reviewed several empirical effects which appear to invalidate expected utility theory as a descriptive model." The study continues with the development of the prospect theory. The theory is developed in order to explain simple predictions which have economic outcomes and declared probabilities; however, it is possible to extend the theory to more complicated decisions. The prospect theory is comprised of two sequential phases; the editing phase, and the evaluation phase. The former is the preliminary analysis of the alternatives and the latter is the evaluation and decision phase. The editing phase is composed of mainly six operations; coding, combination, segregation, cancellation, simplification and detection of dominance. After the editing phase is completed depending on the context, a decision is made according to the subjective valuation of the alternatives. The basis of the prospect theory is the assumption that "the carriers of value are changes in wealth or welfare, rather than final

states” and “decision weights do not coincide with stated probabilities.” The authors also state that there is the expected utility theory and on the other hand there are “inconsistencies, intransitivities, and violations of dominance.” If decision makers were aware of these deviations, they are expected to avoid them and follow the rules of the expected utility theory. However, in general, decision makers are not aware of their deviations from the expected utility theory; therefore, the prospect theory takes the stage. It is also noted in the paper that the study is based on a simple decision making process where there are two available options. More complicated tasks (for instance, bidding behavior) in which “the decision maker generates an alternative that is equal in value to a given prospect” are not studied. Therefore, because the prospect theory is a model of the decision making process between alternatives, the discrepancy of bids and final decisions is an indicator of the evaluation of values and decision weights only between alternatives (but not between bids or other tasks). The final part of the study aims to show how prospect theory is applicable to the risk attitudes, the debate over alternative representations of the decision inquiries which are created by shifts of reference points, and the inspection of possible expansions to the current treatment. In brief, an alternative theory of choice to the expected utility theory is developed in the study. In the prospect theory, the authors assign values to gains or losses rather than to final assets, and they replace probabilities with decision weights.

Sitkin and Pablo publish an impressive and comprehensive article in 1992. The focus of the article is risk propensity along with risk perceptions. Sitkin and Pablo consider previous researches as a combination of contradictory findings and take the prospect theory into account. Therefore, the initial aim of the article is defined as to reconcile contradictory findings by focusing on risk propensity together with risk perception. In addition, the purpose of the article is to develop "a more integrated, complete and accurate model of the determinants of risk behavior than models that have been formulated in the past." The authors begin their article with the definitions. Risk is defined as a characteristic of the decisions which have uncertainty about potential outcomes and expectations. Therefore, in the article, risk has three dimensions; *outcome uncertainty*, *outcome expectations*, and *outcome potential*. What influence a decision maker during the decision making process are stated as *the characteristics of the individual decision maker*, *the characteristics of the organizational context*, and *the characteristics of the problem itself*. The alternative model of the determinants of risk behavior which places risk propensity and ridk perception in the central role is expressed as follows. The model is a reformulation to investigate previously studied direct effects indirectly, by setting up a connection between risk propensity and risk perception. Moreover, one of the essential aims of the model is to reveal contradictory findings of previous researches and to reconcile these contradictory findings. Based on the description of their model, the authors state that previous researches define risk propensity by three components; *risk preferences*, *inertia*, and *history of*

risk-related success and failure. In the next part of the study, 11 propositions which are deducted from previous researches follow. This part of the article is very comprehensive and makes the story of risk propensity easy to follow:

> "Proposition 1: The risk propensity of decision makers will be consistent with their preferences concerning risk.
> Proposition 2: Over time, decision makers will exhibit inertia in their risk propensity.
> Proposition 3a: Decision makers' propensity to take risks will be contingent upon the degree of outcome success associated with their past propensity to take risks.
> Proposition 3b: The variability of decision makers' risk propensity will decrease with increases in the scale of prior failure outcomes, but will be unaffected by the schedule of prior failure outcomes.
> Proposition 4: Decision makers who have a risk-seeking propensity will perceive risks to be lower than decision makers who have a risk-averse propensity.
> Proposition 5a: Positively framed situations will be perceived as involving higher risk than is normatively appropriate, whereas negatively framed situations will be perceived as involving a level of risk that is lower than normatively appropriate.
> Proposition 5b: Negatively framed situations will be perceived as involving higher risk than is normatively appropriate, whereas positively framed situations will be perceived as involving a level of risk that is below a normatively acceptable limit.
> Proposition 6: The more homogeneous the top-management team, the more its individual members will exhibit risk perceptions that are similar and extreme; they also will exhibit confidence in the accuracy of those perceptions.
> Proposition 7a: Decision makers in organizations with more moderate cultural risk values will perceive risks more slowly but more accurately than decision makers in organizations with more extreme cultural risk values.
> Proposition 7b: Decision makers' perceptions of risk will be consistent with the risk-related role models provided by their leaders.
> Proposition 8a: Decision makers with moderate levels of domain familiarity will have more accurate estimates of risk and more moderate levels of confidence in the accuracy of those estimates than will decision makers with high or low levels of domain familiarity.
> Proposition 8b: Decision makers with moderate or high levels of domain familiarity will have more stable perceptions of risk than will decision makers with low levels of domain familiarity.

> Proposition 9a: The greater the emphasis on process controls in organizations, the lower the level of risk perceived by decision makers.
> Proposition 9b: The greater the emphasis on outcome controls in organizations, the higher the level of risk perceived by decision makers.
> Proposition 10: Decision makers' risk behavior will be consistent with their risk propensities.
> Proposition 11: The higher the level of perceived risk, the stronger the association between risk propensity and risk behavior, except that for risk-seeking decision makers this effect will reach a limit defined by their propensity."

The authors mention that the most important contribution of this study to the literature is its comprehensive and simultaneous inspection of previous researches, and its discovery of the contradictory findings for the first time. The conclusion of the authors is as follows. Throughout most of the previous studies to this research, the apparent and direct impact of objective or perceived properties on risk behavior is analyzed. However, this study makes a careful inspection of previous researches and tries to reconcile the results of them by a theory which proposes that risk propensity has much impact on risk behavior. By developing an integrated and comprehensive model of the determinants of risk behavior, the authors question and compare previous theories, and point out possible opportunities for further theoretical and empirical researches.

Sitkin and Weingart (1995) follow up the article reviewed above by publishing *Determinants of risky decision-making behavior: A test of the mediating role of risk perceptions and propensity*. The starting point of the article is quite similar to that of Sitkin and Pablo. Previous researches which study decision making behavior are judged to be inadequate in explaining

risk perceptions and risk behavior. Past studies are also assumed to reach potentially inaccurate conclusions about the reasons of these behaviors. The purpose of the study is to test the hypothetical model that is developed by Sitkin and Pablo (1992) by two experimental studies. For this purpose, based on the approach of Sitkin and Pablo, a mediated model and nine hypotheses are developed by reexamining the determinants of risk propensity:

> "(1) The more successful the outcomes of a decision maker's risk-related decisions have been, the higher his or her risk propensity.
> (2) Positively framed situations will be perceived as involving higher risk than negatively framed situations.
> (3) The higher a decision maker's risk propensity, the lower the level of perceived situational risk.
> (4) The higher a decision maker's risk propensity, the riskier will be his or her decision-making behavior.
> (5) The degree to which individuals make risky decisions will be negatively associated with their level of perceived risk.
> (6) The effect of outcome history on risky decision-making behavior will be fully mediated by risk propensity.
> (7) The effect of outcome history on risk perception will be fully mediated by risk propensity.
> (8) The effect of risk propensity on risky decision-making behavior will be partially mediated by risk perception.
> (9) The effect of problem framing on risky decision-making behavior will be fully mediated by risk perception."

Two studies follow these hypotheses. The first study manipulates the outcome history in order to investigate the mediated model with regard to risk propensity and risk perception. The second study manipulates the problem framing in order to investigate the mediated model with regard to risk perception. 38 MBA students participate to the first study in a classroom setting during an organizational behavior must course. Age of the participants is ranging from 23 to 46, with a mean of 28,3 and work

experience of the participants is ranging from 0 to 25 years, with a mean of 6,2. 66% of the participants are men. A set of instructional stimulus materials and a paper-based questionnaire are distributed to the participants. A decision-making case which involves business risk, personal financial risk, and physical risk is given to them, and the questions regarding to the case are asked. In the second study, the participants are 63 undergraduate students who take an introductory organizational behavior course. The survey is conducted again in a classroom setting. The mean age of the participants is 20,1 (ranging from 18 to 26) and the mean of work experience in years is 4,2 (ranging from 0 to 9). In this second study, 71% of the respondents are men. The procedure is exactly the same as the first study, except that different manipulations are tested in the second study. As a result of the first study, Hypotheses 1, 3, 4, 5, 6 and 7 are supported and Hypothesis 8 is rejected. In a nutshell, the results of the first study are as follows. The first study shows that there is a flow of the effects of past outcomes from risk propensity to risk perception and from risk perception to risk behavior in decision making processes. This finding helps to explain the connection between the effects of outcomes and the processes which result in these effects. As a result of the second study, Hypotheses 2, 5, and partially 9 are supported. The summary of the results of the second study is as follows. The second study demonstrates that risk behavior in decision making processes is affected by problem framing both directly and indirectly. This finding also helps to understand the connective model of risk behavior in decision making, and to refine the contingent relationships between the

effects and the results of these effects. In conclusion, the study of Sitkin and Weingart tests the Sitkin-Pablo model of the determinants of risk propensity and risk perception. Sitkin and Weingart provide support for the Sitkin-Pablo model. Particularly, the presence and the power of a mediated model of risk behavior is supported. The importance of analyzing direct effects of many variables individually is emphasized. Apart from supporting a mediated model in which risk perception and risk propensity are key mediators, the authors inspect and clarify some contingent relationships, providing an inspiration for future work on the variables of risk involving decision making behaviors.

Powell and Ansic (1997) investigate risk behavior topic in the specific context of gender. Focusing on gender differences in risk propensity, the article states that previous researches have contradictory findings. The authors claim that stereotypical assumptions are common in previous researches. The authors also show that several studies which claim significant gender differences are actually factitious. Based on the judgments above, the purpose of the study is to evaluate the degree to which women display a more risk averse behavior than men in the context of financial decision making processes. Financial decision making processes are examined by comparing the attitudes of both men and women. Moreover, previous hypotheses which explain gender differences by context but not by trait factors are questioned. During the study, financial decision making context is limited to management, business and personal decision

making processes. In order to obtain a realistic environment for the study, computers are used for the experiment since computers are already the main sources of financial information. The instructions are standardized, and any possible deceptive effects of the interaction between the experimenter and the subjects are intended to be prevented. The participants are undergraduate and post-graduate students from the business school. This is preferred to provide that any possible undesired gender effects which are caused by familiarity (with the subject, the information technology, or the computer literacy) are eliminated. The participants are randomly paid by an amount that is determined by their survey results. There are two experiments; the first one is about the choice of insurance cover, and the second one is about the decisions on foreign exchange market. Insurance cover is preferred because it is a familiar subject for both males and females, and both genders have similar experience on the topic. Insurance cover has a focus on losses. Currency market is preferred to as the other topic since it is an unfamiliar subject for both genders of the participant pool although their education is relevant. Currency market has a focus on gains. 64 male and 62 female volunteers participate in the insurance study. Subjects are undergraduate and post-graduate students with a mean age of 20,57 years (the standard deviation of the data is 3,08 years). Computer screens are used as the only source of information about insurance problem, and the participants are not allowed to interact with each other. Both written and verbal instructions are given beforehand. All participants make a total of 12 different insurance decisions, after they are given an amount of assets and

cash, and some information on the price of the insurance and the risk of loss. The decision is based on whether to insure their assets. The aim of subjects is to maximize their wealth after each decision. For each decision they make, one of the following three factors changes; the insurance premium, the wealth or the nature of the risk. The information regarding these variables is presented on the screen before each decision. The preliminary result is as follows; according to the number of previous purchases of insurance policies, the results which are obtained from the post-experiment survey data show that there is no gender difference in the previous knowledge of insurance policies. 66 male and 35 female undergraduate and post-graduate students participate in the currency market study. The method is the same as the insurance experiment. The subjects are asked to trade in currency markets during a specified time interval. All participants are presented all of the conditions over four treatments, which represent seasons. The seasons differ in the entrance costs to the market. All subjects are initially given 100 ECU cash. They have to pay for the entrance into US dollar market, and according to their positions they earn or lose money by changes in the ECU-US Dollar exchange rate. The aim of the participants is to earn the highest amount of money they can. Exiting from the market is also an option to guarantee the current amount of wealth but re-entering to the market is again at a cost. The entrance cost represents the initial investment in real life situations which is spent in order to acquire information, and legal and financial advice. Both written and verbal instructions are given initially and the subjects are allowed to practice for only one season. The preliminary

results are as follows; it is shown that there is not a significant gender difference in the final outcomes of the financial decisions which are made throughout the experiments. Although the average payment of males is £3,95 and it is less than the average payment of females (£4,68), the difference is not found to be statistically significant. In final conclusion, females are found to have significantly lower preference for risk taking and this finding is supported by both studies, not depending on the degree of familiarity to the topic, to the domain, or to the cost. The result is in contradiction to the belief which points out a relationship between the gender differences in risk preference and the contexts in which that preference is defined. The authors state that female risk aversion might be because of their greater desire for security, and male risk taking tendency might be because of their greater desire for returns. Even though the risk propensities and the strategies of both genders are obviously different, in the end there are no significant differences in the final outcomes of their financial decisions. Moreover, females are found more likely to attribute their successes to good luck than males, provided that the prior experience and the education levels of both groups are very similar. The authors finish their inspiring article by encouraging further research to extend these findings to other contexts and to other financial instances. Only by this way, the concluded gender related patterns can be accepted as general traits.

Jianakoplos and Bernasek (1998) ask whether women are more risk averse in their article which aims to investigate risk behavior further in the context

of gender and some other demographic factors. The study starts with a statement which defines its purpose. The aim is to analyze women's attitude towards risky choices and inspect how much it differs from men's, if it does. The authors state the fact that several previous studies show that women are more risk averse than men when they are directly asked to evaluate risks by survey questions. The article aims to test this common finding in the context of financial decision making, in order to see whether women are really more risk averse in that context. The authors indicate that according to the previous studies, there is also a consensus that absolute risk aversion diminishes with wealth. However, the relative correlation of risk aversion is not proved yet. Therefore, the authors define one of their aims in this study as to reveal these relationships by empirical methods. Moreover, the authors claim that this is the first study that takes gender into account in relative risk aversion. An empirical model is built on these concerns, which includes the following variables; wealth, race, number of kids, homeowner or not, human capital, age, employment and education, some of which being dummy variables. Then, the developed model is estimated by the data provided by the 1989 Survey of Consumer Finances (SCF89) which is sponsored by the Federal Reserve System. SCF89 has a sample of 3,143 households as a representative of the financial condition of all U.S. households in 1989. The crucial variable, wealth, is assumed to be the total value of risky and risk-free assets possessed. As a result of the empirical test of the model, the estimated equations differ significantly between single women and both single men and married couples. In addition, "the

estimates indicate that age has a very different impact on portfolio allocation for single women versus single men and married households." Contrary to the common belief, education is not found to be a significant factor for the risk taking behaviors of the households. Besides, "as the number of young dependents in a household increases, the proportion of risky assets held significantly decreases for single women, is unaffected for single men, and significantly increases for married couples." Several other conclusions follow according to the regression analysis of all variables. However, in conclusion, the survey results show that women are significantly more risk averse than men in financial decision making processes. In addition to this fundamental conclusion, relative risk aversion is found to decrease as household wealth increases (wealth is defined by excluding residential housing and human capital). The study reveals that the comparative risk aversion does not diminish as much for single women as for single men. This finding shows that single women are more risk averse than single men. In brief, the study concludes that the financial assets of single women are less risky than those of single men, provided that both have the same economic status. The results of this study are the starting point for the investigation of gender difference in the context of financial decision making and in the allocation of household wealth. Further research is also suggested for the other countries and for the inspection of the change over time, if any.

A year later, in 1999, another relevant article is published by Schubert, Brown, Gysler, and Brachinger: *…Are women really risk averse?* It starts by

questioning previous studies, including the study of Jianakoplos and Bernasek. Schubert, Brown, Gysler, and Brachinger consider the common belief in the risk aversion of women as a stereotype which results in a statistical discrimination which alleviates women's success in financial and labor markets. The authors view this common belief as a substantial contributor to the glass ceiling effect. Two main errors of previous studies are specified. The first one is that previous studies which are based on individual wealth structures do not represent a strong control on the decision making processes of different genders and the corresponding gender-specific limitations in the daily financial decisions. The second problem is the doubt whether abstract gambling experiments correspond to risk behavior in the contextual decisions. Due to these concerns about previous researches, the purpose of the study is defined as to remove above mentioned limitations in analyzing the gender effect on risk attitudes. In other words, it aims to investigate whether the proposed risk propensity of women is a reflection of their actual economic behavior. An experiment is designed to prevent possible errors by providing participants with not only abstract gaming decisions but also financially motivated risky decisions embedded in an investment or insurance context. The experiment is specifically designed for "examining gender-specific risk propensity in decisions relevant for investors and managers" and consists of two treatments. The first one is the context treatment and the second one is the abstract treatment. In order to measure the contextual frames, 68 participants of which 36 are males are asked questions in two decision

domains; investment (gain domain), and insurance (loss domain). The abstract frames are measured by the participation of 73 subjects of which 40 are males. Abstract frames have two decision domains as well; gain-gambling (gain domain), and loss-gambling (loss domain). In both experimental settings, as introductory information, the participants are told that their decisions are the sole determinants of their final earnings. Before starting the experiment, all subjects fill in a questionnaire which measures their disposable income. By this way, the authors remove the wealth effect which is caused by income differences in order to get a more reliable picture of gender differences. All participants are undergraduate students from different departments of the University of Zurich and the Swiss Federal Institute of Technology. The results show that comparative risk propensity of both genders is "strongly dependent on the financial decision setting" and there are "no gender differences in risk propensity when subjects face contextual decisions." Since financial decisions are contextual all the time, the results show that (contrary to previous researches) females are not more risk averse than males; therefore, the common stereotypical belief in the risk attitudes of female investors and female managers is wrong.

Kwon and Lee (2009) investigate risk propensity in the context of the evaluation of financial products. In their corresponding article, the effects of reference point are also investigated along with the effects of knowledge in two other main hypotheses. However, for the purpose of this part, the third main hypothesis of the study is reviewed. The authors propose that risk

propensity has an effect on situational cases and on the information which is used for the evaluation of risky alternatives. It is also predicted that risk propensity might have a balancing effect against the effect of reference point on decision making processes. For instance, a risk taker who faces with a decision including reference point which encourages risk-seeking behavior might be more open to the effects of the reference point. The third hypothesis of the study by Kwon and Lee is as follows:

> "The effect of a reference point on the evaluation of a financial product will be stronger for those who are more risk prone than for those who are less risk prone."

An internet-based experiment is conducted by the contribution of the participants who are recruited by an announcement which is posted on the main page of a large credit union in United States. 322 voluntary participants contribute to the experiment in the end. Three reference states are shown to the subjects randomly by the computer. The computer randomly assigns one of the three reference states when a subject logs into the study environment. The participants are asked to evaluate a new certificate of deposit (CD) without an early withdrawal option. The details of the new certificate of deposit are presented to the participants in three different ways. In the first one, the participants see the new certificate of deposit without any other information below it. In the second one, the participants see the new certificate of deposit together with a riskier reference point which is another certificate of deposit with a higher interest rate, a longer maturity and no withdrawal option. In the third case, the participants evaluate the new certificate of deposit with the presence of a

safer reference point which is another certificate of deposit with a lower interest rate and the same maturity but with withdrawal option. Answers from only 247 subjects are analyzed according to their performance on qualification check questions which are used to test whether the answers are reliable. 247 participants contribute to the study. The demographic characteristics of the participant pool are as follows: Age of *35–49* (40.8%) or *50–64* (24.6%); Caucasians (87.8%); education of *some college* (36.8%) or *bachelor's degree or more* (53.3%); marital status of *married or living together* (68.3%). The income distribution is as follows: $25,000 or below (7.9%); $25,001–$50,000 (18.7%); $50,001–$75,000 (26.6%); $75,001–$100,000 (22.2%); $100,001–$200,000 (23.0%); and $200,001 or more (1.5%). The distribution of total financial assets is as follows: $5,000 or below (19.5%); $5,001–$25,000 (16.0%); $25,001–$50,000 (7.5%); $50,001–$100,001 (12.0%); $100,001–$200,000 (13.4%); and $200,001 or more (31.6%). The participants are also asked to evaluate four different situations which involve decisions about the financial future of their families. The responses are collected on a seven-point Likert scale which ranges from *very unlikely* to *very likely* (for the measure which is used in this study, the Cronbach's alpha coefficient is 0,899). The results of the four-item test are then summed. According to the totals, high and low levels of risk propensity are analyzed around a median split of "13" ("12" corresponds to the risk neutrality). The results of the experiment are as follows. In the risky reference environment, the participants with higher risk propensities evaluate the focal product more negatively than they do in the no reference

and in the safer reference scenarios. In other words, risk takers have a tendency to make a more negative evaluation when a relatively safer alternative is presented together with the focal product. Last but not least, the authors state that the finding of a marginal effect of risk propensity on the effect of reference point encourages future research on this topic.

Oechssler, Roider, and Schmitz (2009) study three well-known behavioral biases and whether they are related to cognitive ability. The three biases that are studied in this inspirational article are conjunction fallacy, conservatism, and anchoring. The purpose of this article is to examine the relationships of the above mentioned three biases to cognitive ability with respect to risk and time preferences. 564 subjects participate to the online questionnaire of this study. Three questions which measure cognitive ability are randomly spread into the questions of the questionnaire (the test used is *Cognitive Reflection Test (CRT) by Frederick (2005)* which is explained later in the review). A total of ten questions are asked to the participants in addition to the demographics questions. The participants are contacted by emailing and their email addresses are obtained by the help of the economic experimental laboratories in Bonn, Cologne, and Mannheim. The participants are the people who state their interests in contributing to economic experiments. 90% of the participants are composed of university students, and among them 25% have economics or business degrees. 46% of all the participants are female and the mean age of the all participants is 24. The conclusions are as follows. The internet-based experiment is conducted by a

large-scale contribution of the participants. In brief, the study aims to reveal the relationships between cognitive ability and behavioral biases, if there is any. As a result, behavioral biases are found to be more prominent in the decision making processes of individuals with low cognitive abilities. According to the results based on the attitudes of risk aversion and impatience, the people with higher cognitive abilities are inclined to put aside more money and earn higher interests; therefore, they are more likely to take part in the financial markets than the people with low cognitive abilities. Even though the study reveals a statistically significant relationship between cognitive ability and behavioral biases, it also points out that all studied biases are found to exist in high cognitive ability level group as well.

2.4.1. HYPOTHESES ON RISK PROPENSITY

Prospect theory suggests that people are biased to be loss averse, i.e. risk attitudes change according to the domain. The change of the domain from gain to loss affects the decision making processes, and people become risk takers in the presence of a loss and risk avoiders in the presence of a gain, provided that the events are high probability events (Kahneman and Tversky, 1979). There are several studies that investigate the prospect theory, particularly the loss aversion, which are published since 1979. Kahneman and Tversky provide alternatives for the participants of their study and make them decide between certain and uncertain options, hypothesizing that people have a tendency to be risk averse for gains and

risk seeker for losses in exactly the same choice sets which are designed according to the expected utility theory. In this thesis study, a similar choice set is used in order to test the following hypothesis in a high probability event environment as it is defined by Kahneman and Tversky.

Hypothesis 5

$H5_0$: The participants will have a tendency to choose the uncertain alternative in gain domain; however, they will be inclined to select the certain alternative in loss domain, provided that the expected utilities are the same.

$H5_1$: The participants will have a tendency to choose the certain alternative in gain domain; however, they will be inclined to select the uncertain alternative in loss domain, provided that the expected utilities are the same.

As Kwon and Lee (2009) point out, risk tendency might have an effect on reference point bias. This possibility is tested in a larger sample with the contribution of diverse respondents in the Regression Analyses section. In their famous article, Jianakoplos and Bernasek (1998) conclude that women are more risk averse than men in the financial decision making processes. However, the study is based on the analysis of the wealth variable in a survey data, namely *Survey of Consumer Finances*. Just a year after, Schubert, Brown, Gysler, and Brachinger (1999) show by their experimental study that women are not more risk averse than men. As Schubert et al. focus on the effect of contextual differences and conduct a questionnaire

based survey in order to test the gender effect in a financial decision making setting, and the setting of this thesis study is very similar to what they use, it is proposed that there is no gender effect on risk propensity levels of the respondents. This proposition is also tested during the regression analyses.

2.5. COGNITIVE ABILITY

The purposes of this thesis study do not include the investigation of the measurement of cognitive ability and a closer look on the subject. The only concern of this study related to cognitive ability is to find out how cognitive ability levels of people affect their decisions, and to what extent cognitive ability levels are in relation to the selected biases. Therefore, for the purpose of this study, a simple but significant three-question model is preferred in order to measure cognitive ability levels of the respondents. The test is names as *Cognitive Reflection Test (CRT)* and developed by Frederick (2005). Considering time and risk preferences, Frederick shows that CRT is a significant predictive measure in the context of decision making theories (particularly, the expected utility theory and the prospect theory). Frederick's study also points out a gender difference in cognitive ability levels of its participants. Apart from Frederick's study, there are many researches which focus on the inspection of the relationships between cognitive ability and economic behavior, such as Benjamin, Brown, and Shapiro (2006), Slonim, Carlson, and Bettinger (2007), and Dohmen, Falk, Huffman, and Sunde (2010). All these studies have three common findings about the relationship of cognitive ability with decision making processes. It is shown that the higher the cognitive ability level, the more the risk seeking behavior *in the context of gambling in the positive domain* although there is a contradictory evidence which claims that there is no relation between the mathematical cognitive abilities (i.e. the success in GRE math items) and the

risk attitudes of people (Brañas-Garza, Guillen, and Rafael López del Paso; 2008). The second finding is a positive correlation between the cognitive ability levels and the patience levels of people. The third finding is the relation of the levels of education (not the corresponding degrees) with the correct probability judgments. As several studies such as Benjamin, Brown, and Shapiro (2006) and Oechssler, Roider, and Schmitz (2009) point out, there is an inverse ratio between cognitive ability levels and the possibility of behavioral biases. Therefore, it is expected that the respondents of this thesis study who have higher cognitive abilities are less biased than the ones who have lower cognitive abilities. In their investigation of cognitive ability and its relation to behavioral biases, Dohmen, Falk, Huffman, and Sunde (2010) conclude that there is a positive correlation between cognitive ability and risk aversion. They state that the correlation is valid and statistically significant for all age groups and for both genders. These effects are investigated in the Regression Analyses section in detail.

Dohmen, Falk, Huffman, and Sunde (2010) also show that the above mentioned correlation is weaker for females and younger individuals. These patterns are expected to be repeated in our larger sample. The relationship of cognitive ability with age is inspected during the regression analyses.

Hypothesis 6

$H6_0$: The relationship between cognitive ability and risk aversion will not be weaker for the females compared to the males.

$H6_1$: The relationship between cognitive ability and risk aversion will be weaker for the females compared to the males.

3. MEASURES OF VARIABLES AND QUESTIONNAIRE

Selected four biases and cognitive ability are measured by the following questions. Four biases are anchoring, reference point, probability judgment, and risk propensity. These biases together with individual cognitive ability level are measured by the answers to the questions of a designed survey. Other than the questions which measure these variables, some demographics questions are also asked to the respondents of the survey. The survey is composed of 18 fundamental questions of which 6 are questions about demographic variables. The remaining 12 questions are used to measure a total of five variables (above mentioned four biases and cognitive ability). The original questionnaire of the survey which is in Turkish is in Appendix I. In the original questionnaire, the questions are in a mixed order to reduce any possible undesired biases due to a realization of question subgroups by the respondents. All questions of the survey are shown below in their subgroups which are created according to the measured variables. The original question numbers of the survey are given in parentheses for each question to provide a match between this section of the study and the attached questionnaires.

3.1. ANCHORING BIAS

Anchoring bias is measured by two questions. The first question asks respondents to write down the last two digits of their phone numbers. These two digits become a random anchor for each participant. This random anchor is completely unrelated with the second question since the second question asks respondents to bid on an antique engraving which is printed on the questionnaire above the second question. The purpose of asking these questions is to find out whether there is a relationship (a correlation) between the answers to the two questions. If a significant correlation is found, it might be because of the biasing effect of the last two digits of phone numbers on the bids of the respondents. The questions are a modification of the questions which are used by Wilson, Houston, Etling and Brekke (1996). Wilson et al. ask the participants of their study to write down arbitrary numbers on a piece of paper and then to answer "How many physicians practice medicine in your community?"

Question 1 (Question 9 of the Original Questionnaire)**:** What are the last two digits of your phone number (cellular or home)?
Answer Format: Integer from 00 to 99.

Figure 1: "Smyrna from the Harbour-Asia Minor," Thomas Allom, 1840

Question 2 (Question 10 of the Original Questionnaire)**:** How much would you offer for one copy of the engraving above? (The engraving is by Thomas Allom, dated at 1840, named as "Smyrna from the Harbour-Asia Minor", and its size is 20x25cm)

Answer Format: Integer from 0 to 100000 (upper limit).

3.2. REFERENCE POINT BIAS

Reference point bias is measured by three questions. The questions ask the respondents to evaluate a certified of deposit (CD) in the given context. The base part is the same for all three questions. The base part (called base

scenario) of the questions introduces a new certificate of deposit by stating its terms and conditions (including its interest rate and maturity). The respondents are expected to assume that they have a certain amount of money and they are asked to evaluate the base scenario on a five-level Likert scale in the first question. In the second question, the exact same base scenario is introduced together with a relatively safer reference point. The safer reference point is another certificate of deposit which is less risky and has lower return. In the third question, the base scenario is introduced with a riskier reference point. In this alternative, the riskier reference point is again another certificate of deposit which is more risky and has higher return in this case. The purpose of asking these three questions is to find out whether respondents change their minds about the exact same product in the presence of comparable alternatives (called reference points; safer or riskier). If any shifts in the evaluations of the respondents can be shown statistically, this might show that reference points have a biasing effect on the decisions of the participants. Three questions used in this survey are originally from an article by Kwon and Lee (2009). The original questions are modified to represent meaningful interest rates for the currency Turkish Lira.

Question 1 (Question 3 of the Original Questionnaire) -*Base scenario*- **:** Suppose you have 10,000 TL to save, and a new savings product is introduced. This 5-year CD (certificate of deposit) without an early withdrawal option has an APY (Annual Percentage of Yield) of 8%. Thus, you could earn 800 TL in interest per year by putting 10,000 TL in this new long-

term CD product. Without an early withdrawal option, you cannot withdraw the funds for 5 years. Please evaluate this new savings product.
Answer Format: Five-level Likert Scale, and the options are (1) Very good (2) Good (3) Fair (4) Bad (5) Very bad.

Question 2 (Question 6 of the Original Questionnaire) –*Safer reference*-**:** Suppose you have 10,000 TL to save, and a new savings product is introduced. This 5-year CD (certificate of deposit) without an early withdrawal option has an APY (Annual Percentage of Yield) of 8%. Thus, you could earn 800 TL in interest per year by putting 10,000 TL in this new long-term CD product. Without an early withdrawal option, you cannot withdraw the funds for 5 years. Please evaluate this new savings product.
For comparison, a 5-year CD with an early withdrawal option has an APY of 6.75%, which would yield interest earnings of 675 TL per year. With this product, you can withdraw the funds any time during the 5-year term.
Answer Format: Five-level Likert Scale, and the options are (1) Very good (2) Good (3) Fair (4) Bad (5) Very bad.

Question 3 (Question 11 of the Original Questionnaire) -*Riskier reference*-**:** Suppose you have 10,000 TL to save, and a new savings product is introduced. This 5-year CD (certificate of deposit) without an early withdrawal option has an APY (Annual Percentage of Yield) of 8%. Thus, you could earn 800 TL in interest per year by putting 10,000 TL in this new long-

term CD product. Without an early withdrawal option, you cannot withdraw the funds for 5 years. Please evaluate this new savings product.
For comparison, a 10-year CD without an early withdrawal option has an APY of 11%, which would yield interest earnings of 1100 TL per year. With this product, you cannot withdraw the funds for 10 years.
Answer Format: Five-level Likert Scale, and the options are (1) Very good (2) Good (3) Fair (4) Bad (5) Very bad.

3.3. PROBABILITY JUDGMENT BIAS

Probability judgment bias is measured by the following question. The question asks the respondents to determine probability of tails in a toss of a coin. A sequence of the preceding results of the previous tosses of the same coin is given as an introductory information. In this given sequence, the numbers of heads and tails are shown to be equal in order to make respondents believe that the coin is not tricky. Normally, all respondents should give the answer of 50% since the probability of a toss of a coin is always 50%, no matter what the previous results are. However, it is expected that some respondents give answers below 50% and some give answers above 50%. In this instance, the respondents who give answers below 50% might be biased towards hot hand fallacy and the ones who give answers above 50% might be biased towards gambler's fallacy. The original version of the question is initially used by Tversky and Kahneman (1974) in their fascinating article. The question used here, on the other hand, is the

direct translation of the modified version by Dohmen, Falk, Huffman, Marklein, and Sunde (2009).

Question (Question 5 of the Original Questionnaire)**:** Imagine you are tossing a fair coin. After eight tosses you observe the following result: tails - tails - tails - heads - tails - heads - heads - heads. What is the probability, in percent, that the next toss is "tails"?
Answer Format: Integer from 0 to 100 and "I have no idea" option.

3.4. RISK PROPENSITY BIAS

Risk propensity is measured in two different sets of a three questions in total. In the first set of questions, loss aversion is tested by two questions. The third question is added to the questionnaire in order to measure risk propensity level of the respondents. The questions which are used to test loss aversion phenomena introduce two alternatives to the respondents. The first alternative in each of two questions is a certain one and the second alternative is an uncertain one. The offers which are made in the alternatives in two questions are exactly the same; however, in the first question both proposed choices result in a gain, and in the second one both proposed choices result in a loss. The purpose of asking these two questions is to find out whether the respondents change their minds about choosing an alternative between gain domain and loss domain even though all other factors are exactly the same for the two questions. The questions which are

used to test loss aversion phenomena is the direct translation of what is used by Oechssler, Roider, and Schmitz (2009). Only the currency is changed from Euros to Turkish Liras, but the amounts remain untouched. This model of questions is initially used by Kahneman and Tversky (1979) in several variations.

Question 1 (Question 2 of the Original Questionnaire) *-Loss aversion, Gain-***:** You have the choice between two alternatives. Alternative 1: You receive 10 Turkish Liras. Alternative 2: You receive a lottery ticket that yields a 75% chance of winning 20 Turkish Liras. With 25% probability it is worthless. Which alternative do you choose?
Answer Format: Multiple choice; (1) Alternative 1, (2) Alternative 2 and (3) "Undecided".

Question 2 (Question 7 of the Original Questionnaire) *-Loss aversion, Loss-***:** You have to pay 10 Turkish Liras. Would you rather replace this payment through the following alternative: With a probability of 75% you must pay 20 Turkish Liras. With 25% probability you do not have to pay anything. Which alternative do you choose?
Answer Format: Multiple choice; (1) Alternative 1, (2) Alternative 2 and (3) "Undecided".

The third question which is used to measure risk propensity level is composed of four sub-questions. In the question body, a financial situation

regarding to the families of the participants is defined for the following four risk situations. Then, the respondents mark their preferences for these risk situations. Two of the situations (namely; the first one and the fourth one) define a risk averse attitude and two of the situations (namely; the second one and the third one) define a risk taker attitude towards the financial situation which is defined in the question body. Since a five-level Likert scale is used for the answers, each answer to sub-questions is a value between "1" and "5". These four sub-questions are recoded in order to rank all of them from risk averse to risk taker attitude (from "1" to "5"). Afterwards, the scores of the four situations are summed; therefore, an index which is ranging from "4" to "20" is produced for each participant. According to this index, the respondents with a score close to "4" are highly risk averse and the ones with a score close to "20" are highly risk prone. The question which is used to measure risk propensity level in this thesis study is initially created and used by Sitkin and Weingart (1995). However, since Sitkin and Weingart's measure is at organizational level and for measuring business risk propensity, the following question which is a translation of the modified version of Sitkin and Weingart's measure by Kwon and Lee (2009) is used.

Question 3 (Question 12 of the Original Questionnaire)**:** Suppose you face a decision that affects your family's financial future. If you are the main decision-maker, how would you rate your tendency to do the following?

1: Choose less risky alternatives to ensure financial security,

2: Choose riskier alternatives to maximize potential gains,

3: Choose riskier alternatives to achieve financial goals,

4: Choose less risky alternatives to stabilize financial status.

Answer Format: For each sub-question; a five-level Likert scale; (1) Absolutely (2) Most probably (3) Maybe (4) Less probably (5) Never

3.5. COGNITIVE ABILITY

Cognitive ability is measured by three questions. These three questions ask respondents to make simple mathematical calculations. Although they are simple, the questions require out of the box thinking. Otherwise, it is very possible to give wrong answers to these questions. The respondents who give correct answers are marked as "1" and the ones who give wrong answers are marked as "0" for each question. Summing the results for all three questions, each participant gets a score ranging from "0" to "3." "0" corresponds to the lowest cognitive ability level and "3" corresponds to the highest cognitive ability level. These questions which are used to measure individual cognitive ability level in this thesis study are a part of the cognitive reflection test (CRT) which is developed by Frederick (2005). Only the use of the results is modified. In Frederick's study, the participants are split into two groups; namely, the ones with low cognitive ability (0-1 correct answer) and the ones high cognitive ability level (2-3 correct answers).

Question 1 (Question 1 of the Original Questionnaire)**:** A tennis racket and a tennis ball together cost 110 Turkish Liras (TL). The racket costs 100 Turkish Liras more than the ball. How much does the ball cost? (Impulsive answer: 10 TL; correct answer: 5 TL).
Answer Format: Integers from 0 to 110.

Question 2 (Question 4 of the Original Questionnaire)**:** In a box, there is a colony of bacteria. Every hour, the colony doubles in size. If it takes 48 hours for the colony to cover the entire box, how long would it take for the colony to cover half of the box? (Impulsive answer: 24 hours; correct answer: 47 hours).
Answer Format: Multiple choice; (1) 12, (2) 24, (3) 36, (4) 48, and (5) 47.

Question 3 (Question 8 of the Original Questionnaire)**:** If it takes 5 machines 5 minutes to make 5 coins, how long would it take 100 machines to make 100 coins? (Impulsive answer: 100 min; correct answer: 5 min).
Answer Format: Multiple choice; (1) 100, (2) 50, (3) 10, (4) 5, and (5) 200.

3.6. DEMOGRAPHICS

The following are the six demographics questions which are included in the original questionnaire.

Question 1 (Question 13 of the Original Questionnaire)**:** Age

Answer Format: Integer from 0 to 100.

Question 2 (Question 14 of the Original Questionnaire)**:** Gender

Answer Format: Two choices; (1) Male and (2) Female.

Question 3 (Question 15 of the Original Questionnaire)**:** Please mark your current and/or completed degrees.

1: Undergraduate Degree

2: Master's Degree

3: Doctoral Degree

Answer Format: For each question, multiple choice; (1) Educational Sciences, (2) Arts and Sciences, (3) Fine Arts, (4) Law, (5) Economics and Administrative Sciences, (6) Architecture, (7) Engineering, (8) Medicine, and (9) Other Faculty.

Question 4 (Question 16 of the Original Questionnaire)**:** If you are an undergraduate student, please mark your year of class.

Answer Format: Multiple choice; (1) Prep School, (2) Freshman, (3) Sophomore, (4) Junior, and (5) Senior.

Question 5 (Question 17 of the Original Questionnaire)**:** What is your current household income level?

Answer Format: (1) < 10.000 TL, (2) 10.000-19.999 TL, (3) 20.000-29.999 TL, (4) 30.000-39.999 TL, (5) 40.000-49.999 TL, (6) 50.000-59.999 TL, (7) 60.000-95.999 TL, (8) 96.000-143.999 TL, (9) > 144.000 TL, (10) "I don't want to answer".

Question 6 (Question 18 of the Original Questionnaire)**:** If you are professional, please select the department in which you are working.

Answer Format: Multiple choice (Drop-down select box in the online version and manual data entry in the paper based version of the survey).

1. Academic	2. R&D	3. Documentation
4. Maintenance	5. Information Tech.	6. Auditing
7. Warehouse	8. Education	9. Finance
10. Security	11. Communication	12. Public Relations
13. Service	14. Law	15. Administrative Duty
16. Human Resources	17. Business Develop.	18. Import / Export
19. Quality	20. Logistics	21. Architectural
22. Accounting	23. Engineering	24. Customer Services
25. Customer Relations	26. Interpreter	27. Shipping
28. Operation	29. Organization	30. Market Research
31. Marketing	32. Staff	33. Planning
34. Advertisement	35. Health	36. Purchasing
37. Sales	38. Secretarial	39. Sports
40. Design / Graphics	41. Portage	42. Technical
43. Technician	44. Operator	45. Tourism
46. Transportation	47. Manufacturing	48. Food and Beverage
49. Management	50. Other Department	

Departments are in alphabetical listing in the Turkish version of the survey.

4. SAMPLING AND DATA COLLECTION

The respondents are composed of both professionals and university students. Working professionals contribute to the online version of the survey and students fill in mostly paper-based forms. All respondents voluntarily participate in the survey. Those who contribute to the online version are asked to do so by sending emails to the alumni lists of Middle East Technical University and posting calls on social media (Linkedin, Facebook, Twitter, Blogs etc.). Paper-based surveys, on the other hand, are conducted in class settings before lectures. Freshman, sophomore, junior, and senior students of several disciplines are asked to participate in the survey. They are from Middle East Technical University, TOBB University of Economics and Technology, Atilim University and Gazi University which are all located in Ankara, Turkey. The sample is kept as diverse as possible in order to reduce any possible biases which may be caused by demographics.

In both versions of the survey (online and paper-based), potential participants are asked to fill in a survey to provide required data for a master's thesis study. They are not initially informed about the topic and about the content of the survey, in order to obtain unbiased testing environments. It is also important to note that the permission of Middle East Technical University Ethical Committee is granted before conducting the survey and the official permission letter is in Appendix VIII.

The paper-based version of the survey is in Appendix I and the screenshots of the online version of the survey are in Appendix III. The paper-based version is designed in a way to have a compact design; but, since validation checks are not possible, there are both incomplete questionnaires and completed questionnaires with invalid answers in the paper-based version. The online version of the survey, on the other hand, results in only incomplete questionnaires but not invalid answers. This is because the online version is coded in a way to validate inputs for each question before the submission of the survey data. Moreover, in the online version, in order to reduce the rate of possible incomplete surveys, the survey questions are distributed into five pages with a better user experience design, encouraging the respondents to fully complete the survey by providing.

1681 individuals contribute to the survey. 858 of them participate in the online version, and 823 of them fill in the paper-based version of the survey. Among 823 respondents, 324 are students from Middle East Technical University, and the remaining 499 respondents are from the other universities, mostly from TOBB University of Economics and Technology.

Table 1

Distribution of Respondents by Source

	Total	Incomplete / Not Valid	Complete / Valid
Online Version	858	56	802
TOBB ETU and Others	499	34	465
METU	324	16	308
Total Conducted Survey	1681	106	1575

1575 of the total 1681 participants fully complete the survey and complete it by valid information. Among 1575 respondents, 802 contribute to the online version of the survey. The remaining 773 fill in the paper-based questionnaire, and 308 of these 773 respondents are from Middle East Technical University. 465 of 773 respondents are from other universities, mostly from TOBB Economics and Technology University (see Table 1).

Table 2

Distribution of Respondents by Educational Degree

	Undergraduate	Master's	Doctorate
Online Version	1575	408	98

All 1575 participants have undergraduate degrees. Among them, 408 have master's degrees and 98 of 408 respondents have also doctorate degrees (see Table 2).

Table 3

Distribution of Respondents by Employment

	Working	Not Working
Online Version	669	906

669 of 1575 participants are composed of working professionals. 906 of 1575 respondents are not working, being mostly students and some unemployed participants (only 47). 669 of the participants are employed and most of them answer the online version of the survey (see Table 3). Among the working professionals, 92 are finance professionals, 59 are managers, and 42 are academicians. For a more detailed departmental distribution of these 669 participants, the frequency distribution of departmental occupation can be found in Appendix VII.

772 of the respondents are undergraduate students and their distribution according to their years of class is shown in Table 9 on page 103.

5. ANALYSES AND RESULTS

The data are analyzed by the statistical software package SPSS version 16. In order the analyses to be followed clearly, the coded version of the questionnaire is available in Appendix II (in Turkish).

On the following pages, the descriptive statistics for the answers of each survey question are presented. Next, the hypotheses are restated, the tests for each hypothesis are conducted, and the corresponding results are demonstrated. Last but not least, regression analyses of statistically significant biases are run to examine the effects of individual cognitive ability levels and some demographic variables on those biases.

5.1. DESCRIPTIVE STATISTICS FOR DEMOGRAPHIC VARIABLES

Demographic information is collected by six questions. The six questions collect data for five variables; age, gender, education (level, and year of class if undergraduate student), income, and employment (departmental).

Age

Table 4

Descriptive Statistics for Age

N	Valid	1575,000
	Missing	,000
Mean		27,437
Std. Error of Mean		,224
Median		24,000
Mode		21,000
Std. Deviation		8,872
Variance		78,720
Range		62,000
Minimum		18,000
Maximum		80,000
Sum		43213,000
Percentiles	25	21,000
	50	24,000
	75	31,000

The frequency distribution table for age is in Appendix VI.

The participants are 27 years old in average. Ages of the participants range from 18 to 80 years. The mode is 21 and the median is 24. The percentile 25 is 21, and the percentile 75 is 31 (see Table 4).

Gender

Table 5

Frequency Distribution for Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	933	59,2	59,2	59,2
	Female	642	40,8	40,8	100,0
	Total	1575	100,0	100,0	

The frequency distribution of gender shows that there are more male respondents than female ones. Male participants constitute 59,2% and female participants constitute 40,8% of the total respondents (see Table 5).

Education

Table 6

Frequency Distribution for Undergraduate Degree by Faculty

	Frequency	Percent	Valid Percent	Cumulative Percent
Educational Sciences	27	1,7	1,7	1,7
Arts and Sciences	79	5,0	5,0	6,7
Fine Arts	20	1,3	1,3	8,0
Law	38	2,4	2,4	10,4
Economics and Administrative Sciences	893	56,7	56,7	67,1
Architecture	28	1,8	1,8	68,9
Engineering	394	25,0	25,0	93,9
Medicine	34	2,2	2,2	96,1
Other Faculty	62	3,9	3,9	100,0
Total	1575	100,0	100,0	

Most of the respondents have their undergraduate degrees from Economics and Administrative Sciences Faculty (56,7%). Then, Engineering Faculty follows, with a percentage of 25% (see Table 6).

Table 7

Frequency Distribution for Master's Degree by Faculty

	Frequency	Percent	Valid Percent	Cumulative Percent
Educational Sciences	5	,3	1,2	1,2
Arts and Sciences	25	1,6	6,1	7,4
Fine Arts	4	,3	1,0	8,3
Law	4	,3	1,0	9,3
Economics and Administrative Sciences	238	15,1	58,3	67,6
Architecture	9	,6	2,2	69,9
Engineering	82	5,2	20,1	90,0
Medicine	2	,1	,5	90,4
Other Faculty	39	2,5	9,6	100,0
Total	408	25,9	100,0	
No Master's Degree	1167	74,1		
Total	1575	100,0		

Only 25,9% of 1575 respondents have master's degree and most of them have their master's degrees from Economics and Administrative Sciences Faculty (58,3%). Then, Engineering Faculty follows, with a percentage of 20,1% (see Table 7).

Table 8

Frequency Distribution for Doctorate Degree by Faculty

	Frequency	Percent	Valid Percent	Cumulative Percent
Educational Sciences	3	,2	3,1	3,1
Arts and Sciences	9	,6	9,2	12,2
Fine Arts	2	,1	2,0	14,3
Economics and Administrative Sciences	46	2,9	46,9	61,2
Architecture	4	,3	4,1	65,3
Engineering	21	1,3	21,4	86,7
Other Faculty	13	,8	13,3	100,0
Total	98	6,2	100,0	
No Doctorate Degree	1477	93,8		
Total	1575	100,0		

Only 6,2% of 1575 respondents have doctorate degree and most of them have their doctorate degrees from Economics and Administrative Sciences Faculty (46,9%). Engineering Faculty follows, with a percentage of 21,4% (see Table 8)

Undergraduate Year of Class

Table 9

Frequency Distribution for Undergraduate Year of Class

	Frequency	Percent	Valid Percent	Cumulative Percent
Prep School	2	,1	,3	,3
Freshman	281	17,8	36,4	36,7
Sophomore	101	6,4	13,1	49,7
Junior	230	14,6	29,8	79,5
Senior	158	10,0	20,5	100,0
Total	772	49,0	100,0	
Not Undergraduate	803	51,0		
Total	1575	100,0		

Almost half of the respondents (49%) are undergraduate students. Table 9 shows the frequency distribution of these respondents according to their years of class.

Income

Table 10

Descriptive Statistics for Income

Valid	1328
Missing	247
Mean	5
Median	5
Mode	1

The descriptive statistics of income data show that both the mean and the median is "5." "5" is the categorical equivalent of the income interval "40.000-49.999 TL." Although the word "household" is written on the questionnaire in quotation marks, it is very possible that student respondents might have marked their individual income but not their household income. Therefore, the mean and the mode values of the income variable might be controversial. The frequency table is as follows and has much proof for this possibility (see Table 11).

Table 11

Frequency Distribution for Income

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 10.000 TL	233	14,8	17,5	17,5
10.000 to 19.999 TL	153	9,7	11,5	29,1
20.000 to 29.999 TL	149	9,5	11,2	40,3
30.000 to 39.999 TL	111	7,0	8,4	48,6
40.000 to 49.999 TL	134	8,5	10,1	58,7
50.000 to 59.999 TL	101	6,4	7,6	66,3
60.000 to 95.999 TL	212	13,5	16,0	82,3
96.000 to 143.999 TL	140	8,9	10,5	92,8
More than 144.000 TL	95	6,0	7,2	100,0
Total	1328	84,3	100,0	
Don't want to answer	247	15,7		
Total	1575	100,0		

As it is shown on the frequency table, not only the answer of "less than 10.000 TL" is dominant, but also the answer of "10.000 to 19.999 TL" constitutes 9,7% of the participants. The frequency distribution shows that

24,5% of all participants have a household income 19.999 TL or lower. The highest percentage following the first one is 13,5% which corresponds to the "60.000 to 95.999 TL" interval (See Table 11).

Occupation

1. Academic
2. R&D
3. Documentation
4. Maintenance
5. Information Tech.
6. Auditing
7. Warehouse
8. Education
9. Finance
10. Security
11. Communication
12. Public Relations
13. Service
14. Law
15. Administrative Duty
16. Human Resources
17. Business Develop.
18. Import / Export
19. Quality
20. Logistics
21. Architectural
22. Accounting
23. Engineering
24. Customer Services
25. Customer Relations
26. Interpreter
27. Shipping
28. Operation
29. Organization
30. Market Research
31. Marketing
32. Staff
33. Planning
34. Advertisement
35. Health
36. Purchasing
37. Sales
38. Secretarial
39. Sports
40. Design / Graphics
41. Portage
42. Technical
43. Technician
44. Operator
45. Tourism
46. Transportation
47. Manufacturing
48. Food and Beverage
49. Management
50. Other Department

The frequency distribution table for the occupation is in Appendix VII.

5.2. CROSS-TABS FOR SELECTED BIASES AND CORRELATION MATRIX FOR VARIABLES

Cross-tabs for Reference Point and Probability Judgment Bias

Table 12

*Reference Point Bias * Probability Judgment Cross-tabulation*

			Probability Judgment Bias		Total
			Unbiased	Biased	
Reference Point Bias	Unbiased	Count	1001	169	1170
		% within Reference Point Bias	85,6%	14,4%	100,0%
		% within Probability Judgment Bias	74,8%	71,3%	74,3%
		% of Total	63,6%	10,7%	74,3%
	Biased	Count	337	68	405
		% within Reference Point Bias	83,2%	16,8%	100,0%
		% within Probability Judgment Bias	25,2%	28,7%	25,7%
		% of Total	21,4%	4,3%	25,7%
Total		Count	1338	237	1575
		% within Reference Point Bias	85,0%	15,0%	100,0%
		% within Probability Judgment Bias	100,0%	100,0%	100,0%
		% of Total	85,0%	15,0%	100,0%

The cross-tabulation shows that 63,6% of the respondents are unbiased towards both behavioral biases (the reference point bias and the probability judgment bias). Only 4,3% of them are biased in both cases. 21,4% of the

participants are unbiased in judgment of the probability but make biased decisions in the presence of (safer) alternatives (see Table 12).

Correlation Matrix for Selected Variables

Table 13

Correlation Matrix for Selected Variables

		Cognitive Ability (**1**)	Risk Propensity (**2**)	Age (**3**)	Education (**4**)	Income (5)
1	Pearson Corr.	1	-,054*	,018	,065**	,076**
	P-value		,031	,478	,009	,006
	N	1575	1575	1575	1575	1328
2	Pearson Corr.	-,054*	1	-,173**	-,088**	,036
	P-value	,031		,000	,000	,185
	N	1575	1575	1575	1575	1328
3	Pearson Corr.	,018	-,173**	1	,302**	,260**
	P-value	,478	,000		,000	,000
	N	1575	1575	1575	1575	1328
4	Pearson Corr.	,065**	-,088**	,302**	1	,138**
	P-value	,009	,000	,000		,000
	N	1575	1575	1575	1575	1328
5	Pearson Corr.	,076**	,036	,260**	,138**	1
	P-value	,006	,185	,000	,000	
	N	1328	1328	1328	1328	1328

*. Correlation is significant at the 0,05 level (2-tailed).
**. Correlation is significant at the 0,01 level (2-tailed).

The correlation matrix shows that there are many significant correlations among measured variables at both 95% and 99% confidence levels. All significant correlations are marked with stars in the table. For instance,

cognitive ability is found to be negatively correlated with risk propensity with a correlation coefficient of -0,054 (p-value is 0,031). It is also shown that cognitive ability is in positive correlation with education at the 0,01 level, as it is with income. Cognitive ability is not correlated with age at a statistically significant level. Risk propensity is, on the other hand, negatively correlated with age (coefficient is -0,082 and p-value is 0,000), and education (coefficient is -0,088 and p-value is 0,000). It is shown that risk propensity is not significantly correlated with income. For all significant correlations, please see Table 13.

5.3. ANCHORING BIAS

5.3.1. DESCRIPTIVE STATISTICS FOR ANCHORING BIAS

The role of the first anchoring question is to create a random anchor value. The question asks participants to write down the last two digits of their mobile or home phone numbers. The answer inherently varies between 00 and 99, and the descriptive statistics for this question are as follows:

Table 14

Descriptive Statistics for Two Digits of Phone Number and Bids for Engraving[5]

		Last Two Digits of Phone Number	Bid Price for Engraving (Turkish Lira currency)
N	Valid	1575	1575
	Missing	0	0
Mean		48,28	4011,65
Std. Error of Mean		,729	349,930
Median		46,00	100,00
Mode		0	100,00
Std. Deviation		28,943	13887,416
Variance		837,698	1,929E8
Range		99	100000
Minimum		0	0
Maximum		99	100000
Sum		76045	6318346
Percentiles	25	23,00	20,00
	50	46,00	100,00
	75	73,00	1000,00

[5] Frequency distribution for "Last Two Digits of Phone Number" and "Bid Price for Engraving" can be found in Appendix IV and in Appendix V accordingly.

The descriptive statistics of the answers to the first anchoring question (Table 14) show that the mean is 48,28 and the median is 46,00. These are very close to the ideal mean and the median of 49,50 as if there should be one of each number from 00 to 99 in a 100-values distribution. The frequency table of the data can be found in Appendix IV.

The second question which measures anchoring bias asks the participants to make an offer for a copy of the engraving which is defined in the question in detail. The results are ranging from 0 to 100.000 TL and the descriptive statistics are as shown on the previous page. The mode and the median of the data is 100 TL. The mean of all the bids is 4011,65 TL. The frequency table for the bids on the engraving can be found in Appendix V.

5.3.2. HYPOTHESES ON ANCHORING BIAS

Hypothesis 1

$H1_0$: The participants with higher last two digits of phone numbers will not tend to bid higher amounts for the focal product (the engraving).

$H1_1$: The participants with higher last two digits of phone numbers will tend to bid higher amounts for the focal product (the engraving).

The role of the first anchoring question is to create a random anchor value which is not compared to the value of the focal product, and it is random, uninformative, and irrelevant. The question asks participants to write down

the last two digits of their mobile or home phone numbers. The answer inherently varies between "00" and "99".

The second anchoring question asks the participants to make an offer for a copy of the engraving which is defined in the question in detail. Hypothesis 1 tests whether the two digits which are written down as an answer to the first question affect the answers given to the second question. The answers which are given to the second question are ranging from 0 TL to 100.000 TL.

To test whether Hypothesis 1 is supported or not, a correlation between the answers to the first question and the answers to the second question is required to be inspected. The results of the Pearson correlation for these two data sets are as follows.

Table 15

Correlation between Two Digits of Phone Number (Anchor Value) and Bids for Engraving (Focal Product)

		Anchor Value	Bids for Engraving
Anchor Value	Pearson Correlation	1,000	,001
	P-value		,954
	N	1575,000	1575
Bids for Engraving	Pearson Correlation	,001	1,000
	P-value	,954	
	N	1575	1575,000

As seen on Table 15, the Pearson correlation coefficient is found to be 0,001 (p-value is 0,954) meaning that there is not a statistically significant

correlation between the anchor values (the last two digits of phone numbers) and the prices which are offered for the engraving. Ariely, Loewenstein, and Prelec (2003) ask the subjects of their experiment to compare arbitrary anchors with the value of the focal product before asking them to evaluate it. They find a significant anchoring effect. On the other hand, Wilson, Houston, Etling, and Brekke (1996) do not ask the participants of their study to relate the anchors to the focal product. However, they also find a significant anchoring effect. In brief, both Ariely, Loewenstein, and Prelec and Wilson, Houston, Etling, and Brekke find a significant anchoring effect even though their methods are different, the latter measuring the *basic anchoring effect* as it is measured also in this thesis study. Therefore, it is clear that the results are contradictory to previous researches in which the anchor values are found to have a significant effect on different kind of decisions although they use various methods (see Tversky and Kahneman, 1974; Cervone and Peake, 1986; Johnson and Schkade, 1989; Jacowitz and Kahneman, 1995; Wilson, Houston, Etling, and Brekke, 1996; Mussweiler and Strack, 1999; Chapman and Johnson, 1999; Ariely, Loewenstein, and Prelec, 2003; Oechssler, Roider, and Schmitz, 2009; and Kudryavtsev and Cohen, 2010). The reason why the null hypothesis is failed to be rejected may be the complexity of the focal product under evaluation. It is possible that the participants might not have understood what the focal product really is since engraving is not popular anymore. This may also explain the wide range of the answers from 0 TL to 100.000 TL. Another possible reason might be the length of the questionnaire and the corresponding fact that there are several

digits on the previous questions of the survey. This complexity might have prevented the effect of the randomly created anchor values. In any case, no relationship between the uninformative, irrelevant anchor values and the evaluation of the focal product (engraving) is found; therefore, there is a statistically significant evidence that the participants with higher last two digits of phone numbers will not tend to bid higher amounts for the focal product (the engraving). The null hypothesis is failed to be rejected; thus, there is not sufficient evidence to support the alternative hypotheses.

5.4. REFERENCE POINT BIAS

5.4.1. DESCRIPTIVE STATISTICS FOR REFERENCE POINT BIAS

The respondents are asked to evaluate a new financial product (a certificate of deposit) initially alone (base scenario), later together with a safer reference point, and after that with a riskier reference point.

Table 16

Descriptive Statistics for Base Scenario, Safer and Riskier Reference Scenarios

		Base Scenario	Safer Reference Point	Riskier Reference Point
N	Valid	1575	1575	1575
	Missing	0	0	0
Mean		3,27	3,17	3,13
Std. Error of Mean		,026	,026	,027
Median		3,00	3,00	3,00
Mode		3	3	3
Std. Deviation		1,013	1,025	1,078
Variance		1,025	1,051	1,163
Range		4	4	4
Minimum		1	1	1
Maximum		5	5	5
Sum		5153	4996	4922
Percentiles	25	3,00	2,00	2,00
	50	3,00	3,00	3,00
	75	4,00	4,00	4,00

The descriptive statistics for the base scenario show that the most frequent answer of the participants is "Fair (3)" and the second most popular answer is "Bad (4)." The results of the answers to the safer reference and the riskier reference conditions are only slightly different from the results of the answers to the base scenario (see Table 16).

Table 17

Frequency Distribution for Base Scenario

	Frequency	Percent	Valid Percent	Cumulative Percent
Very good	32	2,0	2,0	2,0
Good	351	22,3	22,3	24,3
Fair	553	35,1	35,1	59,4
Bad	435	27,6	27,6	87,0
Very bad	204	13,0	13,0	100,0
Total	1575	100,0	100,0	

Table 18

Frequency Distribution for Safer Reference Scenario

	Frequency	Percent	Valid Percent	Cumulative Percent
Very good	52	3,3	3,3	3,3
Good	381	24,2	24,2	27,5
Fair	564	35,8	35,8	63,3
Bad	400	25,4	25,4	88,7
Very bad	178	11,3	11,3	100,0
Total	1575	100,0	100,0	

Table 19

Frequency Distribution for Riskier Reference Point Scenario

	Frequency	Percent	Valid Percent	Cumulative Percent
Very good	77	4,9	4,9	4,9
Good	412	26,2	26,2	31,0
Fair	509	32,3	32,3	63,4
Bad	391	24,8	24,8	88,2
Very bad	186	11,8	11,8	100,0
Total	1575	100,0	100,0	

According to the frequency distributions (Table 17, 18 and 19), "Fair" is the most frequent answer in all three conditions. "Good" and "Bad" follow it. The frequency distributions show that the results are only slightly different from each other. This might be the expected result since the focal product under evaluation is the same for all three conditions.

5.4.2. HYPOTHESES ON REFERENCE POINT BIAS

Hypothesis 2

$H2_0$: In the evaluation of a financial product, providing a safer (and lower return) reference will not make the focal product more attractive.

$H2_1$: In the evaluation of a financial product, providing a safer (and lower return) reference will make the focal product more attractive.

The hypothesis tests whether the same participants evaluate the focal product in the base scenario condition different from the safer reference point condition in which there is also a relatively safer alternative to the focal product, unlike the base scenario in which the focal product is presented alone.

According to Hypothesis 2, if the participants perceive the same product more attractive when there is a safer reference point, then the answers to the safer reference condition should be at least a level more positive than the answers to the base scenario condition for the same respondents.

Therefore, in order to test the hypothesis, it is necessary to know how many of the participants are affected by the safer reference and change their decision to a better value. In order to acquire the required data set, a syntax[6] is run on SPSS 16 and a new data column is created accordingly. The syntax marks the participants who change their evaluation to a better value as "1." The other participants who do not change their evaluation to a better value (who keep the same evaluation or worsen their evaluation in the presence of a safer alternative) are marked as "0".

Table 20

Frequency Distribution for Change from Base to Safer Reference Scenarios

	Frequency	Percent	Valid Percent	Cumulative Percent
0	1170	74,3	74,3	74,3
1	405	25,7	25,7	100,0
Total	1575	100,0	100,0	

The data in Table 20 show that 405 of the 1575 participants (25,7% of all the respondents) change their evaluations to more positive values in the presence of a safer reference point as the alternative hypothesis proposes. For further analysis, a T-test follows in order to test whether the degree of the change (the difference) is significant.

[6] if ((Question3 eq 2 and Question6 lt 2) or (Question3 eq 3 and Question6 lt 3) or (Question3 eq 4 and Question6 lt 4) or (Question3 eq 5 and Question6 lt 5))Condition36=1.

Table 21

Paired Samples T-test for Base Scenario and Safer Reference Scenario

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Base Scenario	3,27*	1575	1,013	,026
	Safer Reference	3,17*	1575	1,025	,026

Paired Samples Correlations

		N	Correlation	P-value
Pair 1	Base Scenario and Safer Reference	1575	,570	,000

Paired Samples Test (Paired Differences: Base Scenario - Safer Reference)

Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	P-value
			Lower	Upper			
,100	,945	,024	,053	,146	4,187	1574	,000

* (1) Very good (2) Good (3) Fair (4) Bad (5) Very bad.

The paired samples statistics (the T-test in Table 21) show that the difference between two sets of data is statistically significant. Since the mean of the base scenario (Question 1) is lower than that of the safer reference scenario (Question 2) (and lower scales corresponds to a better evaluation of the focal product), the null hypothesis is rejected and the alternative hypothesis is supported. These conclusions are also confirmed by a nonparametric Sign test which results in the same significant result (see Table 22 below).

Table 22

Sign Test for Change from Base Scenario to Safer Reference Scenarios

		N
Safer - Base	Negative Differences[a]	405
	Positive Differences[b]	305
	Ties[c]	865
	Total	1575

a. Safer < Base

b. Safer > Base

c. Safer = Base

	Safer - Base
Z	-3,715
Asymp. P-value	,000

To sum up, in the evaluation of a financial product, a safer (and lower return) alternative is found to make the focal product significantly more attractive as Kwon and Lee (2009) also show in their study. Besides, similar results are obtained by the previous researches (e.g. Dholakia and Simonson, 2005; Tversky and Kahneman, 1991; Simonson and Tversky, 1992; Hsee and Leclerc, 1998; and Brenner, Rottenstreich, and Sood, 1999). More discussion is available on reference point bias after the test of the third hypothesis since it is a complementary proposition to the second hypothesis in defining the reference point effect.

Hypothesis 3

$H3_0$: In the evaluation of a financial product, providing a riskier (and higher return) reference will not have an effect on the evaluation of the focal product.

$H3_1$: In the evaluation of a financial product, providing a riskier (and higher return) reference will have an effect on the evaluation of the focal product.

Hypothesis 3 claims that the respondents will change their minds in the presence of a riskier reference point, similar to what they do in the presence of a safer reference point. Then, it is necessary to know how many of the participants are affected by the riskier reference and change their decisions. In order to obtain the necessary data set, a syntax[7] is run on SPSS 16 and a new data column is created accordingly. The syntax marks the participants who change their evaluations to a different value as "1." The other participants who keep the exact same evaluations are recoded as "0."

Table 23

Frequency Distribution for Change from Base to Riskier Reference Scenarios

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	750	47,6	47,6	47,6
	1	825	52,4	52,4	100,0
	Total	1575	100,0	100,0	

[7] if ((Question3 eq 1 and Question11 eq 1) or (Question3 eq 2 and Question11 eq 2) or (Question3 eq 3 and Question11 eq 3) or (Question3 eq 4 and Question11 eq 4) or (Question3 eq 5 and Question11 eq 5))Condition311=0.

The frequency distribution of the data shows that more than half of the respondents (52,4%) change their minds about the evaluation of the focal product in the presence of a riskier reference point (see Table 23). Moreover, the alternative hypothesis proposes that the evaluations of the participants for the focal product will differ in the presence of a riskier alternative. In other words, the answers to the base scenario and the answers to the riskier reference point scenario are expected to be significantly different. In order to see whether the effect of the riskier alternative on the evaluation of the focal product is significant, a T-test follows.

Table 24

Paired Samples T-test for Base Scenario and Riskier Reference Scenario

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Base Scenario	3,27*	1575	1,013	,026
	Riskier Reference	3,13*	1575	1,078	,027

Paired Samples Correlations

		N	Correlation	P-value
Pair 1	Base Scenario and Riskier Reference	1575	,408	,000

Paired Samples Test (Paired Differences: Base Scenario - Riskier Scenario)

Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	P-value
			Lower	Upper			
,147	1,139	,029	,090	,203	5,109	1574	,000

* (1) Very good (2) Good (3) Fair (4) Bad (5) Very bad.

T-test results (Table 24) show that there is a significant difference between the answers given to the base scenario and the ones given to the riskier reference scenario. These results actually prove that, contrary to what the null hypothesis proposes, the presence of a riskier alternative has a significant effect on the evaluation of the focal product (in the same direction with the safer alternative). The null hypothesis is rejected; therefore, there is sufficient evidence to support the alternative hypothesis. These conclusions are also confirmed by a nonparametric Sign test which results in the same significant result (see Table 25 below).

Table 25

Sign Test for Change from Base Scenario to Riskier Reference Scenarios

		N
Riskier - Base	Negative Differences[a]	473
	Positive Differences[b]	352
	Ties[c]	750
	Total	1575

a. Riskier < Base

b. Riskier > Base

c. Riskier = Base

	Riskier - Base
Z	-4,178
Asymp. P-value	,000

Unlike the study of Kwon and Lee (2009) which also investigates the decision making pattern in the evaluation of a financial product, the results of this thesis study reject the null hypothesis; a significant reference point

effect is found in the presence of a riskier alternative as it is found in the presence of a safer alternative.

Explicit reference points are used in this study to test the effect of the bias as Dholakia and Simonson (2005) do. What Tversky and Kahneman (1991) and Simonson and Tversky (1992) theoretically, and Hsee and Leclerc (1998) experimentally show is supported by the rejection of the null hypothesis of Hypothesis 3 and the acceptance of the alternative hypothesis of Hypothesis 2 of this study; reference point is always in effect, no matter which alternative is the winner. Riskier reference point is also shown to lead the participants to a better evaluation as safer reference point does. Brenner, Rottenstreich, and Sood (1999) also support this result by inspecting the reference point effect in the context of comparisons. They show that what really matters is the presence of any kind of alternatives (safer or riskier); a comparison environment with better or worse options is shown to hurt the evaluation of the focal product, on the other hand.

5.5. PROBABILITY JUDGMENT BIAS

5.5.1. DESCRIPTIVE STATISTICS FOR PROBABILITY JUDGMENT BIAS

Table 26

Descriptive Statistics for Probability Judgment Bias

N	Valid	1440,000
	Missing	135,000
Mean		51,122
Std. Error of Mean		,238
Median		50,000
Mode		50,000
Std. Deviation		9,023
Variance		81,407
Range		96,000
Minimum		4,000
Maximum		100,000
Sum		73616,000
Percentiles	25	50,000
	50	50,000
	75	50,000

Table 27

Frequency Distribution for Probability Judgment Bias

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 50%	30	1,9	2,1	2,1
50%	1338	85,0	92,9	95,0
More than 50%	72	4,6	5,0	100,0
Total	1440	91,4	100,0	
I have no idea	135	8,6		
Total	1575	100,0		

As the frequency distribution (Table 27) shows clearly, and the mode and the median values of the data confirm accordingly; the most frequent answer is the correct one, 50%. The mean is %51,122 and it is slightly above the correct answer (see Table 26). This might mean that the results show a tendency to gambler's fallacy; however, the difference is too small to comment on it. 85% of the respondents give the correct answer, and excluding the ones who do not answer the question, only 6,5% of the respondents give wrong answers.

5.5.2. HYPOTHESES ON PROBABILITY JUDGMENT BIAS

Hypothesis 4

$H4_0$: There will not be a significant difference between gambler's fallacy and hot hand fallacy.

$H4_1$: There will be a significant difference between gambler's fallacy and hot hand fallacy.

Probability judgment is tested by the fifth question of the original questionnaire of this study. The respondents are expected to answer the question either by writing down a prediction of the probability of tails or by choosing the option "I have no idea." "I have no idea" option is coded as "0" since there are no given answers of "0" which is written down as a prediction. Then, zeros are excluded from the analysis and the data are recoded by a SPSS 16 syntax[8].

[8] recode Question5Original (0=.)(1 thru 49=1)(50=2)(51 thru 100=3) into Question5.

By this way, the answers are converted into digits, ranging from "1" to "4." The digit "1" corresponds to the participants who are biased towards hot hand fallacy (<%50), and "3" corresponds to the participants who are biased towards gambler's fallacy (>%50). Digit "2" corresponds to the correct objective Bayesian probability judgment which yields a calculation of 50%. Accordingly, the frequency table of the new data set is created (see Table 27 on page 124).

The respondents who give answers below 50% might be biased towards hot hand fallacy and the ones who give answers above 50% might be biased towards gambler's fallacy. However, as the frequency distribution shows clearly, the most frequent answer is the correct one, 50%. The mean is 51,122% and it is slightly above the correct answer. In order to see whether 50% is significantly different from 51,122% (whether there is any bias in the judgment of probability), a proportion test follows. According to the proportion test, there is no significant difference between these percentages (chi-square is 0,025181 and p-value is 0,873917). This means that the respondents are not actually biased in judgment of probabilities.

Since the mean is higher than 50%, there might be a slight predominant effect of gambler's fallacy; however, since the difference between the percentage of the participants who show a tendency to hot hand fallacy and the percentage of the ones who show a tendency to gambler's fallacy is too small (2,1% vs. 5,0% accordingly), it is concluded that an analysis on these

data might lead to erroneous results. Moreover, the proportion test already shows that there is not a statistically significant difference between the proportions 2,1% and 5,0% (chi-square is 1,228 and p-value is 0,267). Therefore, the null hypothesis is failed to be rejected and the alternative hypothesis is rejected. There is not a significant difference between gambler's fallacy and hot hand fallacy.

There is a strong dominancy of the correct answers since 85% of the answers are correct. This may be because of the education level of the respondents. All of the participants have at least a bachelor's degree, and as Dohmen, Falk, Huffman, Marklein, and Sunde (2008) show that educated people are more likely to give correct answers to probability judgment questions.

Even though there are some contradictory results in different contexts, almost all previous studies show that people are inclined to be biased in probability judgments, if not towards gambler's fallacy but towards hot hand fallacy (Kahneman and Tversky, 1972; Tversky and Kahneman, 1974; Camerer, 1987; Clotfelter and Cook, 1993; Dohmen, Falk, Huffman, and Marklein, and Sunde, 2009). Some of the researchers, on the other hand, such as Rabin (2002) or Croson and Sundali (2005), do not consider gambler's fallacy as an opposite bias of hot hand fallacy. They claim the possibility of their joint presence, and they also find a statistically significant bias in probability judgments.

5.6. RISK PROPENSITY

5.6.1. DESCRIPTIVE STATISTICS FOR RISK PROPENSITY

Loss aversion is measured by two questions which both provide two alternatives to the respondents. The expected values of the proposed alternatives are exactly the same in these two questions; however, there is a subtle difference: Question 1 (gain domain) offers a certain gain and an uncertain alternative for more gain. The expected value of the uncertain alternative is higher, compared to the certain alternative. Question 2 (loss domain), on the other hand, offers a certain loss and an uncertain alternative for more loss. The expected value of the uncertain alternative is higher in absolute terms, compared to the certain alternative. First of all, the descriptive statistics for the Question 1 (gain domain) and Question 2 (loss domain) are as follows.

Table 28

Frequency Distribution for Gain Domain (Question 1)

	Frequency	Percent	Valid Percent	Cumulative Percent
Certain Alternative	669	42,5	44,0	44,0
Uncertain Alternative	850	54,0	56,0	100,0
Total	1519	96,4	100,0	
Undecided	56	3,6		
Total	1575	100,0		

Table 29

Frequency Distribution for Loss Domain (Question 2)

	Frequency	Percent	Valid Percent	Cumulative Percent
Certain Alternative	1000	63,5	67,2	67,2
Uncertain Alternative	489	31,0	32,8	100,0
Total	1489	94,5	100,0	
Undecided	86	5,5		
Total	1575	100,0		

The descriptive statistics of the two questions show that there are noteworthy differences between the two sets of data. In the gain domain, the respondents seem to have a tendency to take risks and choose the uncertain option. In the loss domain, however, the respondents are inclined to choose the certain alternative rather than the uncertain one. The frequency distributions of the questions show that the weights of the answers to the two questions are observably different. The tendency of the answers to the uncertain option in the gain domain (54,0%) and the tendency of the answers to the certain option in the loss domain (67,2%) are two notably important facts (see Table 28 and 29).

Risk propensity levels of the respondents are measured by four sub-questions, each defining an attitude towards the hypothetically given financial situation. The descriptive statistics are as follows (the answers are on five-level Likert scale) in Tables 30, 31, 32, 33, and 34.

Table 30

Descriptive Statistics for Risk Propensity Level Sub-Questions

		1*	2*	3*	4*
N	Valid	1575	1575	1575	1575
	Missing	0	0	0	0
Mean*		2,18	2,66	2,64	2,41
Std. Error of Mean		,020	,024	,024	,023
Median*		2,00	3,00	3,00	2,00
Mode*		2	2	2	2
Std. Deviation		,813	,937	,948	,932
Variance		,661	,877	,898	,868
Range*		4	4	4	4
Minimum*		1	1	1	1
Maximum*		5	5	5	5
Sum		3436	4192	4157	3793
Percentiles	25*	2,00	2,00	2,00	2,00
	50*	2,00	3,00	3,00	2,00
	75*	3,00	3,00	3,00	3,00

*****1: Choose less risky alternatives to ensure financial security.
*****2: Choose riskier alternatives to maximize potential gains.
*****3: Choose riskier alternatives to achieve financial goals.
*****4: Choose less risky alternatives to stabilize financial status.
*(1) Absolutely (2) Most probably (3) Maybe (4) Less probably (5) Never

Table 31

*Frequency Distribution for Risk Propensity Sub-Question 1**

	Frequency	Percent	Valid Percent	Cumulative Percent
Absolutely	260	16,5	16,5	16,5
Most probably	898	57,0	57,0	73,5
Maybe	302	19,2	19,2	92,7
Less probably	101	6,4	6,4	99,1
Never	14	,9	,9	100,0
Total	1575	100,0	100,0	

*****Choose less risky alternatives to ensure financial security.

Table 32

*Frequency Distribution for Risk Propensity Sub-Question 2**

	Frequency	Percent	Valid Percent	Cumulative Percent
Absolutely	111	7,0	7,0	7,0
Most probably	663	42,1	42,1	49,1
Maybe	500	31,7	31,7	80,9
Less probably	250	15,9	15,9	96,8
Never	51	3,2	3,2	100,0
Total	1575	100,0	100,0	

*****Choose riskier alternatives to maximize potential gains.

Table 33

*Frequency Distribution for Risk Propensity Sub-Question 3**

	Frequency	Percent	Valid Percent	Cumulative Percent
Absolutely	130	8,3	8,3	8,3
Most probably	649	41,2	41,2	49,5
Maybe	509	32,3	32,3	81,8
Less probably	233	14,8	14,8	96,6
Never	54	3,4	3,4	100,0
Total	1575	100,0	100,0	

*****Choose riskier alternatives to achieve financial goals.

Table 34

*Frequency Distribution for Risk Propensity Sub-Question 4**

	Frequency	Percent	Valid Percent	Cumulative Percent
Absolutely	194	12,3	12,3	12,3
Most probably	808	51,3	51,3	63,6
Maybe	344	21,8	21,8	85,5
Less probably	194	12,3	12,3	97,8
Never	35	2,2	2,2	100,0
Total	1575	100,0	100,0	

*****Choose less risky alternatives to stabilize financial status.

These four sub-questions are used to create a new data set in the following method: All of them are recoded so that they all become conditions which are ranking from less risky choices to more risky choices ("1" to "5" in a five-level Likert scale). Next, these results are summed into one final data column. The final data column has sums which range from "4" to "20" (if each answer is "1" for a respondent, the total is "4" and if each answer is "5", the total is "20"). "4" corresponds to the highest risk aversion and "20" corresponds to the highest risk propensity. The descriptive statistics of the new data column as follows in Table 35.

Table 35

Descriptive Statistics for Total Risk Propensity Level

N	Valid	1575,000
	Missing	,000
Mean		9,891
Std. Error of Mean		,073
Median		9,000
Mode		8,000
Std. Deviation		2,878
Variance		8,280
Range		16,000
Minimum		4,000
Maximum		20,000
Sum		15578,000
Percentiles	25	8,000
	50	9,000
	75	12,000

The mean of the data is 9,891. Since the code "12" corresponds to the neutral risk attitude, it is clear that there is a net risk aversion of the

respondents. Percentile 75 is "12," so this fact also shows that most of the respondents are risk averse (scores below "12"). For a clear picture, the frequency distribution of the total risk propensity data may help.

Table 36

Frequency Distribution for Total Risk Propensity Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Highly Risk	4	43	2,7	2,7	2,7
Averse	5	13	,8	,8	3,6
↑	6	87	5,5	5,5	9,1
	7	81	5,1	5,1	14,2
	8	389	24,7	24,7	38,9
	9	180	11,4	11,4	50,3
	10	234	14,9	14,9	65,2
	11	114	7,2	7,2	72,4
	12	173	11,0	11,0	83,4
	13	54	3,4	3,4	86,9
	14	90	5,7	5,7	92,6
	15	38	2,4	2,4	95,0
	16	54	3,4	3,4	98,4
	17	9	,6	,6	99,0
	18	8	,5	,5	99,5
↓	19	3	,2	,2	99,7
Highly Risk	20	5	,3	,3	100,0
Prone	Total	1575	100,0	100,0	

The most frequent result is "8," and "10" together with "9" follows. These three answers all of which represent risk aversion relative to the risk neutrality correspond exactly 51% of the respondents. The total percentage

of the answers above "12" is only 16,5%. This fact clearly shows that only 16,5% of the participants are risk takers (see Table 36).

5.6.2. HYPOTHESES ON RISK PROPENSITY

Hypothesis 5

$H5_0$: The participants will have a tendency to choose the uncertain alternative in gain domain; however, they will be inclined to select the certain alternative in loss domain, provided that the expected utilities are the same.

$H5_1$: The participants will have a tendency to choose the certain alternative in gain domain; however, they will be inclined to select the uncertain alternative in loss domain, provided that the expected utilities are the same.

Hypothesis 5 is related to the loss aversion aspect of the risk propensity and loss aversion is tested by two questions. The descriptive statistics of these two questions are shown on the previous section. According to the results of the descriptive statistics, in the gain domain, the respondents seem to have a tendency to take risks and choose the uncertain option. In the loss domain, however, the respondents are inclined to choose the certain alternative rather than the uncertain one.

At first, these results seem contradictory to what Kahneman and Tversky (1979) find out when they develop *prospect theory*. However, a cross-tabulation would help to see the net effect of the change in the participants'

evaluations of two alternatives in two different domains; namely, the gain domain and the loss domain (See Table 37).

Table 37

*Cross-tabulation Gain Domain * Loss Domain*

			Question 7			
			1	2	3	Total
Question 2	1	Count	440	201	28	669
		% within Question 2	65,8%	30,0%	4,2%	100,0%
		% within Question 7	44,0%	41,1%	32,6%	42,5%
		% of Total	27,9%	12,8%	1,8%	42,5%
	2	Count	544	275	31	850
		% within Question 2	64,0%	32,4%	3,6%	100,0%
		% within Question 7	54,4%	56,2%	36,0%	54,0%
		% of Total	34,5%	17,5%	2,0%	54,0%
	3	Count	16	13	27	56
		% within Question 2	28,6%	23,2%	48,2%	100,0%
		% within Question 7	1,6%	2,7%	31,4%	3,6%
		% of Total	1,0%	,8%	1,7%	3,6%
	Total	Count	1000	489	86	1575
		% within Question 2	63,5%	31,0%	5,5%	100,0%
		% within Question 7	100,0%	100,0%	100,0%	100,0%
		% of Total	63,5%	31,0%	5,5%	100,0%

The results are more surprising because it seems that the number of the participants who choose the uncertain alternative in the gain domain and after change their minds to the certain alternative in the loss domain constitute the largest percentage (35,5%). On the other hand, the number of the participants who choose the certain alternative in the gain domain and after change their minds to the uncertain alternative in the loss domain constitute only 12,8%. Based on their own article which is published in 1979,

Tversky and Kahneman develop a four-fold pattern in 1992. The four-fold pattern suggests risk aversion for gains and risk seeking behavior for losses in high probability events. However, it predicts risk seeking behavior for gains and risk aversion for losses in low probability events (Tversky and Kahneman, 1992). In this thesis study, the gain domain and the loss domain both provide high probability alternatives so that the results are in contradiction to the *prospect theory*. Moreover, the proportion test shows that there is a statistically significant difference between the distribution of the answers for the gain domain and the distribution of the answers for the loss domain (chi-square is 10,90 and p-value is 0,000961).

The participants who show the same risk preference in both domains constitute 47,1% of the total subjects. This means that more than half of the participants evaluate the same alternatives differently depending on whether it is a gain or a loss environment. This is the second important outcome of the cross tabulation.

These varying responses to the same choices might be in relation with the perception of the risk. However, Sitkin and Pablo (1992) build the theoretical background in order to understand the effects of risk propensity in detail, and Sitkin and Weingart (1995) support that theoretical background with their experimental approach. In both of these two studies, the relationship between risk propensity and perceived risk is found not to exist significantly. Therefore, the reason is not the perception of the risk.

5.7. COGNITIVE ABILITY

5.7.1. DESCRIPTIVE STATISTICS FOR COGNITIVE ABILITY

Table 38

Descriptive Statistics for Cognitive Ability

	Frequency	Percent	Valid Percent	Cumulative Percent
Lowest Cognitive Ability	132	8,4	8,4	8,4
Lower Cognitive Ability	281	17,8	17,8	26,2
Higher Cognitive Ability	374	23,7	23,7	50,0
Highest Cognitive Ability	788	50,0	50,0	100,0
Total	1575	100,0	100,0	

The highest percentage of the participants (50%) have the top cognitive ability level according to the Cognitive Reflection Test (CRT). The relationship of individual cognitive ability levels with education levels is investigated in the next section (Regressions Analyses) in detail; however, the percentage 73,7% shows that most of the respondents have cognitive ability levels above average and this result might be related to the education levels of the participants (see Table 38).

5.7.2. HYPOTHESES ON COGNITIVE ABILITY

Hypothesis 6

$H6_0$: The relationship between cognitive ability and risk aversion will not be weaker for the females compared to the males.

$H6_1$: The relationship between cognitive ability and risk aversion will be weaker for the females compared to the males.

The relationship between cognitive ability and risk aversion are examined for different genders in order to test this hypothesis. Males constitute 59,2% of the total participants and females constitute 40,8% of the total participants. In order to see whether the relationship between cognitive ability and risk aversion is different for males from females, the data is split into two gender groups. The first group is composed of 933 males and the second group is composed of 642 females. After the split up, the corresponding correlations are investigated between cognitive ability and risk aversion both for males and for females.

Table 39
Correlation between Cognitive Ability and Risk Propensity (for female participants only)

		Cognitive Ability	Risk Propensity
Cognitive Ability	Pearson Correlation	1,000	-,087*
	P-value		,028
	N	642,000	642
Risk Propensity	Pearson Correlation	-,087*	1,000
	P-value	,028	
	N	642	642,000

*. Correlation is significant at the 0.05 level (2-tailed).

Table 40
Correlation between Cognitive Ability and Risk Propensity (for male participants only)

		Cognitive Ability	Risk Propensity
Cognitive Ability	Pearson Correlation	1,000	-,060
	P-value		,069
	N	933,000	933
Risk Propensity	Pearson Correlation	-,060	1,000
	P-value	,069	
	N	933	933,000

Contrary to what Dohmen, Falk, Huffman, and Sunde (2010) show, the correlation between cognitive ability and risk propensity is stronger for females than males, not the reverse. The Pearson correlations are negative; therefore, cognitive ability is in direct proportion with risk aversion. As cognitive ability level increases for an individual, risk aversion also increases. It can be concluded that the relationship between cognitive ability and risk aversion is stronger for the females compared to the males (Pearson correlation coefficients are -0,087 and -0,060 correspondingly). Therefore, the null hypothesis is failed to be rejected and the alternative hypothesis is rejected. What is more, the correlation between cognitive ability and risk propensity is significant for females at the 0,05 level (two-tailed) but it is not significant for males at this level (see Table 39 and 40).

5.8. REGRESSIONS

Age, gender, education, income, employment, cognitive ability, (safer) reference point bias, probability judgment bias, and risk propensity are all of the variables which are used in regressions. Among them, cognitive ability, (safer) reference point bias, probability judgment bias, and risk propensity will be dependent variables in the corresponding settings.

- Age: Ranging from (18) to (80).
- Gender: Male (0) or Female (1).
- Education: Undergraduate (1), Master's (2), Doctorate (3).
- Income: Ranging from lower income (1) to higher income (9).
- Employment: Students (0) or Professionals (1).
- Cognitive Ability: Ranging from lower cognitive ability (0) to higher (3).
- (Safer) Reference Point Bias[9]: None (0) or Present (1).
- Probability Judgment Bias[10]: None (0) or Present (1).
- Risk Propensity: Ranging from lower risk propensity (4) to higher (20).

[9] Respondents who change their mind to a better evaluation in the presence of a safer alternative.

[10] Respondents who give an answer other than 50% for the probability of tails a coin toss.

5.8.1. **REGRESSION I** (Factors that affect Risk Propensity Level)

Table 41

Descriptive Statistics of Regression I (Risk Propensity)

	Mean	Std. Deviation	N
Risk Propensity	9,82	2,869	1328
Cognitive Ability	2,20	,973	1328
Age	27,89	8,781	1328
Education	1,34	,603	1328
Income	4,64	2,657	1328

Table 42

Model Summary of Regression I (Risk Propensity)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,241[a]	,058	,054	2,791

a. Predictors: (Constant), Employment, Gender, Cognitive Ability, Income, Education, Age

In the model summary (Table 42), R is shown to be 0,241 and this result indicates a positive linear relationship between the predictors and the risk propensity level (dependent variable). The coefficient of determination (R Square) shows that only 5,8% of the variation in the risk propensity level can be explained by cognitive ability, age, gender, education, income and employment. As a better estimate, adjusted R square confirms the above fact by a result of 5,4%. The standard error of the estimate is 2,791.

Table 43

ANOVA[b] of Regression I (Risk Propensity)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	633,482	6	105,580	13,554	,000[a]
	Residual	10290,318	1321	7,790		
	Total	10923,800	1327			

a. Predictors: (Constant), Employment, Gender, Cognitive Ability, Income, Education, Age

b. Dependent Variable: Risk Propensity

The results are significant at the 0,01 significance level (99% confidence interval) and the model significantly explains the dependent variable significantly (F-value is 13,554 and P-value is 0,000) (See Table 43).

Table 44

Coefficients[a] of Regression I (Risk Propensity)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11,933	,363		32,873	,000
	Cognitive Ability	-,241	,081	-,082	-2,994	,003
	Age	-,051	,011	-,155	-4,786	,000
	Gender	-,798	,160	-,136	-5,000	,000
	Education	-,110	,137	-,023	-,801	,424
	Income	,096	,030	,089	3,189	,001
	Employment	-,321	,189	-,056	-1,699	,089

a. Dependent Variable: Risk Propensity

According to Table 44, Letting y=risk propensity level, x_1=cognitive ability, x_2=age, x_3=gender, x_4=education, x_5=income, and x_6=employment, the

least squares equation yields "$\hat{y}$=11,933-0,241x_1-0,051x_2-0,798x_3-0,110x_4+0,096x_5-0,321x_6" and the significance values of t tests show that among the independent variables, only x_4 and x_6 are not statistically significant at the 95% confidence interval since p-values of these variables are higher than 0,05. All other independent variables are significant at the 0,01 significance level (99% confidence interval).

The results of the Regression I are notably important. Cognitive ability level is in negative relationship with risk propensity. This is an expected result, since as cognitive ability increases risk propensity decreases. This means that, similar to what Dohmen, Falk, Huffman, and Sunde (2010) find, higher cognitive ability levels have a discouraging effect on risk taking behavior; as cognitive ability levels of the participants increase, risk aversion also increase. The reason behind this fact may be the typical behavior of the risk averse people; they might have spent more time on cognitive ability questions and thus they might have gotten higher scores. Age also has a negative relationship with risk propensity. Participants who are older are more risk averse and younger subjects are more risk prone.

In addition, females are shown to be more risk averse than males. This is a finding about a very popular research subject. Although Powell and Ansic (1997) show by their complicated experiments and detailed analyses that there is no significant effect of gender on financial decisions, Jianakoplos and Bernasek (1998) answer their question "Are women risk averse?" in the

opposite way. Jianakoplos and Bernasek find significant gender difference by analyzing investment data of their subjects. Schubert, Brown, Gysler, and Brachinger (1999) enhance the question by adding a suspicious word *really* in their article and ask "Are women *really* risk averse?" They also answer the question with a *no* for contextual situations. Based on a measure which uses contextual questions in an experiment, the results of this study obviously show that there is a significant gender difference (although the correlation is not very strong).

Moreover, income has a positive relationship with risk propensity. As income increases, risk propensity increases. This might be related to higher self-confidence of the respondents who have higher incomes.

5.8.2. REGRESSION II (Factors that affect Reference Point Bias)

Table 45

Omnibus Tests of Model Coefficients of Regression II (Reference Point)

		Chi-square	df	Sig.
Step	Step	22,267	7	,002
1	Block	22,267	7	,002
	Model	22,267	7	,002

Omnibus tests show that the model is significantly improved on the baseline model by adding variable interests to the equation (P-value is 0,002) (See Table 45).

Table 46

Model Summary of Regression II (Reference Point)

Step	-2 Log likelihood	Cox and Snell R Square	Nagelkerke R Square
1	1462,442[a]	,017	,025

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

The Cox and Snell R square is 0,017 and the Nagelkerke R square is 0,025. These are different ways of approximating the percentage of variance explained; therefore, according to Cox and Snell model 1,7%, and according to Nagelkerke model 2,5% of the variation in the significant effect of (safer) reference point bias can be explained by the independent variables which are cognitive ability, risk propensity, age, gender, education, income and employment (see Table 46).

Table 47

Classification Table[a] of Regression II (Reference Point)

Observed			Predicted		
			Reference Point Bias		Percentage
			Unbiased	Biased	Correct
Step 1	Reference Point Bias	Unbiased	1000	0	100,0
		Biased	328	0	,0
	Overall Percentage				75,3

a. The cut value is ,500

Classification table (Table 47) shows that overall 75,3% of the cases are predicted correctly. This shows that the model has a quite high degree goodness of fit.

Table 48

Variables in the Equation of Regression II (Reference Point)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Cognitive Ability	-,005	,067	,006	1	,940	,995
	Risk Propensity	,051	,023	5,084	1	,024	1,052
	Age	,005	,009	,344	1	,557	1,005
	Gender	,073	,135	,297	1	,586	1,076
	Education	,269	,114	5,610	1	,018	1,309
	Income	-,028	,025	1,220	1	,269	,972
	Employment	-,514	,160	10,323	1	,001	,598
	Constant	-1,797	,408	19,399	1	,000	,166

a. Variable(s) entered on step 1: Cognitive Ability, Risk Propensity, Age, Gender, Education, Income, Employment.

As seen on Table 48, letting y=reference point bias, x_1=cognitive ability, x_2=risk propensity, x_3=age, x_4=gender, x_5=education, x_6=income, and

x_7=employment, the least squares equation yields "$\hat{y}$=-1,797-0,005x_1+0,051x_2+0,005x_3+0,073x_4+0,269x_5-0,028x_6-0,514x_7" and the significance values of t tests show that among the independent variables, only risk propensity (x_2), education (x_5), and employment (x_7) variables are significant. Risk propensity (x_2) and education (x_5) are significant at the 0,05 level (p-values are 0,024 and 0,018) and employment (x_7) is significant at the 0,01 level (p-value is 0,001). The other independent variables do not have a statistically significant effect on reference point bias at the 0,05 level (95% confidence interval).

According to the results, risk propensity and education have a positive relationship with reference point bias. Particularly, education has a strong positive relationship with reference point bias; therefore, it can be concluded that as education levels of the respondents increase, the possibility of reference point bias also increases. Moreover, employment has the strongest relationship with reference point bias in a negative direction. This means that, according to the equation, students are inclined to have a reference point bias more than working professionals.

5.8.3. REGRESSION III (Factors that affect Probability Judgment Bias)

The descriptive statistics show that probability judgments of the respondents are mostly true (85%); therefore, the predictive power of the following model might be expected to be low.

Table 49

Omnibus Tests of Model Coefficients of Regression III (Probability Judgment)

		Chi-square	df	Sig.
Step	Step	260,525	7	,000
1	Block	260,525	7	,000
	Model	260,525	7	,000

Omnibus tests show that the model is significantly improved on the baseline model by adding variable interests to the equation (P-value is 0,000) (See Table 49).

Table 50

Model Summary of Regression III (Probability Judgment)

Step	-2 Log likelihood	Cox and Snell R Square	Nagelkerke R Square
1	782,168[a]	,178	,327

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

The Cox and Snell R square is 0,178 and the Nagelkerke R square is 0,327. These are different ways of approximating the percentage of variance explained; therefore, according to Cox and Snell model 17,8%, and according to Nagelkerke model 32,7% of the variation in the significant effect of probability judgment bias can be explained by the independent variables which are cognitive ability, risk propensity, age, gender, education, income and employment (see Table 50).

Table 51

Classification Table[a] of Regression III (Probability Judgment)

Observed			Predicted		
			Probability Judgment Bias		Percentage Correct
			Unbiased	Biased	
Step 1	Probability Judgment Bias	Unbiased	1117	34	97,0
		Biased	123	54	30,5
	Overall Percentage				88,2

a. The cut value is ,500

Classification table shows that overall 88,2% of the cases are predicted correctly. This shows that the model has a very strong goodness of fit (see Table 51).

Table 52

Variables in the Equation of Regression III (Probability Judgment)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	CognitiveAbility	-1,236	,094	171,607	1	,000	,291
	RiskPropensity	,052	,033	2,547	1	,110	1,054
	Age	,015	,013	1,463	1	,227	1,015
	Gender	,260	,188	1,902	1	,168	1,297
	Education	-,376	,193	3,816	1	,051	,686
	Income	-,020	,036	,308	1	,579	,980
	Employment	-,490	,233	4,420	1	,036	,613
	Constant	,010	,549	,000	1	,985	1,010

a. Variable(s) entered on step 1: CognitiveAbility, RiskPropensity, Age, Gender, Education, Income, Employment.

According to Table 52, letting y=probability judgment bias, x_1=cognitive ability, x_2=risk propensity, x_3=age, x_4=gender, x_5=education, x_6=income, and x_7=employment, the least squares equation yields "$\hat{y}$=-0,010-1,236x_1+0,052x_2+0,015x_3+0,260x_4-0,376x_5-0,020x_6-0,490x_7" and the significance values of t tests show that among the independent variables, only cognitive ability (x_1) and employment (x_7) variables are significant (p-values are 0,000 and 0,036 accordingly). The other independent variables do not have a statistically significant effect on probability judgments at the 0,05 level (95% confidence interval).

In sum, cognitive ability has a strong negative relationship with biased probability judgment. Considering the previous studies, this is an expected result, since as cognitive ability increases the capability of the probability judgment also increases according to previous researches. As Benjamin, Brown, and Shapiro (2006) and Oechssler, Roider, and Schmitz (2009) point out, there is a strong relationship between cognitive ability levels and the possibility of unbiased decisions.

Another statistically significant variable is employment. The resulting equation of the Regression III shows that students are inclined to make biased probability judgments more than working professionals do.

5.8.4. **REGRESSION IV** (Factors that affect Cognitive Ability Level)

Table 53

Descriptive Statistics of Regression IV (Cognitive Ability)

	Mean	Std. Deviation	N
Cognitive Ability	2,20	,973	1328
Risk Propensity	9,82	2,869	1328
Age	27,89	8,781	1328
Gender	,40	,490	1328
Education	1,34	,603	1328
Income	4,64	2,657	1328
Employment	,47	,499	1328

Table 54

Model Summary of Regression IV (Cognitive Ability)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,224[a]	,050	,046	,951

a. Predictors: (Constant), Employment, Gender, Risk Propensity, Income, Education, Age

The coefficient of multiple correlation, R, is shown to be 0,224 and this result indicates a positive linear relationship between the predictors and the dependent variable. The coefficient of determination (R Square) shows that only 5,0% of the variation in the significant effect of risk propensity can be explained by the independent variables which are risk propensity, age, gender, education, income, and employment. Adjusted R square is 4,6% and the standard error of the estimate is 0,951 (see Table 54).

Table 55

ANOVA[b] of Regression IV (Cognitive Ability)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63,156	6	10,526	11,650	,000[a]
	Residual	1193,564	1321	,904		
	Total	1256,720	1327			

a. Predictors: (Constant), Employment, Gender, Risk Propensity, Income, Education, Age

b. Dependent Variable: Cognitive Ability

The results are significant at the 0,01 significance level (99% confidence interval) and the model explains the dependent variable significantly (F-value is 11,650 and P-value is 0,000) (See Table 55).

Table 56

Coefficients[a] of Regression IV (Cognitive Ability)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,610	,150		17,346	,000
	Risk Propensity	-,028	,009	-,082	-2,994	,003
	Age	-,010	,004	-,092	-2,818	,005
	Gender	-,327	,054	-,165	-6,041	,000
	Education	,054	,047	,033	1,156	,248
	Income	,019	,010	,053	1,879	,060
	Employment	,255	,064	,131	3,988	,000

a. Dependent Variable: Cognitive Ability

The data on Table 56 shows that letting y=cognitive ability level, x_1=risk propensity, x_2=age, x_3=gender, x_4=education, x_5=income, and

x_6=employment, the least squares equation yields "$\hat{y}$=2,610-0,028x_1-0,010x_2-0,327x_3+0,054x_4+0,019x_5+0,255x_6" and the significance values of t tests show that among the independent variables, only education (x_4) and income (x_5) variables are not significant since p-values of these variables are not in the 95% confidence interval (0,248 and 0,060 accordingly). All other independent variables are significant at the 0,01 level (99% confidence interval).

According to the results of Regression IV, risk propensity, age, and gender has a negative relationship with individual cognitive ability levels. This means that, similar to what Dohmen, Falk, Huffman, and Sunde (2010) find out, cognitive ability level has a discouraging effect on risk taking behavior. As cognitive ability levels of the participants increase, risk aversion also increase. This result is inspected in detail after the analysis of the first regression.

It is also shown that as age increases, cognitive ability decreases. Moreover, males have a higher cognitive ability than females. Last but not least, working professionals are found to be have higher levels of cognitive abilities than students have.

6. DISCUSSION AND CONCLUSION

In sum, the study supports some findings of the previous researches and it does not support some others. Since the study aims to measure four different biases and cognitive ability by the same questionnaire, the errors some of which are mentioned previously might have been occurred. For instance, the measured variables might have been interacted and this might have created an undesired biasing effect. However, in brief, the research contributes to the literature in several aspects. The sample size of the study is quite big (1575 respondents), the study is carried out in an emerging country, and the survey is applied to the different groups of participants in terms of social status, i.e. both students and professionals are included in the same participant pool. Moreover, the relationships among some demographic measures, individual cognitive ability levels and behavioral biases are investigated in the same study.

A questionnaire is designed and used to collect the data. It includes four question sets which correspond to four selected biases, three questions to measure cognitive ability, and six questions in order to collect demographics data (a total of 18 questions). The questions within question sets are in a mixed order, in order the respondents to be prevented from finding logical connections between the questions. The purpose of this particular design is to create an unbiased survey environment. By using SPSS statistical package version 16, a total of six hypotheses are tested and four

regressions are run on two of the selected biases, individual cognitive ability levels and risk propensity. As an exception, some of the regressions are run on SPSS version 19 because of the latest version's enhanced flexibility in binary logistic regressions.

According to the analyses, anchoring effect is not found at a significant level. This result is contradictory to most of the previous studies (see Tversky and Kahneman, 1974; Cervone and Peake, 1986; Johnson and Schkade, 1989; Jacowitz and Kahneman, 1995; Wilson, Houston, Etling, and Brekke, 1996; Mussweiler and Strack, 1999; Chapman and Johnson, 1999; Ariely, Loewenstein, and Prelec, 2003; Oechssler, Roider, and Schmitz, 2009; and Kudryavtsev and Cohen, 2010). Possible explanations for the contradicting results might be the complexity of the focal product and the design of the survey. Participants might have had difficulty in understanding for what they are bidding exactly. It is also very probable that the presence of several numbers on the questionnaire might have affected the decisions of the respondents. Not depending on whether these predictions are true, it would be wise to extend current research. In order to test anchoring bias correctly, the design and application of a focused questionnaire on the sole anchoring subject might be a contribution to the literature. In such a new study, even though a more tangible focal product might be a better choice, the market price of it should not be precisely guessed by the participants.

In another set of analyses, a safer reference point is found to affect the financial decisions significantly, compared to the case in which there is no reference. Moreover, a riskier alternative is also found to affect the financial decisions of the participants, contrary to a recent study by Kwon and Lee (2009). Tversky and Kahneman (1991), Simonson and Tversky (1992), and Hsee and Leclerc (1998) also show that reference points are always in effect no matter they are safer or riskier compared to the focal product. Although Brenner, Rottenstreich, and Sood (1999) find out that all references lead to comparison in the end and they hurt the evaluation of the focal product, the findings of this thesis study show that reference points make the focal product more attractive in the context of the evaluation of financial products. Since the reference point effect is found to be highly dependent on the context in which it is investigated, further research is suggested in various contexts to investigate its effect extensively.

Biased probability judgment is another effect which is investigated by the analyses of the descriptive statistics and a hypothesis. Although most of the participants (85%) are found to make correct probability judgments for a toss of a coin and give the correct answer (50%), gambler's fallacy is shown to be more frequent than hot hand fallacy. However, since the difference is not significant and only 6,5% of the participants are found to be biased, the hypothesis which claims a difference between gambler's fallacy and hot hand fallacy is rejected. The result is contradictory to the several previous studies (e.g., Kahneman and Tversky, 1972; Tversky and Kahneman, 1974;

Camerer, 1987; Clotfelter and Cook, 1993; Dohmen, Falk, Huffman, and Marklein, and Sunde, 2009). Further research by the use of different survey designs is suggested.

The last behavioral bias which is investigated during the study is risk propensity. During the analyses of risk propensity, *loss aversion* is also tested. There are two questions in the questionnaire which are the two cases of the same choice condition, one in a gain domain and the other one in a loss domain. Although the cross-tabulation results of the two questions show that more than half of the participants change their risk preference while shifting from the gain domain to the loss domain, the percentage of the participants who behave in accordance with the loss aversion theory is only 12,8%. Tversky and Kahneman develop loss aversion theory in 1979 and extend it by explaining four-fold pattern of the theory in 1992. In their articles, they define a certain loss aversion effect, basing the effect on several different type of questions; however, this thesis study demonstrate that the percentage of the respondents who behave in accordance with the loss aversion theory is quite low. In the risk propensity part of the study, individual risk propensity levels are also measured. A total of four survey questions -each of which defining a different risk preference- are combined into one scale and this scale is used as a demonstration of the individual risk propensity levels. According to this scale, the participants are found to be mostly risk averse (72,5%). This is the expected result when it is compared to the previous studies, for instance, to the study by Sitkin and Weingart

(1995) from which the measure is originally taken or to a more recent study by Kwon and Lee (2009).

The survey of the study also includes the cognitive ability reflection test (CRT) which is developed by Frederick (2005). Three questions are asked to the participants and the answers are combined into one a set of data, with a scale from "0" to "3." Several different relationships between this final cognitive ability data set and the other tested variables are investigated. The results of the analyses on cognitive ability levels of the respondents are supported by previous researches (Benjamin, Brown, and Shapiro, 2006 and Oechssler, Roider, and Schmitz, 2009). During the analyses of cognitive ability, the relationship between cognitive ability and risk propensity is tested on gender variable. A reverse effect of gender is shown, contrary to the findings of Dohmen, Falk, Huffman, and Sunde (2010). According to the results, the correlation between cognitive ability and risk propensity is stronger for females than males. Moreover, since the correlation for females is significant and it is not for males, the results need to be reexamined by extended research which may focus on the measurement of cognitive ability and risk propensity together with gender.

The regressions also yield interesting results. Cognitive ability level is found to be in a negative relationship with risk propensity. This is an expected result, since as cognitive ability increases, risk propensity decreases. In other words, similar to what Dohmen, Falk, Huffman, and Sunde (2010) find,

higher cognitive ability levels have a discouraging effect on risk taking behavior. In addition, being male is found to be in a positive relationship with risk propensity; otherwise stated, females are shown to be more risk averse. Although Powell and Ansic (1997) show by their complicated experiments and detailed analyses that there is no significant gender effect on financial decisions, Jianakoplos and Bernasek (1998) answer their question "Are women risk averse?" in the opposite way. The results of this thesis study are parallel to what Jianakoplos and Bernasek find out. Education is found to have a strong positive relationship with reference point bias. Moreover, employment has the strongest relationship with reference point bias in a negative direction. This means, students are inclined to have a reference point bias more than professionals do. Cognitive ability is found to have a strong negative relationship with biased probability judgment. Taking the previous studies into consideration, this is an expected result. Since as Benjamin, Brown, and Shapiro (2006) and Oechssler, Roider, and Schmitz (2009) point out, there is a strong relationship between higher cognitive ability levels and unbiased decisions. Moreover, males are found to have higher cognitive ability levels than females do. Last but not least, professionals are found to have higher cognitive ability levels than students.

In conclusion, anchoring bias is not found to be statistically significant. Reference point bias is found to exist in the presence of both safer and riskier alternatives. On the other hand, probability judgment bias is not found to significantly exist among the respondents. This result is explained

by high education levels of the participants. Loss aversion is not found to exist in the sample. Moreover, individual risk propensity levels of the respondents are measured. Biases are, in general, found to be affected by demographic variables. All these results may provide an initial step for further research in emerging markets since there have not been enough studies on the behavioral finance subject until now. In addition, the indisputable effect of reference points on decision making processes may have numerous applications in marketing field, and especially in the financial marketing subfield.

REFERENCES

Andersen, J. V. (2010). Detecting anchoring in financial markets. *Journal of Behavioral Finance*, *11*(2), 129-133.

Ariely, D., Loewenstein, G., and Prelec, D. (2003). "Coherent arbitrariness": Stable demand curves without stable preferences. *The Quarterly Journal of Economics*, *118*(1), 73-105.

Barone, M. J., Rose, R. L., Manning, K. C., and Miniard, P. W. (1996). Another look at the impact of reference information on consumer impressions of nutrition information. *Journal of Public Policy and Marketing*, *15*(1), 55-62.

Becker, G. S. (1962). Irrational behavior and economic theory. *The Journal of Political Economy*, *70*(1), 1-13.

Benjamin, D. J., Brown, S. A., and Shapiro, J. M. (2006). Who is "behavioral"? Cognitive ability and anomalous preferences, (May 5, 2006), Available at SSRN: http://ssrn.com/abstract=675264.

Berger, P. O., and Smith, G. E. (1997). The effect of direct mail framing strategies and segmentation variables on university fundraising performance. *Journal of Direct Marketing*, *11*(Winter), 30-43.

Blackmore, S., and Troscianko, T. (1985). Belief in the paranormal: Probability judgements, illusory control, and the 'chance baseline shift." *British Journal of Psychology*, *76*(4), 459-468.

Brañas-Garza, P., Guillen, P., and Rafael López del Paso. (2008). Math skills and risk attitudes. *Economics Letters*, *99*(2), 332-336.

Brenner, L., Rottenstreich, Y., and Sood, S. (1999). Comparison, grouping, and preference. *Psychological Science*, *10*(3), 225-229.

Brockhaus, R. H., Sr. (1980). Risk taking propensity of entrepreneurs. *The Academy of Management Journal*, *23*(3), 509-520.

Brown, J. S. (1970). Risk propensity in decision marking: A comparison of business and public school administrators. *Administrative Science Quarterly*, *15*(4), 473-481.

Camerer, C. F. (1987). Do biases in probability judgment matter in markets? Experimental evidence. *The American Economic Review*, *77*(5), 981-997.

Cervone, D., and Peake, P. K. (1986). Anchoring, efficacy, and action: The influence of judgmental heuristics on self-efficacy judgments and behavior. *Journal of Personality and Social Psychology*, *50*(3), 492-501.

Chapman, G. B., and Johnson, E. J. (1999). Anchoring, activation, and the construction of values. *Organizational Behavior and Human Decision Processes*, *79*(2), 115-153.

Chatterjee, S., and Heath, T. B. (1996). Conflict and loss aversion in multiattribute choice: The effects of trade-off size and reference dependence on decision difficulty. *Organizational Behavior and Human Decision Processes*, *67*(2), 144-155.

Clotfelter, C. T., and Cook, P. J. (1993). "Gambler's fallacy" in lottery play. *Management Science*, *39*(12), 1521-1525.

Croson, R., and Sundali, J. (2005). The gambler's fallacy and the hot hand: Empirical data from casinos. *The Journal of Risk and Uncertainty*, *30*(3), 195-209.

Dhar, R., and Nowlis, S. M. (2004). To buy or not to buy: response mode effects on consumer choice. *Journal of Marketing Research*, *41*(November), 423-443.

Dholakia, U. M., and Simonson, I. (2005). The effect of explicit reference points on consumer choice and online bidding behavior. *Marketing Science*, *24*(2), 206-217.

Dodonova, A., and Khoroshilov, Y. (2004). Anchoring and transaction utility: Evidence from on-line auctions. *Applied Economics Letters*, *11*(307), 307-310.

Dohmen, T., Falk, A., Huffman, D., and Sunde, U. (2010). Are risk aversion and impatience related to cognitive ability? *American Economic Review*, *100*(3), 1238-1260.

Dohmen, T., Falk, A., Huffman, D., Marklein, F., and Sunde, U. (2008). The economic consequences of biased probability judgment: Representative evidence, *mimeo*, University of Maastricht.

Dohmen, T., Falk, A., Huffman, D., Marklein, F., and Sunde, U. (2009). Biased probability judgment: Evidence of incidence and relationship to economic outcomes from a representative sample. *Journal of Economic Behavior and Organization*, *72*, 903-915.

Forbes, W. (2009). *Behavioural finance*. United Kingdom: Wiley.

Frederick, S. (2005). Cognitive reflection and decision making. *American Economic Association*, *19*(4), 25-42.

Hamilton, R. W., and Biehal, G. J. (2005). Achieving your goals or protecting their future? The effects of self-view on goals and choices. *Journal of Consumer Research*, *32*(2), 277-283.

Harrison, J. D., Young, J. M., Butow, P., Salkeld, G., and Solomon, M. J. (2005). Is it worth the risk? A systematic review of instruments that measure risk propensityfor use in the health setting. *Social Science and Medicine*, *60*(6), 1385-1396.

Hatfield, J., and Fernandes, R. (2009). The role of risk-propensity in the risky driving of younger drivers. *Accident Analysis and Prevention*, *41*(1), 25-35.

Helson, H. (1964). *Adaptation level theory: An experimental and systematic approach to behavior*. New York: Harper.

Howard, D. J., and Kerin, R. A. (2006). Broadening the scope of reference price advertising research: A field study of consumer shopping involvement. *Journal of Marketing*, *70*(October), 185-204.

Hsee, C. K., and Leclerc, F. (1998). Will products look more attractive when presented separately or together? *The Journal of Consumer Research*, *25*(2), 175-186.

Huth, P., Bennett, D. S., and Gelpi, C. (1992). System Uncertainty, Risk Propensity, and International Conflict among the Great Powers. *Journal of Conflict Resolution*, *36*(3), 478-517.

Jacowitz, K. E., and Kahneman, D. (1995). Measures of anchoring in estimation tasks. *Pers Soc Psychol Bull*, *21*(11), 1161-1166.

Jianakoplos, N. A., and Bernasek, A. (1998). Are women more risk averse? *Economic Inquiry*, *XXXVI*, 620-630.

Johnson, E. J., and Schkade, D. A. (1989). Bias in utility assessments: Further evidence and explanations. *Management Science*, *35*(4), 406-424.

Johnson, E. J., Payne, J. W., and Bettman, J. R. (1988). Information displays and preference reversals. *Organizational Behavior and Human Decision Processes*, *42*, 1-21.

Kahneman, D., and Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology*, *3*, 430-454.

Kahneman, D., and Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263-292.

Kai Lai Chung. (2001). *A course in probability theory*. United States of America: Academic Press.

Kameda, T., and Davis, J. H. (1990). The function of the reference point in individual and group risk decision making. *Organizational Behavior and Human Decision Processes*, *46*(1), 55-76.

Keil, M., Wallace, L., Turk, D., Dixon-Randall, G., and Nulden, U. (2000). An investigation of risk perception and risk propensity on the decision to continue a software development project. *The Journal of Systems and Software*, *53*(2), 145-157.

Khoroshilov, Y., and Dodonova, A. (2007). Buying winners while holding on to losers: An experimental study of investors' behavior. *Economics Bulletin*, *7*(8), 1-8.

Killgore, W. D. S., Vo, A. H., Castro, C. A., and Hoge, C. W. (2006). Assessing risk propensity in American soldiers - preliminary reliability and validity of the evaluation of risks (*evar*) scale. *Military Medicine*, *171*(3), 233-239.

Kudryavtsev, A., and Cohen, G. (2010). Anchoring and pre-existing knowledge in economic and financial settings. *American Journal Of Social And Management Sciences*, *1*(2), 164-180.

Kwon, K., and Lee, J. (2009). The effects of reference point, knowledge, and risk propensity on the evaluation of financial products. *Journal of Business Research*, *62*, 719-725.

Massad, V. J., and Reardon, J. (1996). Channel surfing, brand loyalty and risk propensity: A segmentation approach to modelling consumer switching Behaviours in the USA. *International Journal of Advertising*, *15*(3), 250-261.

Miner, J. B., and Raju, N. S. (2004). Risk propensity differences between managers and entrepreneurs and between low- and high-growth entrepreneurs: A reply in a more conservative vein. *Journal of Applied Psychology*, *89*(1), 3-13.

Mussweiler, T., and Strack, F. (1999). Comparing is believing: A selective accessibility model of judgmental anchoring. *European Review of Social Psychology*, *10*(1), 135-167.

Northcraft, G. B., and Neale, M. A. (1987). Experts, amateurs, and real estate: An anchoring and adjustment perspective on property pricing decisions. *Organizational Behavior and Human Decision Processes*, *39*(1), 84-97.

Oechssler, J., Roider, A., and Schmitz, P. W. (2009). Cognitive abilities and behavioral biases. *Journal of Economic Behavior and Organization*, *72*, 147-152.

Palich, L. E., and Bagby, R. (1995). Using cognitive theory to explain entrepreneurial risk-taking: Challenging conventional wisdom. *Journal of Business Venturing*, *10*(6), 425-438.

Powell, M., and Ansic, D. (1997). Gender differences in risk behaviour in financial decision-making: An experimental analysis. *Journal of Economic Psychology*, *18*, 605-628.

Rabin, M. (2002). Inference by believers in the law of small numbers. *The Quarterly Journal of Economics*, *117*(3), 775-816.

Redelmeier, DA, Koehler, DJ, Liberman, V, and Tversky, A. (1995). Probability judgement in medicine: discounting unspecified possibilities. *Medical Decision Making*, *15*(3), 227-230.

Schubert, R., Brown, M., Gysler, M., and Brachinger. (1999). Financial decision-making: Are women really more risk-averse? *The American Economic Review*, *89*(2), 381-385.

Selden, G. C. (1912). *Psychology of the Stock Market: Human Impulses Lead To Speculative Disasters*. New York: Ticker Publishing

Sharma, S., and Nguan, O. (1999). The biotechnology industry and strategies of biodiversity conservation: The influence of managerial interpretations and risk propensity. *Business Strategy and the Environment*, *8*(1), 46-61.

Shefrin, H. (2005). *A behavioral approach to asset pricing*. New York: Elsevier.

Shefrin, H. M., and Statman, M. (1985). The disposition to sell winners too early and rise losers too long. *Journal of Finance*, *40*, 770-777.

Shleifer, A. (2004). *Inefficient markets: An introduction to behavioral finance*. New York: Oxford University Press.

Siegmund, D. O. (2011). *Probability theory (mathematics) -- britannica online encyclopedia*. United States: Encyclopædia Britannica, Inc. Retrieved from http://www.britannica.com/EBchecked/topic/477530/probability-theory

Simon, M., Houghton, S. M., and Aquino, K. (1999). Cognitive biases, risk perception, and venture formation: How individuals decide to start companies. *Journal of Business Venturing*, *15*, 113-134.

Simonson, I., and Tversky, A. (1992). Choice in context: Tradeoff contrast and extremeness aversion. *Journal of Marketing Research*, *XXIX*, 281-295.

Sitkin, S. B., and Pablo, A. L. (1992). Reconceptualizing the determinants of risk behavior. *The Academy of Management Review*, *17*(1), 9-38.

Sitkin, S. B., and Weingart, L. R. (1995). Determinants of risky decision-making behavior: A test of the mediating role of risk perceptions and propensity. *The Academy of Management Journal*, *38*(6), 1573-1592.

Slonim, R., Carlson, J., and Bettinger, E. (2007). Possession and discounting behavior. *Economics Letters*, *97*, 215-221.

Slovic, P., and Lichtenstein, S. (1971). Comparison of bayesian and regression approaches to the study of information processing in judgment. *Organizational Behavior and Human Performance*, *6*(6), 649-744.

Tversky, A, and Kahneman, D. (1996). Loss aversion in riskless choice: a reference-dependent model. *The Quarterly Journal of Economics*, *106*(4), 1039-1061.

Tversky, A., and Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, *5*(2), 207-232.

Tversky, A., and Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*.

Tversky, A., and Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. *The Quarterly Journal of Economics*, *106*(4), 1039-1061.

Tversky, A., and Kahneman, D. (1992). Advances in prospect theory:Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, *5*, 297-323.

Tversky, A., and Simonson, I. (1993). Context-dependent preferences. *Management Science*, *39*(10), 1179-1189.

Walls, M. R., and Dyer, J. S. (1996). Risk propensity and firm performance: A study of the petroleum exploration industry. *Management Science*, *42*(7), 1004-1021.

Wilson, T. D., Houston, C. E., Etling, K. M., and Brekke, N. (1996). A new look at anchoring effects: Basic anchoring and its antecedents. *Journal of Experimental Psychology*, *125*(4), 387-402.

Wright, W. F., and Bower, G. H. (1992). Mood effects on subjective probability assessment. *Organizational Behavior and Human Decision Processes*, *52*(2), 276-291.

Yates, J. F., Zhu, Y., Ronis, D. L., Wang, D., Shinotsuka, H., and Toda, M. (1989). Probability judgment accuracy: China, Japan, and the United States. *Organizational Behavior and Human Decision Processes*, *43*(2), 145-171.

Ye, G. (2004). Inertia equity: The impact of anchoring price in brand switching. *Available at SSRN: http://ssrn.com/abstract=548862*.

Zhang, Y, and Mittal, V. (2005). Decision difficulty: effects of procedural and outcome accountability. *Journal of Consumer Research*, *32*(Dec.), 465-472.

.

APPENDICES

A. ORIGINAL QUESTIONNAIRE (IN TURKISH)

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

Anketimiz bir ODTÜ İşletme Bölümü MBA Yüksek Lisans Tezi için veri toplamak amacıyla hazırlanmıştır. Hiçbir şekilde kişisel verilerinizin toplanmadığı bu anket uzun zamanınızı almayacak şekilde tasarlanmıştır. Lütfen tüm soruları cevaplayınız. Değerli katkınız için teşekkür eder, başarılar dileriz.

1. Bir raket ve bir tenis topu birlikte 110 TL etmektedir. Raket tenis topundan 100 TL daha fazla tutuyorsa, topun fiyatı kaç TL'dir?

2. İki seçenekten birini tercih edebilirsiniz: Seçenek 1: 10 TL alırsınız. Seçenek 2: %75 ihtimalle 20 TL kazandıracak bir piyango bileti alırsınız. %25 ihtimalle bilet değersizdir. Hangi seçeneği tercih edersiniz?

- ◯ Seçenek 1
- ◯ Seçenek 2
- ◯ Kararsızım

3. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir yatırım fırsatı sunmaktadır?

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	◯	◯	◯	◯	◯

4. Bir kutuda bir bakteri kolonisi vardır. Bu kolonideki bakterilerin sayısı her saat iki katına çıkmaktadır. Eğer bakterilerin kutuyu tümüyle kaplaması 48 saat sürüyorsa, kutunun yarısını kaplaması ne kadar sürer?

- ◯ 12 saat
- ◯ 24 saat
- ◯ 36 saat
- ◯ 48 saat
- ◯ 47 saat

5. Yazı-tura attığınızı hayal ediniz. Sekiz atıştan sonra sonuçlara baktığınızda şöyle bir dizilim oluşuyor: Yazı – yazı – yazı – tura – yazı – tura – tura – tura. Sizce bir sonraki atışta yazı gelme ihtimali yüzde kaçtır?

- ◯ Fikrim yok
- ◯ Yüzde (%)

Page 1

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

6. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir fırsat sunmaktadır?

Kıyaslayabilmeniz için, vadesi dolmadan paranızı çekme imkanı sunan 5 yıllık bir mevduat hesabı %6,75'lik bir getiri oranına sahiptir ve yıllık 675 TL kazandırır.

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	◯	◯	◯	◯	◯

7. İki seçenekten birini tercih edebilirsiniz: Seçenek 1: 10 TL ödersiniz. Seçenek 2: %75 ihtimalle 20 TL ödersiniz ve %25 ihtimalle hiç ödeme yapmazsınız. Hangi seçeneği tercih edersiniz?

- ◯ Seçenek 1
- ◯ Seçenek 2
- ◯ Kararsızım

8. Eğer 5 makine 5 dakikada 5 jeton basıyorsa, 100 makine 100 jetonu kaç dakikada basar?

- ◯ 100 dakika
- ◯ 50 dakika
- ◯ 10 dakika
- ◯ 5 dakika
- ◯ 200 dakika

9. Lütfen cep (yoksa ev) telefon numaranızın yalnızca son 2 hanesini yazınız.

10. Lütfen yukarıda görünen, Thomas Allom tarafından yapılmış 1840 tarihli "Smyrna from the Harbour-Asia Minor" adlı 20x25 cm ölçülerindeki İzmir gravüründen bir adet satın almak için teklif edebileceğiniz fiyatı Türk Lirası cinsinden yazınız.

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

11. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir fırsat sunmaktadır?

Kıyaslayabilmeniz için, yine vadesi dolmadan paranızı çekme imkanı tanımayan 10 yıllık bir mevduat hesabı %11'lik bir getiri oranına sahiptir ve yıllık 1100 TL kazandırır.

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	◯	◯	◯	◯	◯

12. Ailenizin finansal geleceğine ilişkin bir karar vermeniz gerekseydi ve karar verici de siz olsaydınız, aşağıdaki durumlara ilişkin tavrınız ne olurdu?

	Kesinlikle	Yüksek İhtimalle	Belki	Düşük İhtimalle	İmkansız
Finansal güvenliği sağlamak için düşük riskli alternatifi seçerdim.	☐	☐	☐	☐	☐
Potansiyel getiriyi artırmak için yüksek riskli alternatifi seçerdim.	☐	☐	☐	☐	☐
Finansal hedefleri gerçekleştirmek için yüksek riskli alternatifi seçerdim.	☐	☐	☐	☐	☐
Finansal durumu korumak için düşük riskli alternatifi seçerdim.	☐	☐	☐	☐	☐

Bu bölüm anonim bilgilerden oluşmaktadır. Lütfen tüm soruları cevaplayınız.

13. Yaşınız

14. Cinsiyetiniz

◯ Erkek

◯ Kadın

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

15. Devam etmekte olduğunuz ve/veya tamamladığınız tüm dereceleri lisans ve sonrası için fakülteleri ile birlikte seçiniz:

	Lisans	Yüksek Lisans	Doktora
Eğitim Bilimleri	☐	☐	☐
Fen Edebiyat	☐	☐	☐
Güzel Sanatlar	☐	☐	☐
Hukuk	☐	☐	☐
İktisadi ve İdari Bilimler	☐	☐	☐
Mimarlık	☐	☐	☐
Mühendislik	☐	☐	☐
Diğer Fakülte	☐	☐	☐

Diğer Derece (lütfen belirtiniz: İlköğretim, Lise, Önlisans)

16. Lisans öğrencisiyseniz, lütfen sınıfınızı seçiniz:

- ◯ Hazırlık
- ◯ 1. Sınıf
- ◯ 2. Sınıf
- ◯ 3. Sınıf
- ◯ 4. Sınıf

17. Mevcut yıllık "hane halkı" geliriniz hangi aralıktadır?

- ◯ < 10.000 TL
- ◯ 10.000-19.999 TL
- ◯ 20.000-29.999 TL
- ◯ 30.000-39.999 TL
- ◯ 40.000-49.999 TL
- ◯ 50.000-59.999 TL
- ◯ 60.000-95.999 TL
- ◯ 96.000-143.999 TL
- ◯ > 144.000 TL
- ◯ Cevaplamak istemiyorum

18. Çalışansanız, şirketinizin hangi biriminde çalışmaktasınız?

19. Anket ve araştırma sonuçlarından haberdar olmak istiyorsanız, lütfen e-posta adresinizi yazınız (gerekli değildir, boş bırakabilirsiniz).

B. CODED QUESTIONNAIRE (IN TURKISH)

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

Anketimiz bir ODTÜ İşletme Bölümü MBA Yüksek Lisans Tezi için veri toplamak amacıyla hazırlanmıştır. Hiçbir şekilde kişisel verilerinizin toplanmadığı bu anket uzun zamanınızı almayacak şekilde tasarlanmıştır. Lütfen tüm soruları cevaplayınız. Değerli katkınız için teşekkür eder, başarılar dileriz.

1. Bir raket ve bir tenis topu birlikte 110 TL etmektedir. Raket tenis topundan 100 TL daha fazla tutuyorsa, topun fiyatı kaç TL'dir?

0-110

2. İki seçenekten birini tercih edebilirsiniz: Seçenek 1: 10 TL alırsınız. Seçenek 2: %75 ihtimalle 20 TL kazandıracak bir piyango bileti alırsınız. %25 ihtimalle bilet değersizdir. Hangi seçeneği tercih edersiniz?

1 ( ) Seçenek 1

2 ( ) Seçenek 2

3 ( ) Kararsızım

3. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir yatırım fırsatı sunmaktadır?

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	1	2	3	4	5

4. Bir kutuda bir bakteri kolonisi vardır. Bu kolonideki bakterilerin sayısı her saat iki katına çıkmaktadır. Eğer bakterilerin kutuyu tümüyle kaplaması 48 saat sürüyorsa, kutunun yarısını kaplaması ne kadar sürer?

1 ( ) 12 saat

2 ( ) 24 saat

3 ( ) 36 saat

4 ( ) 48 saat

5 ( ) 47 saat

5. Yazı-tura attığınızı hayal ediniz. Sekiz atıştan sonra sonuçlara baktığınızda şöyle bir dizilim oluşuyor: Yazı – yazı – yazı – tura – yazı – tura – tura – tura. Sizce bir sonraki atışta yazı gelme ihtimali yüzde kaçtır?

0 ( ) Fikrim yok

( ) Yüzde (%)

1-100

Page 1

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

6. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir fırsat sunmaktadır?

Kıyaslayabilmeniz için, vadesi dolmadan paranızı çekme imkanı sunan 5 yıllık bir mevduat hesabı %6,75'lik bir getiri oranına sahiptir ve yıllık 675 TL kazandırır.

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	(1	2	3	4	5)

7. İki seçenekten birini tercih edebilirsiniz: Seçenek 1: 10 TL ödersiniz. Seçenek 2: %75 ihtimalle 20 TL ödersiniz ve %25 ihtimalle hiç ödeme yapmazsınız. Hangi seçeneği tercih edersiniz?

(1) Seçenek 1
(2) Seçenek 2
(3) Kararsızım

8. Eğer 5 makine 5 dakikada 5 jeton basıyorsa, 100 makine 100 jetonu kaç dakikada basar?

(1) 100 dakika
(2) 50 dakika
(3) 10 dakika
(4) 5 dakika
(5) 200 dakika

9. Lütfen cep (yoksa ev) telefon numaranızın yalnızca son 2 hanesini yazınız.

XX

10. Lütfen yukarıda görünen, Thomas Allom tarafından yapılmış 1840 tarihli "Smyrna from the Harbour-Asia Minor" adlı 20x25 cm ölçülerindeki İzmir gravüründen bir adet satın almak için teklif edebileceğiniz fiyatı Türk Lirası cinsinden yazınız.

0-100.000

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

11. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir fırsat sunmaktadır?

Kıyaslayabilmeniz için, yine vadesi dolmadan paranızı çekme imkanı tanımayan 10 yıllık bir mevduat hesabı %11'lik bir getiri oranına sahiptir ve yıllık 1100 TL kazandırır.

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	1	2	3	4	5

12. Ailenizin finansal geleceğine ilişkin bir karar vermeniz gerekseydi ve karar verici de siz olsaydınız, aşağıdaki durumlara ilişkin tavrınız ne olurdu?

		Kesinlikle	Yüksek İhtimalle	Belki	Düşük İhtimalle	İmkansız
12-1	Finansal güvenliği sağlamak için düşük riskli alternatifi seçerdim.	1	2	3	4	5
12-2	Potansiyel getiriyi artırmak için yüksek riskli alternatifi seçerdim.	1	2	3	4	5
12-3	Finansal hedefleri gerçekleştirmek için yüksek riskli alternatifi seçerdim.	1	2	3	4	5
12-4	Finansal durumu korumak için düşük riskli alternatifi seçerdim.	1	2	3	4	5

Bu bölüm anonim bilgilerden oluşmaktadır. Lütfen tüm soruları cevaplayınız.

13. Yaşınız

XX

14. Cinsiyetiniz

(1) Erkek

(2) Kadın

ODTÜ MBA Yüksek Lisans Tezi Anketi v2

15. Devam etmekte olduğunuz ve/veya tamamladığınız tüm dereceleri lisans ve sonrası için fakülteleri ile birlikte seçiniz:

		15-1 Lisans	15-2 Yüksek Lisans	15-3 Doktora
1	Eğitim Bilimleri	☐	☐	☐
2	Fen Edebiyat	☐	☐	☐
3	Güzel Sanatlar	☐	☐	☐
4	Hukuk	☐	☐	☐
5	İktisadi ve İdari Bilimler	☐	☐	☐
6	Mimarlık	☐	☐	☐
7	Mühendislik	☐	☐	☐
8	Tıp	☐	☐	☐

16. Lisans öğrencisiyseniz, lütfen sınıfınızı seçiniz:

(1) Hazırlık
(2) 1. Sınıf
(3) 2. Sınıf
(4) 3. Sınıf
(5) 4. Sınıf

17. Mevcut yıllık "hane halkı" geliriniz hangi aralıktadır?

1 < 10.000 TL
2 10.000-19.999 TL
3 20.000-29.999 TL
4 30.000-39.999 TL
5 40.000-49.999 TL
6 50.000-59.999 TL
7 60.000-95.999 TL
8 96.000-143.999 TL
9 > 144.000 TL
10 Cevaplamak istemiyorum

C. SCREENSHOTS OF THE ONLINE SURVEY (IN TURKISH)

ODTÜ MBA Yüksek Lisans Tez Anketi v2

1. Anket Soruları

17%

Anketimiz bir ODTÜ İşletme Bölümü MBA Yüksek Lisans Tezi için veri toplamak amacıyla hazırlanmıştır. Hiçbir şekilde kişisel verilerinizin toplanmadığı bu anket uzun zamanınızı almayacak şekilde tasarlanmıştır. Soruların genellikle doğru cevapları olmayıp, kişisel tercihleri ölçmektedirler. Lütfen tüm soruları cevaplandırarak bir sonraki sayfaya ilerleyiniz.

1. Bir raket ve bir tenis topu birlikte 110 TL etmektedir. Raket tenis topundan 100 TL daha fazla tutuyorsa, topun fiyatı kaç TL'dir?

2. İki seçenekten birini tercih edebilirsiniz: Seçenek 1: 10 TL alırsınız. Seçenek 2: %75 ihtimalle 20 TL kazandıracak bir piyango bileti alırsınız. %25 ihtimalle bilet değersizdir. Hangi seçeneği tercih edersiniz?

- Seçenek 1
- Seçenek 2
- Kararsızım

3. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir yatırım fırsatı sunmaktadır?

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:					

4. Bir kutuda bir bakteri kolonisi vardır. Bu kolonideki bakterilerin sayısı her saat iki katına çıkmaktadır. Eğer bakterilerin kutuyu tümüyle kaplaması 48 saat sürüyorsa, kutunun yarısını kaplaması ne kadar sürer?

- 12 saat
- 24 saat
- 36 saat
- 48 saat
- 47 saat

İleri

ODTÜ MBA Yüksek Lisans Tez Anketi v2

2. Anket Soruları (Devam)

33%

5. Yazı-tura attığınızı hayal ediniz. Sekiz atıştan sonra sonuçlara baktığınızda şöyle bir dizilim oluşuyor: Yazı – yazı – yazı – tura – yazı – tura – tura – tura. Sizce bir sonraki atışta yazı gelme ihtimali yüzde kaçtır?

- Fikrim yok
- Yüzde (%)

6. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir fırsat sunmaktadır?

Kıyaslayabilmeniz için, vadesi dolmadan paranızı çekme imkanı sunan 5 yıllık bir mevduat hesabı %6,75'lik bir getiri oranına sahiptir ve yıllık 675 TL kazandırır.

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:					

7. İki seçenekten birini tercih edebilirsiniz: Seçenek 1: 10 TL ödersiniz. Seçenek 2: %75 ihtimalle 20 TL ödersiniz ve %25 ihtimalle hiç ödeme yapmazsınız. Hangi seçeneği tercih edersiniz?

- Seçenek 1
- Seçenek 2
- Kararsızım

8. Eğer 5 makine 5 dakikada 5 jeton basıyorsa, 100 makine 100 jetonu kaç dakikada basar?

- 100 dakika
- 50 dakika
- 10 dakika
- 5 dakika
- 200 dakika

Geri İleri

ODTÜ MBA Yüksek Lisans Tez Anketi v2

3. Anket Soruları (Devam)

50%

9. Lütfen cep (yoksa ev) telefon numaranızın yalnızca son 2 hanesini yazınız.

10. Lütfen yukarıda görünen, Thomas Allom tarafından yapılmış 1840 tarihli "Smyrna from the Harbour-Asia Minor" adlı 20x25 cm ölçülerindeki İzmir gravüründen bir adet satın almak için teklif edebileceğiniz fiyatı Türk Lirası cinsinden yazınız.

Geri İleri

ODTÜ MBA Yüksek Lisans Tez Anketi v2

4. Anket Soruları (Devam)

67%

11. Yatırım amaçlı 10.000 TL'lik bir birikiminiz olduğunu varsayalım ve size yeni bir mevduat hesabı tanıtılıyor. Vadesi dolmadan paranızı çekme imkanı tanımayan 5 yıllık bu mevduat hesabı yıllık %8'lik bir getiri oranına sahiptir. Yani, yılda faiz olarak 800 TL kazanabilirsiniz. Sizce bu mevduat hesabı nasıl bir fırsat sunmaktadır?

Kıyaslayabilmeniz için, yine vadesi dolmadan paranızı çekme imkanı tanımayan 10 yıllık bir mevduat hesabı %11'lik bir getiri oranına sahiptir ve yıllık 1100 TL kazandırır.

	Çok İyi	İyi	Vasat	Kötü	Çok Kötü
Lütfen seçiniz:	○	○	○	○	○

12. Ailenizin finansal geleceğine ilişkin bir karar vermeniz gerekseydi ve karar verici de siz olsaydınız, aşağıdaki durumlara ilişkin tavrınız ne olurdu?

Finansal güvenliği sağlamak için düşük riskli alternatifi seçerdim. [▼]

Potansiyel getiriyi artırmak için yüksek riskli alternatifi seçerdim. [▼]

Finansal hedefleri gerçekleştirmek için yüksek riskli alternatifi seçerdim. [▼]

Finansal durumu korumak için düşük riskli alternatifi seçerdim. [▼]

Geri İleri

ODTÜ MBA Yüksek Lisans Tez Anketi v2

5. Demografik Bilgiler

83%

Bu bölüm anonim bilgilerden oluşmaktadır. Lütfen tüm soruları cevaplandırarak bir sonraki sayfaya ilerleyiniz.

13. Yaşınız

14. Cinsiyetiniz

- Erkek
- Kadın

15. Devam etmekte olduğunuz ve/veya tamamladığınız tüm dereceleri lisans ve sonrası için fakülteleri ile birlikte seçiniz:

Lisans

Yüksek Lisans

Doktora

Diğer Derece (lütfen belirtiniz: İlköğretim, Lise, Önlisans) [Lisans öncesi derece girişi için öncelikle yukarıdan Lisans-Diğer seçiniz. Dereceniz lisans ve sonrası ise lütfen bu alanı boş bırakınız.]

16. Lisans öğrencisiyseniz, lütfen sınıfınızı seçiniz:

Lütfen seçiniz:

17. Mevcut yıllık "hane halkı" geliriniz hangi aralıktadır?

Lütfen seçiniz:

18. Çalışansanız, şirketinizin hangi biriminde çalışmaktasınız?

Lütfen seçiniz:

Geri İleri

ODTÜ MBA Yüksek Lisans Tez Anketi v2

6. Sonuç

100%

Lütfen aşağıdaki "Anketi Gönder" butonuna tıklayarak anketi tamamlayınız. Değerli katkınız için teşekkür ederiz.

19. Anket ve araştırma sonuçlarından haberdar olmak istiyorsanız, lütfen e-posta adresinizi yazınız (gerekli değildir, boş bırakabilirsiniz).

Geri Anketi Gönder

D. FREQUENCY TABLE FOR TWO DIGITS OF PHONE NUMBER (ANCHOR VALUE)

	Frequency	Percent	Valid Percent	Cumulative Percent
00	28	1,8	1,8	1,8
01	21	1,3	1,3	3,1
02	7	,4	,4	3,6
03	17	1,1	1,1	4,6
04	10	,6	,6	5,3
05	14	,9	,9	6,2
06	16	1,0	1,0	7,2
07	17	1,1	1,1	8,3
08	15	1,0	1,0	9,2
09	9	,6	,6	9,8
10	20	1,3	1,3	11,0
11	14	,9	,9	11,9
12	21	1,3	1,3	13,3
13	14	,9	,9	14,2
14	14	,9	,9	15,0
15	15	1,0	1,0	16,0
16	14	,9	,9	16,9
17	19	1,2	1,2	18,1
18	17	1,1	1,1	19,2
19	12	,8	,8	19,9
20	14	,9	,9	20,8
21	25	1,6	1,6	22,4
22	21	1,3	1,3	23,7
23	20	1,3	1,3	25,0
24	13	,8	,8	25,8
25	16	1,0	1,0	26,9
26	12	,8	,8	27,6
27	21	1,3	1,3	29,0
28	12	,8	,8	29,7
29	20	1,3	1,3	31,0

30	25	1,6	1,6	32,6
31	17	1,1	1,1	33,7
32	23	1,5	1,5	35,1
33	22	1,4	1,4	36,5
34	15	1,0	1,0	37,5
35	18	1,1	1,1	38,6
36	20	1,3	1,3	39,9
37	17	1,1	1,1	41,0
38	17	1,1	1,1	42,0
39	14	,9	,9	42,9
40	20	1,3	1,3	44,2
41	14	,9	,9	45,1
42	16	1,0	1,0	46,1
43	16	1,0	1,0	47,1
44	27	1,7	1,7	48,8
45	12	,8	,8	49,6
46	13	,8	,8	50,4
47	9	,6	,6	51,0
48	17	1,1	1,1	52,1
49	9	,6	,6	52,6
50	25	1,6	1,6	54,2
51	11	,7	,7	54,9
52	13	,8	,8	55,7
53	18	1,1	1,1	56,9
54	11	,7	,7	57,6
55	24	1,5	1,5	59,1
56	14	,9	,9	60,0
57	6	,4	,4	60,4
58	14	,9	,9	61,3
59	15	1,0	1,0	62,2
60	19	1,2	1,2	63,4
61	13	,8	,8	64,3
62	14	,9	,9	65,1
63	10	,6	,6	65,8
64	8	,5	,5	66,3
65	19	1,2	1,2	67,5
66	14	,9	,9	68,4
67	7	,4	,4	68,8

68	18	1,1	1,1	70,0
69	17	1,1	1,1	71,0
70	23	1,5	1,5	72,5
71	19	1,2	1,2	73,7
72	11	,7	,7	74,4
73	11	,7	,7	75,1
74	22	1,4	1,4	76,5
75	15	1,0	1,0	77,5
76	13	,8	,8	78,3
77	12	,8	,8	79,0
78	14	,9	,9	79,9
79	15	1,0	1,0	80,9
80	14	,9	,9	81,8
81	15	1,0	1,0	82,7
82	10	,6	,6	83,4
83	11	,7	,7	84,1
84	11	,7	,7	84,8
85	12	,8	,8	85,5
86	14	,9	,9	86,4
87	16	1,0	1,0	87,4
88	16	1,0	1,0	88,4
89	15	1,0	1,0	89,4
90	23	1,5	1,5	90,9
91	22	1,4	1,4	92,3
92	12	,8	,8	93,0
93	12	,8	,8	93,8
94	14	,9	,9	94,7
95	18	1,1	1,1	95,8
96	15	1,0	1,0	96,8
97	20	1,3	1,3	98,0
98	11	,7	,7	98,7
99	20	1,3	1,3	100,0
Total	1575	100,0	100,0	

E. FREQUENCY TABLE FOR BIDS FOR THE ENGRAVING (FOCAL PRODUCT)

		Frequency	Percent	Valid Percent	Cumulative Percent
TL	0	84	5,3	5,3	5,3
	1	46	2,9	2,9	8,3
	2	5	,3	,3	8,6
	3	9	,6	,6	9,1
	4	2	,1	,1	9,3
	5	58	3,7	3,7	13,0
	7	3	,2	,2	13,1
	8	2	,1	,1	13,3
	10	101	6,4	6,4	19,7
	12	1	,1	,1	19,7
	15	23	1,5	1,5	21,2
	19	1	,1	,1	21,3
	20	74	4,7	4,7	26,0
	23	1	,1	,1	26,0
	24	1	,1	,1	26,1
	25	35	2,2	2,2	28,3
	27	1	,1	,1	28,4
	30	22	1,4	1,4	29,8
	31	1	,1	,1	29,8
	35	5	,3	,3	30,2
	40	13	,8	,8	31,0
	43	2	,1	,1	31,1
	44	1	,1	,1	31,2
	45	5	,3	,3	31,5
	49	1	,1	,1	31,6
	50	119	7,6	7,6	39,1
	55	2	,1	,1	39,2
	60	1	,1	,1	39,3
	65	2	,1	,1	39,4
	68	1	,1	,1	39,5

70	6	,4	,4	39,9
75	7	,4	,4	40,3
77	1	,1	,1	40,4
80	8	,5	,5	40,9
89	2	,1	,1	41,0
99	3	,2	,2	41,2
100	172	10,9	10,9	52,1
101	2	,1	,1	52,3
110	4	,3	,3	52,5
120	5	,3	,3	52,8
125	2	,1	,1	53,0
130	2	,1	,1	53,1
150	30	1,9	1,9	55,0
151	1	,1	,1	55,0
200	49	3,1	3,1	58,2
215	1	,1	,1	58,2
220	1	,1	,1	58,3
225	1	,1	,1	58,3
250	49	3,1	3,1	61,5
277	1	,1	,1	61,5
300	23	1,5	1,5	63,0
350	6	,4	,4	63,4
400	10	,6	,6	64,0
450	3	,2	,2	64,2
500	76	4,8	4,8	69,0
520	1	,1	,1	69,1
600	8	,5	,5	69,6
640	1	,1	,1	69,7
650	3	,2	,2	69,8
675	1	,1	,1	69,9
700	3	,2	,2	70,1
750	10	,6	,6	70,7
780	1	,1	,1	70,8
800	7	,4	,4	71,2
840	1	,1	,1	71,3
850	1	,1	,1	71,4
900	3	,2	,2	71,6
950	1	,1	,1	71,6

999	1	,1	,1	71,7
1000	114	7,2	7,2	78,9
1001	1	,1	,1	79,0
1050	1	,1	,1	79,0
1055	1	,1	,1	79,1
1100	1	,1	,1	79,2
1150	1	,1	,1	79,2
1200	2	,1	,1	79,4
1250	3	,2	,2	79,6
1389	1	,1	,1	79,6
1500	11	,7	,7	80,3
1750	1	,1	,1	80,4
1840	1	,1	,1	80,4
2000	40	2,5	2,5	83,0
2100	1	,1	,1	83,0
2200	1	,1	,1	83,1
2500	10	,6	,6	83,7
2900	1	,1	,1	83,8
3000	11	,7	,7	84,5
3500	5	,3	,3	84,8
3750	1	,1	,1	84,9
4000	4	,3	,3	85,1
4200	1	,1	,1	85,2
5000	49	3,1	3,1	88,3
6000	1	,1	,1	88,4
7000	1	,1	,1	88,4
7500	1	,1	,1	88,5
8000	3	,2	,2	88,7
8790	1	,1	,1	88,8
9999	1	,1	,1	88,8
10000	69	4,4	4,4	93,2
11000	1	,1	,1	93,3
12000	1	,1	,1	93,3
12200	1	,1	,1	93,4
12800	1	,1	,1	93,5
13000	1	,1	,1	93,5
15000	10	,6	,6	94,2
17000	1	,1	,1	94,2

18000	1	,1	,1	94,3
18400	1	,1	,1	94,3
20000	17	1,1	1,1	95,4
22000	1	,1	,1	95,5
22200	1	,1	,1	95,6
25000	7	,4	,4	96,0
30000	11	,7	,7	96,7
35000	2	,1	,1	96,8
37000	1	,1	,1	96,9
45000	2	,1	,1	97,0
50000	22	1,4	1,4	98,4
75000	2	,1	,1	98,5
80000	2	,1	,1	98,7
81500	1	,1	,1	98,7
100000	20	1,3	1,3	100,0
Total	1575	100,0	100,0	

F. FREQUENCY TABLE FOR AGES OF THE RESPONDENTS

	Frequency	Percent	Valid Percent	Cumulative Percent
18	17	1,1	1,1	1,1
19	87	5,5	5,5	6,6
20	174	11,0	11,0	17,7
21	177	11,2	11,2	28,9
22	166	10,5	10,5	39,4
23	126	8,0	8,0	47,4
24	96	6,1	6,1	53,5
25	56	3,6	3,6	57,1
26	53	3,4	3,4	60,4
27	59	3,7	3,7	64,2
28	64	4,1	4,1	68,3
29	48	3,0	3,0	71,3
30	49	3,1	3,1	74,4
31	29	1,8	1,8	76,3
32	32	2,0	2,0	78,3
33	34	2,2	2,2	80,4
34	20	1,3	1,3	81,7
35	29	1,8	1,8	83,6
36	19	1,2	1,2	84,8
37	16	1,0	1,0	85,8
38	19	1,2	1,2	87,0
39	17	1,1	1,1	88,1
40	28	1,8	1,8	89,8
41	24	1,5	1,5	91,4
42	17	1,1	1,1	92,4
43	16	1,0	1,0	93,5
44	5	,3	,3	93,8
45	11	,7	,7	94,5
46	9	,6	,6	95,0
47	10	,6	,6	95,7
48	5	,3	,3	96,0
49	4	,3	,3	96,3

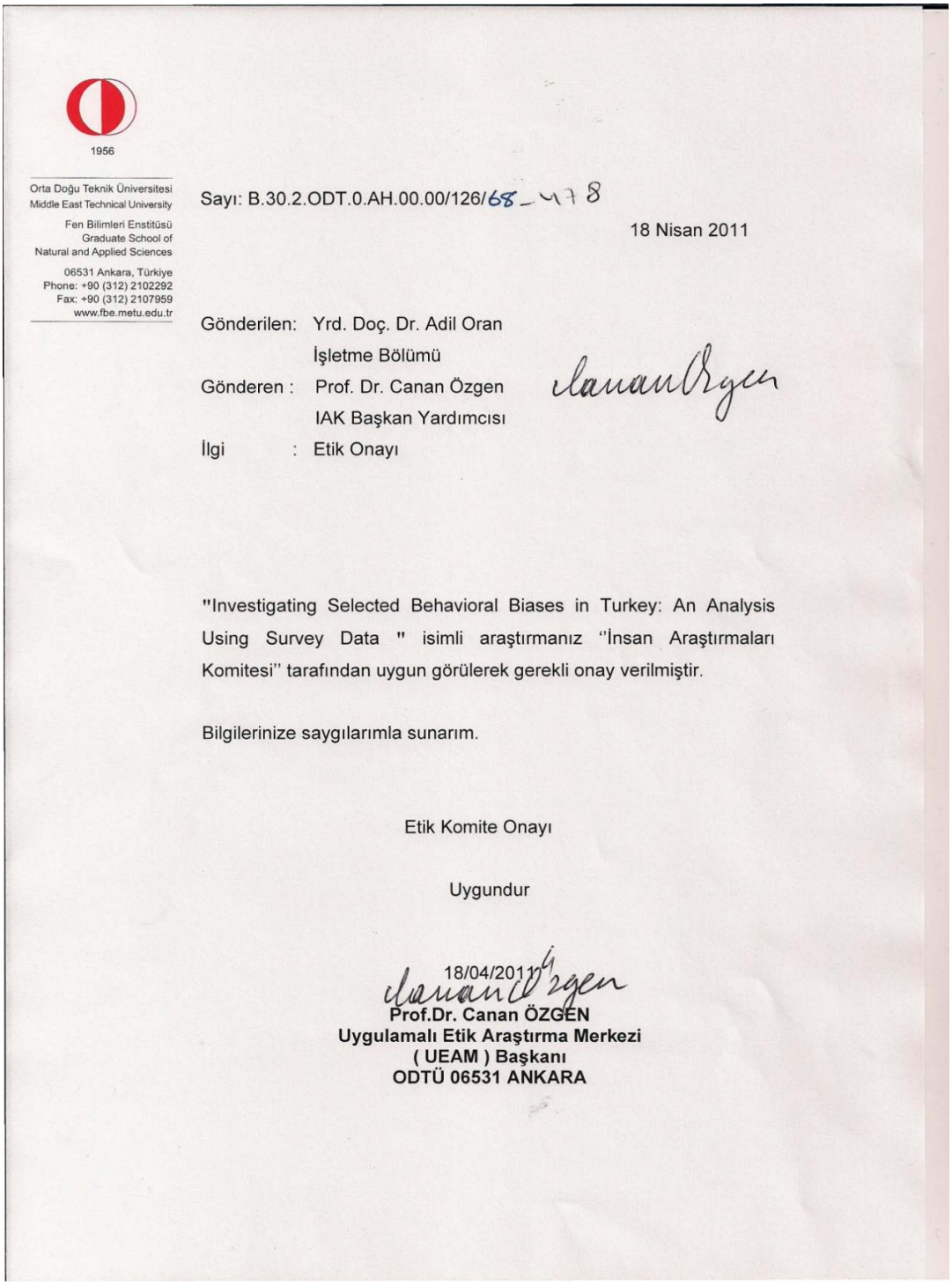
50	7	,4	,4	96,7
51	8	,5	,5	97,2
52	10	,6	,6	97,8
53	5	,3	,3	98,2
54	4	,3	,3	98,4
55	5	,3	,3	98,7
56	6	,4	,4	99,1
57	4	,3	,3	99,4
58	1	,1	,1	99,4
59	2	,1	,1	99,6
60	2	,1	,1	99,7
62	1	,1	,1	99,7
64	1	,1	,1	99,8
65	1	,1	,1	99,9
71	1	,1	,1	99,9
80	1	,1	,1	100,0
Total	1575	100,0	100,0	

G. FREQUENCY TABLE FOR DEPARTMENTAL OCCUPATION

	Frequency	Percent	Valid Percent	Cumulative Percent
Academic	42	2,7	6,3	6,3
Research and D.	38	2,4	5,7	12,0
Documentation	3	,2	,4	12,4
Maintenance	2	,1	,3	12,7
Information Tech.	29	1,8	4,3	17,0
Auditing	42	2,7	6,3	23,3
Warehouse	1	,1	,1	23,5
Education	18	1,1	2,7	26,2
Finance	92	5,8	13,8	39,9
Communication	2	,1	,3	40,2
Public Relations	3	,2	,4	40,7
Service	8	,5	1,2	41,9
Law	5	,3	,7	42,6
Administrative	9	,6	1,3	43,9
Human Res.	13	,8	1,9	45,9
Business Dev.	16	1,0	2,4	48,3
Import / Export	12	,8	1,8	50,1
Quality	2	,1	,3	50,4
Logistics	2	,1	,3	50,7
Architectural	5	,3	,7	51,4
Accounting	20	1,3	3,0	54,4
Engineering	38	2,4	5,7	60,1
Customer Rel.	3	,2	,4	60,5
Operation	9	,6	1,3	61,9
Organization	5	,3	,7	62,6
Market Research	2	,1	,3	62,9
Marketing	41	2,6	6,1	69,1
Staff	1	,1	,1	69,2
Planning	8	,5	1,2	70,4
Advertisement	10	,6	1,5	71,9
Health	16	1,0	2,4	74,3
Purchasing	10	,6	1,5	75,8

Sales	34	2,2	5,1	80,9
Secretarial	3	,2	,4	81,3
Sports	1	,1	,1	81,5
Design / Graphics	4	,3	,6	82,1
Technical Staff	4	,3	,6	82,7
Transportation	2	,1	,3	83,0
Manufacturing	10	,6	1,5	84,5
Food and Bev.	2	,1	,3	84,8
Management	59	3,7	8,8	93,6
Other Department	43	2,7	6,4	100,0
Total	669	42,5	100,0	
Students	906	57,5		
Total	1575	100,0		

H. OFFICIAL PERMISSION LETTER OF METU ETHICAL COMMITTEE



1956

Orta Doğu Teknik Üniversitesi
Middle East Technical University
Fen Bilimleri Enstitüsü
Graduate School of
Natural and Applied Sciences
06531 Ankara, Türkiye
Phone: +90 (312) 2102292
Fax: +90 (312) 2107959
www.fbe.metu.edu.tr

Sayı: B.30.2.ODT.0.AH.00.00/126/68_478

18 Nisan 2011

Gönderilen: Yrd. Doç. Dr. Adil Oran
İşletme Bölümü
Gönderen : Prof. Dr. Canan Özgen
IAK Başkan Yardımcısı
İlgi : Etik Onayı

"Investigating Selected Behavioral Biases in Turkey: An Analysis Using Survey Data " isimli araştırmanız "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

18/04/2011

Prof.Dr. Canan ÖZGEN
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkanı
ODTÜ 06531 ANKARA