

T.C.
GALATASARAY UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF BUSINESS ADMINISTRATION

**THE EFFECTS OF FINANCIAL ANXIETY AND FINANCIAL
LITERACY ON MENTAL ACCOUNTING PROCESSES: A
SURVEY OF UNIVERSITY STUDENTS IN TURKEY**

MASTER’S THESIS

Ayberk SADIÇ

Thesis Advisor: Prof. Dr. Ömür SÜER

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PREFACE

Galatasaray Üniversitesi'ndeki eğitimimde hem kendisinden almış olduğum dersler ve hem bu tez çalışması sürecinde değerli katkı, ilgi, ve yönlendirmeleriyle beni her daim destekleyen tez danışmanım Sayın Prof. Dr. Ömür SÜER'e; ve yüksek lisans eğitimimde üzerimde emeği geçen bütün saygı değer hocalarıma sonsuz saygı ve teşekkürlerimi sunarım.

İyi günde ve kötü günde; hastalıkta ve sağlıkta; gurbette; yaşamım boyunca benim yanımda olan ve daima destekleyen ailem Bahtiyar SADIÇ, Altan SADIÇ ve Burak SADIÇ'a teşekkür ederim.

Az ama öz, derin muhabbet ve samimiyetleriyle bana yoldaşlık eden değerli dostlarım Caner UÇAL'a, Çağrı BAŞAY'a, Gökcan GÖK'e, Mete Han KARAKAŞ'a ve Murat ERDEM'e teşekkür ederim.

Son olarak küçük ev arkadaşlarım, güzel kedilerime teşekkür ederim. Bu tezi hazırladığım zorlu günlerde beni mutlu edip, yüzümü güldürdüler.

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ABBREVIATIONS

ANOVA	: Analysis of Variance
APT	: Arbitrage Pricing Theory
BIST	: Borsa Istanbul (Istanbul Stock Exchange)
CAPM	: Capital Asset Pricing Model
CFC	: Consideration of Future Consequences
DOW	: Dow Jones Industrial Average
EMH	: Efficient Market Hypothesis
ERP	: Equity Risk Premium
EUT	: Expected Utility Theorem
MANOVA	: Multivariate Analysis of Variance
MANCOVA	: Multivariate Analysis of Covariance
MPT	: Modern Portfolio Theory
MRP	: Market Risk Premium
NFCS	: National Financial Capability Study
PTI	: Payment-to-Income Ratio
SCF	: Survey on Consumer Finances
SFFT	: Solution Focused Financial Therapy
SPSS	: Statistical Package for Social Sciences
UK	: United Kingdom
US	: United States

LIST OF SYMBOLS

∞	:	Infinity
$\in$	:	Element
λ	:	Probability
β	:	Beta correlation coefficient
χ^2	:	Nagelkerke Chi-square

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RÉSUMÉ

L'hypothèse fondamentale des théories traditionnelles de la finance est que les agents sont entièrement rationnels, fuient les risques, égoïstes et optimisent pour le plus haut utilité espérée lorsqu'ils prennent des décisions sous incertitude et risque (Ackert, 2014). Telles capacités nécessitent une capacité cognitive illimitée dans lequel un décideur entièrement rationnel doit posséder les solutions à tous les problèmes mathématiques et être capable de faire tout calcul immédiatement, quelles que soient leur complexité. Cependant, les gens sont limités par leurs capacités cognitives et ne peuvent pas attendre l'idéal de la rationalité totale (Selten, 2002, p. 14). Tversky et Kahneman (1974) montrent que les gens utilisent souvent les heuristiques pour réduire la charge cognitive des activités complexes. Néanmoins, cette simplification peut entraîner de graves erreurs systématiques qui donnent lieu aux biais cognitifs. L'un de ces biais cognitifs est la comptabilité mentale qui est définie comme "l'ensemble des opérations cognitives utilisées par les individus et les ménages pour organiser, évaluer et suivre les activités financières" (Thaler, 1999). Bien que de nombreux articles existent sur les effets de processus de comptabilité mentale dans la prise de décision financière, notre revue de la littérature a indiqué que les différences individuelles dans la comptabilité mentale ont été un domaine d'étude relativement récent. Après avoir identifié un manque dans la littérature sur les différences individuelles dans le cadre de la comptabilité mentale, cette étude examine comment le niveau de l'anxiété financière et le niveau de la littératie financière des individus affectent la comptabilité mentale.

Le premier paramètre principal de notre étude est l'anxiété financière. Shapiro et Burchell (2012) décrivent l'anxiété financière comme "*un syndrome psychosocial dans lequel les individus ont une attitude inquiète et malsaine à l'égard de la gestion de leurs finances personnelles efficacement*". Ils ont conclu que l'anxiété financière est un comportement similaire à une phobie dans laquelle les individus cherchent à gérer leur anxiété en évitant les circonstances effrayantes. Les études précédentes sur les conséquences de l'anxiété financière montrent qu'un niveau d'anxiété financière plus élevé est associé à un mauvais usage du crédit (Ahn et al., 2018), à un manque d'épargne pour la retraite (Hasler et al., 2021) et à une intention réduite de planification financière (Grable et al., 2015). De plus, les études montrent que l'anxiété financière perturbe les perceptions de risque des individus (Talwar et al., 2021) et induit certains biais comportementaux où les personnes financièrement anxieuses montrent plus de préférence pour le présent et manquent de maîtrise de soi sur les questions financières (Barboza et al., 2017). Ainsi, nous supposons que le niveau de l'anxiété financière peut avoir une influence significative sur la comptabilité mentale.

Le deuxième paramètre principal de notre étude est la littératie financière. Selon Lusardi et Mitchell (2014), la littératie financière est la capacité d'une personne à comprendre les informations économiques et à faire les choix appropriés de planification financière, gestion d'actifs, de retraite et de dette. De plus, le terme « littératie financière » est souvent utilisé de manière interchangeable avec un autre terme, « connaissance financière » (Huston, 2010). Aren et Aydemir (2015) soulignent que le niveau de la littératie financière possédé par une personne est un aspect crucial pour comprendre les décisions économiques et financières de cette personne. Des recherches antérieures montrent que la littératie financière influence positivement les comportements financiers tels que la participation au marché boursier (Arrondel et al., 2015), les bonnes habitudes d'épargne (Sabri & MacDonald, 2010) et l'accumulation de richesse (van Rooij et al., 2012). De plus, notre revue de la littérature indique que la littératie financière supérieure est un prédicteur négatif de l'anxiété financière (Lind et al., 2020) et de certains biais de comportement comme l'illusion de l'argent (Celiktaş & Yilmaz, 2021). Par conséquent, compte tenu de ces implications de la littératie financière; nous présumons que la littératie financière pourrait avoir une influence considérable sur la comptabilité mentale. Les études précédentes sur la littératie financière comportent également une différenciation fréquente entre la littératie financière subjective et objective. Par définition, la littératie financière subjective est l'auto-perception de la connaissance financière d'une personne; tandis que la littératie financière objective est décrite comme la connaissance réelle d'une personne en matière de finances (Nejad & Javid, 2018). Cette thèse étudie à la fois la littératie financière subjective et objective de telle sorte qu'elles sont mesurées et utilisées dans nos analyses en tant que variables séparées.

Enfin, le troisième paramètre principal de cette étude de thèse est la comptabilité mentale. En utilisant la psychologie cognitive et la microéconomie, Thaler (1985) a établi la comptabilité mentale comme le fondement de son modèle de comportement des consommateurs. Plus tard, Thaler (1999) a publié son article de revue de référence intitulé " *Mental accounting matters* " que nous avons placé au centre de notre revue de la littérature et avons adapté la terminologie. Selon Thaler (1999), la comptabilité mentale est composée de trois composantes clés, à savoir le cadrage des gains et des pertes, la budgétisation et le cadrage des choix. Bien que les théorèmes traditionnels de la finance posent que l'argent est fongible, la comptabilité mentale place les violations de la fongibilité de l'argent au cœur de ses composants, où les gens marquent et valorisent différemment leurs ressources financières en fonction de leurs sources et de leurs objectifs de dépenses. Plusieurs chercheurs ont identifié certaines situations où les gens violent la fongibilité de l'argent, telles que l'effet de house-money (Thaler & Johnson, 1990), les préférences de consommation (Shafir & Thaler, 2006) et les erreurs de coûts irrécupérables (Haita-Falah, 2017).

Le troisième composant de la comptabilité mentale est la mise en cadre des gains et des pertes, qui vise à modéliser comment les gens perçoivent les effets de leurs actions en fonction d'évaluations coûts-bénéfices mentales, c'est-à-dire la mise en cadre. Thaler (1999) explique que la mise en cadre est effectuée en utilisant la fonction de valeur de la théorie de perspectives développée par Kahneman et

Tversky (1979). Pour modéliser comment plusieurs résultats sont mis en cadre dans la comptabilité mentale, Thaler (1999) a élaboré l'hypothèse de la mise en cadre hédonique. Sur la base de la forme de la fonction de valeur, où la fonction de gain est concave et la fonction de perte est convexe; l'hypothèse de la mise en cadre hédonique stipule que lorsque les gens mettent en cadre plusieurs résultats, ils préfèrent la ségrégation de plusieurs gains, l'intégration de plusieurs pertes, l'intégration d'un grand gain avec une plus petite perte et la ségrégation d'une grande perte d'une plus petite gain.

Le deuxième composant de la comptabilité mentale est la budgétisation, qui comprend comment les individus planifient leur consommation (c'est-à-dire loyer, nourriture), répartissent leur richesse dans des comptes mentaux (revenus, pension, épargne, etc.) et classent leur revenu selon leurs ressources (Thaler, 1999). Dans cette étude de thèse, nous sommes principalement intéressés par la budgétisation des comptes de richesse mentale. Shefrin et Thaler (1988) ont proposé l'Hypothèse du cycle de vie comportemental, selon laquelle la disposition des gens à dépenser est la plus élevée pour les comptes de revenu « actuel », qui est généralement un salaire ou un type de revenu régulier similaire, suivi du compte de « actifs actuels », dans lequel les gens utilisent leur volonté pour générer des économies discrétionnaires et enfin pour le compte de « revenu futur », qui pourrait être un fonds de pension.

Le troisième et le dernier composant de la comptabilité mentale est l'encadrement des choix, qui décrit si les gens préfèrent regrouper les événements sous un ensemble lorsqu'ils sont confrontés à des plusieurs alternatives (Thaler, 1999). Un exemple d'encadrement des choix est l'aversion myope pour les pertes, qui se réfère à ce que les gens montrent une plus grande sensibilité aux pertes qu'aux gains lorsqu'ils évaluent leurs positions plus fréquemment (Thaler et al., 1997). Dans notre étude, nous considérons l'aversion myope pour les pertes comme un indicateur pour mesurer le comportement d'encadrement des choix dans le cadre de la comptabilité mentale.

Compte tenu des effets importants de la comptabilité mentale, de l'anxiété financière et de la littératie financière sur la formation de décision financière d'une personne, nous proposons un modèle théorique (voir Figure 4.1) et posons les hypothèses suivantes:

- H1:** Le niveau d'anxiété financière d'une personne est positivement corrélée avec la prévalence du comportement de cadrage hédonique.
- H2:** Le niveau d'anxiété financière est négativement corrélé aux économies discrétionnaires faites dans le cadre de la comptabilité mentale.
- H3:** Le niveau d'anxiété financière affecte positivement l'aversion myope pour les pertes lors de la prise de décision financière.
- H4:** Les niveaux de la littératie financière objective et subjective d'une personne ont une relation négative avec la probabilité de comportement de cadrage hédonique.
- H5:** Les niveaux de la littératie financière objective et subjective sont positivement corrélés aux économies discrétionnaires dans le cadre de la comptabilité

mentale.

- H6:** Les personnes ayant un niveau plus élevé de la littératie financière objective et subjective sont moins susceptibles de démontrer une aversion myope pour les pertes.

Nous recherchons également les facteurs qui peuvent affecter le niveau d'anxiété financière d'une personne. Étant donné les effets positifs de la littératie financière sur le bien-être financier global, nous soupçonnons que le niveau de la littératie financière et certaines données démographiques financières peuvent atténuer l'anxiété financière. Nous présumons donc les hypothèses supplémentaires suivantes:

- H7:** Le niveau de la littératie financière d'une personne a une relation inverse avec le niveau de son anxiété financière.
- H8:** Le revenu mensuel moyen, le nombre de sources de revenu mensuelles, le revenu discrétionnaire mensuel et la satisfaction financière sont des prédictors négatifs de l'anxiété financière.

Pour tester nos hypothèses, nous avons mené une étude par enquête auprès de 350 étudiants turcs universitaires (Université Galatasaray et , Université Technique du Moyen-Orient) dans laquelle nous avons administré un questionnaire en ligne pour collecter des informations sur les caractéristiques démographiques des étudiants, évaluer leur niveau d'anxiété financière et leur niveau de la littératie financière objective/subjective, et évaluer leur comportement dans le cadre de la comptabilité mentale en termes de leurs tendances de cadrage hédonique, d'épargne discrétionnaire et d'aversion myope pour les pertes. Les données de l'enquête ont été collectées entre novembre 2021 et décembre 2022. À notre connaissance, une contribution unique de cette étude de thèse est la modélisation des différences individuelles dans le cadre de la comptabilité mentale en prenant en compte chaque composant de la comptabilité mentale séparément, de sorte que nous ayons pu obtenir un profilage détaillé des habitudes des étudiants universitaires Turcs.

Suite à la collecte des données du sondage, nous avons effectué des analyses de fiabilité interne et des analyses factorielles exploratoires pour garantir la fiabilité et la validité des mesures employées dans notre questionnaire. Les items des mesures d'anxiété financière et de la littératie financière objective ont montré une consistance interne suffisante et une adéquation de l'échantillon tout en tous les items se regroupant autour de composantes principales unique indiquant une bonne mesure de leurs variables respectives. La littératie financière subjective est évaluée par une seule question qui demande aux participants d'évaluer leur niveau de confiance en leur connaissance financière sur une cadre de 1 (très peu confiant) à 10 (très confiant). Les tests de consistance interne sur les items du questionnaire concernant l'encadrement hédonique ont montré que les personnes encadrent les gains multiples, les pertes multiples, les gains mixtes et les pertes mixtes indépendamment. Nous avons donc mis à jour notre modèle théorique pour refléter toutes les informations disponibles où des sous-hypothèses séparées sont générées pour chaque cas d'encadrement hédonique, ce qui aboutit à quatre sous-hypothèses pour les effets de

l'anxiété financière, de la littératie financière objective et de la littératie financière subjective. Le comportement d'épargne discrétionnaire des participants est évalué par des questions sur l'augmentation de leur consommation mensuelle moyenne après avoir reçu une prime de paiement sous trois scénarios de budget où le script du questionnaire conditionne les participants à désigner cette prime comme une dépense discrétionnaire sous des comptes de revenu courant, d'actifs courants et de richesse de revenu futur. Finalement, nous avons mesuré le comportement de l'aversion myope pour les pertes des étudiants via trois scénarios du pari de Samuelson. Les étudiants sont invités à accepter un pari de pile ou face avec une valeur attendue positive (gagner 200TL ou perdre 100TL) une seule fois dans un premier temps, puis nous leur proposons de jouer le même pari 100 fois. Enfin, nous avons montré aux étudiants le graphique de distribution explicite des gains/pertes dans le troisième scénario et leur avons demandé de nouveau s'ils acceptaient de jouer ce pari 100 fois. Les étudiants qui ont montré une aversion myope pour les pertes sont interprétés en fonction de leurs modèles de décision.

La première étape de l'analyse des données a consisté à effectuer des tests de cohérence interne, d'adéquation de l'échantillonnage et de corrélation; puis, nous avons réalisé une analyse factorielle exploratoire qui a confirmé la fiabilité et la validité des mesures utilisées dans notre étude. Pour examiner la signification statistique de la relation entre le niveau de l'anxiété financière, le niveau de la littératie financière, les données démographiques et les composants de la comptabilité mentale; nous avons effectué des analyses de régression logistique binaire (H1, H3, H4, H6) et de régression linéaire multiple (H2, H5, H7, H8). Les réponses aux scénarios de la comptabilité mentale ont été utilisées comme variables dépendantes; tandis que les scores du niveau d'anxiété financière et du niveau de la littératie financière objective/subjective ont été utilisées comme variables indépendantes en testant les hypothèses H1-H6. Nous avons également utilisé les données démographiques concernant le genre, l'âge, le niveau d'éducation, le niveau d'éducation financière, les années d'inscription dans le programme d'éducation, le revenu mensuel moyen, le nombre de sources de revenu mensuel, le revenu discrétionnaire et la satisfaction financière comme variables de contrôle. Pour tester H7 et H8, nous avons employé les scores du niveau d'anxiété financière comme variable dépendante et utilisé les scores du niveau de la littératie financière et les données démographiques comme variables indépendantes.

Les résultats empiriques n'ont fourni aucune preuve de l'anxiété financière comme un prédicteur statistiquement significatif du cadrage hédonique. Par contre, nous avons constaté que le niveau de la littératie financière subjective a une relation inverse avec la préférence de ségrégation dans le cadrage de résultats de pertes mélangées. De plus, nous avons constaté que le niveau de la littératie financière objective est lié positivement avec l'intégration de plusieurs pertes, l'intégration de gains mélangés et la ségrégation de pertes mélangées lors du cadrage hédonique. En outre, nous avons trouvé des preuves soutenant les effets négatifs du niveau de l'anxiété financière et les effets positifs du niveau de la littératie financière objective sur le comportement budgétaire. Les résultats ont montré que les étudiants anxieux financièrement ont alloué moins d'économies discrétionnaires, tandis que ceux ayant

des scores plus élevés sur le niveau de la littératie financière ont montré plus d'économies discrétionnaires.

Les modèles de régression sur l'aversion myope pour les pertes n'ont révélé aucun effet statistiquement significatif de l'anxiété financière, tandis qu'une relation négative significative du niveau de la littératie financière subjective a été trouvée avec la prévalence de l'aversion myope pour les pertes. Cependant, en considérant les variables de contrôle, les modèles finaux ont révélé que les différences de genre prédisent fortement la probabilité d'aversion myope pour les pertes, où les femmes sont trois fois plus enclines à être myopiquement perdantes. Dans les régressions d'aversion myope pour les pertes, les effets de confusion du genre sont si forts que les effets du niveau de la littératie financière subjective se révèlent statistiquement insignifiants dans les modèles finaux où le genre et d'autres démographies sont des variables de contrôle. Enfin, nous avons utilisé des modèles de régression linéaire pour explorer si le niveau de la littératie financière et les facteurs démographiques peuvent prédire le niveau de l'anxiété financière des étudiants universitaires. Les modèles de régression ont fourni des preuves que le niveau de la littératie financière objective, les revenus discrétionnaires et la satisfaction financière sont négativement associées au niveau de l'anxiété financière, mais les effets du niveau de la littératie financière subjective, du revenu mensuel moyen et du nombre de sources de revenus mensuels sont considérés statistiquement insignifiants.

Cette étude apporte une contribution à la littérature sur la comptabilité mentale, la littératie financière et l'anxiété financière sur plusieurs aspects. À notre connaissance, c'est la première étude où les différences individuelles en matière de comptabilité mentale sont explorées en prenant compte individuellement les trois composantes de la comptabilité mentale. Nous croyons que cette approche est utile pour comprendre les différences personnelles en matière de comptabilité mentale de manière plus complète. De plus, nous considérons que l'utilisation des scénarios pour mesurer les composantes de la comptabilité mentale permet de collecter des données plus fiables. Du point de vue de l'anxiété financière et de la littératie financière, nous observons un manque dans la littérature sur les effets combinés de ces deux concepts. Nous attendons que cette étude aide les recherches futures sur les effets de l'anxiété financière et de la littératie financière sur la prise de décision financière d'un point de vue de la finance comportementale. En outre, compte tenu de la portée de cette étude de thèse, une importante limitation de la recherche est que nos résultats fournissent un point de vue exploratoire sur les processus de comptabilité mentale et le niveau d'anxiété financière/ littératie financière des étudiants universitaires en Turquie. Nous croyons que des recherches futures qui utilisent des échantillons différents comprenant des investisseurs, des consommateurs, des ménages et des professionnels de la finance pourraient donner de nouveaux résultats sur les processus de comptabilité mentale individuels. De plus, les comparaisons entre les échantillons de différents milieux sociaux pourraient expliquer davantage les mécanismes sous-jacents des différences individuelles en matière de comptabilité mentale.

Mots clés: anxiété financière, littératie financière, comptabilité mentale, encadrement hédonique, épargne discrétionnaire, aversion myope pour les pertes

ABSTRACT

The fundamental assumption of the traditional finance theories is that agents are fully rational, risk-averse, self-interested, and optimize for the highest expected utility when making decisions under risk and uncertainty (Ackert, 2014). Such capabilities require an unlimited cognitive capacity where a fully rational decision-maker must possess the solutions to all mathematical problems and be capable of doing any calculations instantly, regardless of their complexity. However, people are bounded by their cognitive capabilities and cannot attain the ideal of full rationality (Selten, 2002, p. 14). Tversky and Kahneman (1974) show that people often use heuristics to reduce the cognitive strain of complicated activities. Nonetheless, this simplification may lead to grave and systemic mistakes that result in cognitive biases. One of these cognitive biases is mental accounting which is defined as “*the set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities*” (Thaler, 1999). Although substantial literature exists on the effects of mental accounting processes in financial decision-making; our literature survey indicated that individual differences in mental accounting have been a relatively recent field of study. After identifying a literature gap on individual differences in mental accounting, This study investigates how individuals’ financial anxiety and financial literacy characteristics regulate their mental accounting processes.

The first main parameter of our study is financial anxiety. Shapiro and Burchell (2012) describe financial anxiety as “*a psychosocial syndrome whereby individuals have an uneasy and unhealthy attitude toward engaging with, and administering their personal finances in an effective way*”. They came to the conclusion that financial anxiety is a behavior similar to a phobia in which individuals mistakenly attempt to manage their anxiety by avoiding fear-inducing circumstances. Previous studies on the consequences of financial anxiety show that higher financial anxiety levels are associated with credit misuse (Ahn et al., 2018), lack of retirement savings (Hasler et al., 2021), and reduced financial planning intention (Grable et al., 2015). Furthermore, studies show that financial anxiety disrupts individuals' risk perceptions (Talwar et al., 2021), and induces certain behavioral biases where financially anxious people exhibit more present bias, and a lack of self-control on financial matters (Barboza et al., 2017). Thus, we suspect that financial anxiety might have a significant influence on mental accounting.

The second main parameter of our study is financial literacy. According to Lusardi and Mitchell (2014), financial literacy is the ability of an individual to understand economic information and make proper financial planning, asset development, pension, and debt choices. Also, the term financial literacy is frequently used interchangeably with another term, financial knowledge (Huston,

2010). Aren and Aydemir (2015) point out that the level of financial literacy possessed by a person is a crucial aspect in comprehending that person's economic and financial decision-making patterns. Previous research shows that financial literacy positively influences sound financial behavior such as higher stock market participation (Arrondel et al., 2015), healthy savings habits (Sabri & MacDonald, 2010), and wealth accumulation (van Rooij et al., 2012). Furthermore, our literature survey indicates that higher financial literacy is a negative predictor of financial anxiety (Lind et al., 2020), and certain behavioral biases such as money illusion (Celiktaş & Yilmaz, 2021). Therefore, considering these implications of financial literacy; we presume that financial literacy might have a compelling impact on mental accounting processes. Previous studies on financial literacy also contain a prevalent differentiation between subjective and objective financial literacy. By definition, subjective financial literacy is the self-perception of how financially knowledgeable a person is; whereas, objective financial literacy is described as a person's actual knowledge of financial affairs (Nejad & Javid, 2018). This thesis study focuses on both subjective and objective financial literacy such that they are measured and utilized in our analyses as separate variables.

Lastly, the third main parameter of this thesis study is mental accounting. By making use of cognitive psychology and microeconomics, Thaler (1985) established mental accounting as the foundation for his model of consumer behavior. Later, Thaler (1999) published his seminal review article namely "*Mental accounting matters*" which we placed at a central point for our review of the literature and adapted the terminology. According to Thaler (1999), mental accounting is composed of three core components namely the framing of gains and losses, budgeting, and choice bracketing. Although traditional theorems of finance posit that money is fungible; mental accounting places the violations of money fungibility at its core wherein each of these three components, people label and value their financial resources differently according to their sources and spending purposes. Several researchers identified certain cases where people violate the fungibility of money such as the house-money effect (Thaler & Johnson, 1990), consumption preferences (Shafir & Thaler, 2006), and sunk-cost fallacies (Haita-Falah, 2017).

Mental accounting's first component is the framing of gains and losses which aims to model how humans perceive and withstand the effects of their actions based on mental cost-benefit evaluations. Thaler (1999) explains that framing is undertaken by utilizing the prospect theory's value function developed by Kahneman and Tversky (1979). To model how multiple outcomes are framed in mental accounting, Thaler (1999) come up with the hedonic framing hypothesis. Based on the shape of the value function where the gain function is concave and the loss function is convex; the hedonic framing hypothesis states that when people frame multiple outcomes; they prefer segregation of multiple gains, integration of multiple losses, integration of a large gain with a smaller loss, and segregation of a large loss from a smaller gain.

Mental accounting's second component is budgeting which encompasses how individuals budget their consumption (i.e. rent, food), allocate their wealth into

mental accounts (earnings, pension, savings, etc.), and classify their income according to their sources (Thaler, 1999). In this thesis study, we are mainly interested in the budgeting of mental wealth accounts. Shefrin and Thaler (1988) proposed the Behavioral Life-cycle Hypothesis which states that people's disposition to spend is highest for the "current income" mental accounts which is usually a salary or similar type of regular income, followed by "current assets" account in which people use their willpower to generate discretionary savings and least for the "future income" account which might be a pension fund.

Mental accounting's third and final component is choice bracketing which describes whether people prefer to group events together when confronted with multiple-choice alternatives (Thaler, 1999). A prevalent case of choice bracketing is myopic loss aversion which refers to people exhibiting higher sensitivity to losses than to gains when they evaluate their positions more frequently (Thaler et al., 1997). In our study, we consider myopic loss aversion as a proxy for measuring choice bracketing behavior in mental accounting.

Given the crucial effects of mental accounting, financial anxiety, and financial literacy on shaping one's financial decision-making behavior; we propose a theoretical model (see Figure 4.1) and posit the following hypotheses:

- H1:** A person's financial anxiety is positively correlated with the prevalence of hedonic framing behavior.
- H2:** Financial anxiety levels are negatively correlated with discretionary savings made in mental accounting.
- H3:** Financial anxiety positively predicts myopic loss aversion during financial decision-making.
- H4:** A person's objective and subjective financial literacy levels have a negative relationship with the likelihood of hedonic framing behavior.
- H5:** Objective and subjective financial literacy levels are positively correlated with discretionary savings in mental accounting.
- H6:** People with higher objective and subjective financial literacy levels are less likely to demonstrate myopic loss aversion.

We also investigate the significant factors that influence a person's financial anxiety levels. Given the constructive effects of financial literacy on overall financial well-being; We suspect that financial literacy and certain financial demographics could alleviate financial anxiety. Thus, we presuppose the following supplementary hypotheses:

- H7:** A person's financial literacy has an inverse relationship with his/her financial anxiety.
- H8:** Average monthly income, number of monthly income sources, monthly discretionary income, and financial satisfaction are negative predictors of financial anxiety.

To test our hypotheses, we conducted a survey study among 350 Turkish university students (Galatasaray University and Middle East Technical University) where we administered an online questionnaire to collect information about students'

demographics; assess their financial anxiety and objective/subjective financial literacy levels; and, evaluate their mental accounting behavior in terms of their hedonic framing, discretionary savings, and myopic loss aversion tendencies. The survey data are collected between November 2021 – December 2022. To our knowledge, a unique contribution of this thesis study is that we model the individual differences in mental accounting by taking into account each component of mental accounting separately such that we achieved to come up with a detailed profiling of the mental accounting habits of Turkish university students.

Following the collection of survey data, we conducted internal consistency and exploratory factor analyses to assure the reliability and validity of the measures employed in our questionnaire. The items of the financial anxiety and knowledge-based objective financial literacy measures showed sufficient internal consistency, and sampling adequacy while all the items cluster around single principle components indicating the proper measurement of their respective variables. Subjective financial literacy is assessed by a single question that asks the participants to evaluate how confident are they about their financial knowledge on a scale from 1 (very unconfident) to 10 (very confident). Internal consistency tests on the items of the hedonic framing questionnaire showed that people frame multiple gains, multiple losses, mixed gains, and mixed losses independently from each other. Thus, we updated our theoretical model to reflect upon all available information where separate sub-hypotheses are generated for each hedonic framing case, resulting in four sub-hypotheses each for the effects of financial anxiety, objective financial literacy, and subjective financial literacy. Participants' discretionary savings behavior is evaluated by an open-ended questionnaire where they are asked about the increase in their average monthly consumptions after receiving a bonus payment under three budgeting scenarios where the questionnaire script conditions the participants to label this bonus as a discretionary income under current income, current assets, and future income wealth accounts as in the Behavioral Life-cycle Hypothesis. Lastly, we measured the students' myopic loss aversion behavior via three scenarios of Samuelson's Bet. Students are asked whether they are willing to accept a coin flip bet with a positive expected value (50% win 200TL / 50% lose 100TL) for a single time at first, then, we offer to play the same bet 100 times. Lastly, we showed the students the explicit distribution graph of gains/losses in the third scenario and asked them again whether they are willing to accept to play this bet 100 times. Students who demonstrated myopic loss aversion are interpreted from their decision patterns.

To investigate the statistical significance and relationship of financial anxiety, financial literacy, and demographics on the components of mental accounting; we performed binary logistic regression (H1, H3, H4, H6) and multiple linear regression analyses (H2, H5, H7, H8). Responses to mental accounting case studies were utilized as the dependent variables; while scores of financial anxiety and objective/subjective financial literacy measures are the independent variables for testing hypotheses H1-H6. We also used demographics regarding gender, age, education level, financial education background, years enrolled in the education program, monthly average income, number of monthly income sources, discretionary

income, and financial satisfaction as our control variables. For H7 and H8, we employed the scores of financial anxiety as our dependent variable and used scores of financial literacy measures and demographics as independent variables.

Empirical results provided no evidence for financial anxiety being a statistically significant predictor of hedonic framing; whereas, we found that subjective financial literacy has an inverse relationship with segregation preference in the framing of mixed loss outcomes. Also, we found that objective financial literacy can positively predict the integration of multiple losses, integration of mixed gains, and segregation of mixed losses during hedonic framing. This finding implies that a person's objective financial literacy influences the mental accounting processes that involve losing outcomes. Furthermore, we found supporting evidence on the adverse effects of financial anxiety and the positive effects of objective financial literacy on budgeting behavior. The results showed that financially anxious students allocated lesser discretionary savings; while those who have higher scores on the financial literacy questionnaire reported more discretionary savings in the mental budgeting study.

Regression models on myopic loss aversion revealed no statistically significant effect of financial anxiety; whereas, a significant negative effect of subjective financial literacy on the prevalence of myopic loss aversion is found. Nevertheless, when control variables are taken into consideration, final models disclosed that the likelihood of myopic loss aversion is strongly predicted by gender differences where females are three times more inclined towards being myopically loss averse. In the myopic loss aversion regressions, the confounding effects of gender are so strong that the effects of subjective financial literacy turn out to be statistically insignificant in the final models where gender and other demographics are control variables. Lastly, we utilized linear regression models to explore whether financial literacy and demographic factors could predict the financial anxiety experienced by university students. The regression models provided evidence that objective financial literacy, discretionary income, and financial satisfaction are negatively associated with financial anxiety; however, the effects of subjective financial literacy, average monthly income, and the number of monthly income sources are found to be statistically insignificant.

This study contributes to mental accounting, financial literacy, and financial anxiety literature from multiple aspects. To our knowledge, this is the first study where individual differences in mental accounting are explored by individually taking into consideration all three components of mental accounting. We believe that this approach provides useful for understanding personal mental accounting differences in a more comprehensive way. Moreover, we consider that using experimental case studies for measuring mental accounting components allows the collection of better-refined data regarding the population's mental accounting processes. From financial anxiety and financial literacy perspective, we observe a literature gap on the combined effects of these two concepts. We expect that this study will assist the upcoming research on the effects of financial anxiety and financial literacy on financial decision-making from a behavioral finance

perspective. Also, considering the scope of this thesis study, an important research limitation is that our results provide an exploratory standpoint on the mental accounting processes and financial anxiety/financial literacy status of university students in Turkey. We speculate that future research that utilizes different sampling populations such as investors, consumers, households, and finance professionals could yield new findings on the individual mental accounting processes and comparisons between populations of different socioeconomic backgrounds might explain more about the underlying mechanisms of individual differences in mental accounting.

Keywords: financial anxiety, financial literacy, mental accounting, hedonic framing, discretionary savings, myopic loss aversion

ÖZET

Geleneksel finans teorilerinin temel varsayımı, bireylerin daima rasyonel davrandıkları, riskten kaçındıkları ve belirsizlik altında karar alırken beklenen faydayı maksimize ettikleri yönündedir (Ackert, 2014). Oysa bireyler bilişsel yetenekleriyle sınırlıdır ve her durumda rasyonel karar alacaklarını varsaymak gerçekçi değildir (Selten, 2002, s. 14). Tversky ve Kahneman’a (1974) göre, insanlar karmaşık durumların yarattığı bilişsel gerilimi azaltabilmek için heuristiklerden faydalanırlar. Ancak bu durum, bilişsel önyargılarla sonuçlanan ciddi ve sistemik hatalara yol açabilmektedir. Bunlardan biri, “finansal faaliyetleri düzenlemek, değerlendirmek ve takip etmek için bireyler ve haneler tarafından kullanılan bilişsel işlemler dizisi” olarak tanımlanan zihinsel muhasebedir (Thaler, 1999). Finansal kararlar alırken ortaya çıkan zihinsel muhasebe süreçleri hakkında kapsamlı bir literatür bulunmasına rağmen; zihinsel muhasebedeki bireysel farklılıkların nispeten yeni bir araştırma alanı olduğu söylenebilir. Bu tez çalışmasının amacı, bireylerin finansal kaygı ve finansal okuryazarlık özelliklerinin zihinsel muhasebe süreçlerini nasıl etkilediğini incelemektir.

Çalışmamızın birinci temel parametresi finansal kaygıdır. Shapiro ve Burchell (2012), finansal kaygıyı “bireylerin kişisel mali durumlarıyla ilgilenmeye ve kişisel mali durumlarını etkili bir şekilde yönetmeye yönelik huzursuz ve sağlıklı bir tutuma sahip oldukları psikososyal bir sendrom” olarak tanımlamaktadır. Yazarlara göre finansal kaygı, fobiye benzer bir durumdur. Finansal kaygı ile ilgili araştırmalar; yüksek finansal kaygı düzeyinin, kredibilitiyi olumsuz etkileyebilecek şekilde kredi kullanımı (Ahn ve diğ., 2018), emeklilik için gereken tasarrufun yanlış planlanması (Hasler ve diğ., 2021) ve azalan finansal planlama niyeti (Grable ve diğ., 2015) ile ilişkili olduğunu göstermektedir. Araştırmalar, finansal kaygının bireylerin risk algılarını bozduğunu da göstermektedir (Talwar ve diğ., 2021). Finansal açıdan endişeli kişilerin daha fazla güncel zaman önyargısı ve finansal konularda özenetim eksikliği gibi çeşitli davranışsal eğilimlere sahip oldukları da diğer bulgular arasında yer almaktadır (Barboza ve diğ., 2017). Bu nedenle, finansal kaygının zihinsel muhasebe üzerinde önemli bir etkiye sahip olabileceğini düşünmekteyiz.

Çalışmamızın ikinci temel parametresi finansal okuryazarlıktır. Lusardi ve Mitchell'e (2014) göre finansal okuryazarlık, bireyin ekonomi konularını anlama ve uygun finansal planlama, varlık biriktirme, emeklilik ve borçlanma tercihleri yapabilme becerisidir. Ayrıca, “finansal okuryazarlık” “finans bilgisi” ile eş anlamlıdır (Huston, 2010). Aren ve Aydemir (2015), bir kişinin sahip olduğu finansal okuryazarlık düzeyinin, o kişinin ekonomik ve finansal karar alma alışkanlıklarını anlamada çok önemli bir unsur olduğuna dikkat çekmektedir. Önceki araştırmalar, finansal okuryazarlığın, sermaye piyasalarına daha yüksek düzeyde katılım (Arrondel ve diğ., 2015), sağlıklı tasarruf alışkanlıkları (Sabri ve MacDonald, 2010) ve servet

birikimi (van Rooij ve diğerleri, 2012) gibi faydalı finansal davranışları olumlu yönde etkilediğini göstermektedir. Ayrıca, çeşitli araştırmalarda, yüksek finansal okuryazarlık düzeyi ile finansal kaygının (Lind ve diğ., 2020) ve para yanılması gibi çeşitli davranışsal önyargıların (Çeliktas ve Yılmaz, 2021) negatif ilişkisi olduğu yönünde bulgulara ulaşılmıştır. Finansal okuryazarlığın söz konusu etkileri göz önüne alındığında; zihinsel muhasebe süreçleri üzerinde de etkisi olabileceği düşünülebilir. Finansal okuryazarlık üzerine yapılan önceki çalışmalar, öznel ve nesnel finansal okuryazarlık arasında bir ayrım olduğunu da göstermektedir. Tanım olarak, öznel (*subjektif*) finansal okuryazarlık, bir kişinin finansal olarak ne kadar bilgili olduğuna ilişkin öz algısıdır. Nesnel (*objektif*) finansal okuryazarlık ise, bir kişinin finansal konulara ilişkin gerçek bilgisi olarak tanımlanmaktadır (Nejad ve Javid, 2018). Bu tez çalışması, hem öznel, hem de nesnel finansal okuryazarlığı ayrı ayrı değişkenler olarak ele almakta ve analizlere dahil etmektedir.

Bu tez çalışmasının üçüncü ana parametresi zihinsel muhasebedir. Bilişsel psikoloji ve mikroekonomiden yararlanan Thaler (1985), geliştirdiği tüketici davranış modelinin temeli olarak zihinsel muhasebeyi kullanmaktadır. Bu tez çalışmasında Thaler’ın (1999) yayımlanmış olduğu “*Mental Accounting Matters*” başlıklı makale hareket noktası olmuş; ve ilgili terminoloji de bu makaleden uyarlanmıştır. Thaler’e (1999) göre, zihinsel muhasebe; kazanç ve kayıpların çerçevelenmesi, bütçeleme ve seçim basamaklama olmak üzere üç temel bileşenden oluşmaktadır. Geleneksel finans teorileri paranın ikame edilebilir olduğu prensibini benimsemiş olsa da; zihinsel muhasebe, paranın ikame edilebilirliği ihlallerini merkezine almaktadır. Zihinsel muhasebeye göre bireyler, mali kaynaklarını geldikleri yerlere ve harcama amaçlarına göre farklı şekilde etiketler ve değerlendirirler. Geçmiş çalışmalarda araştırmacılar, house-money etkisi (Thaler & Johnson, 1990), tüketim tercihleri (Shafir & Thaler, 2006) ve batık maliyet yanılırları (Haita-Falah, 2017) gibi bireylerin paranın ikame edilebilirliğini ihlal ettikleri durumları tespit etmişlerdir.

Zihinsel muhasebenin ilk bileşeni, bireylerin zihinsel maliyet-fayda değerlendirmelerine dayalı eylemlerini modellemeyi amaçlayan *kazanç ve kayıpların çerçevelenmesidir*. Thaler (1999), çerçevelemenin Kahneman ve Tversky (1979) tarafından geliştirilen beklenti teorisinin değer fonksiyonu kullanılarak gerçekleştirildiğini ifade etmektedir. Thaler (1999), zihinsel muhasebede çoklu sonuçların nasıl çerçevelendiğini modellemek üzere hedonik çerçeveleme hipotezini ortaya atmıştır. Kazanç alanının içbükey; kayıp alanının ise dışbükey olduğu değer fonksiyonuna göre; hedonik çerçeveleme hipotezi, birden fazla sonucu çerçevelerken bireylerin; çoklu kazançların ayrılmasını, çoklu kayıpların entegrasyonunu, büyük bir kazancın daha küçük bir kayıpla entegrasyonunu ve büyük bir kaybın daha küçük bir kazançtan ayrılmasını tercih edeceklerini öne sürmektedir.

Zihinsel muhasebenin ikinci bileşeni, bireylerin tüketimlerini (örn: kira, yiyecek vb.) nasıl bütçelediklerini, servetlerini zihinsel hesaplara (kazanç, emeklilik, tasarruf vb.) nasıl tahsis ettiklerini ve gelirlerini kaynaklarına göre nasıl sınıflandırdıklarını açıklayan *bütçelemedir* (Thaler, 1999). Bu tez çalışmasında ağırlıklı olarak servetin zihinsel bütçelemesine odaklanılmaktadır. Shefrin ve Thaler (1988), “Davranışsal Yaşam Döngüsü” hipotezi kapsamında; bireylerin harcama

eğiliminin genellikle maaş veya diğer düzenli gelir kaynakları için “cari gelir” zihinsel hesabında en yüksek olduğunu; bunu bireylerin iradelerini kullanarak yaptıkları isteğe bağlı tasarrufların olduğu “cari varlıklar” zihinsel hesabının takip ettiğini, emeklilik fonu gelirleri gibi gelecekte faydalanacakları tasarrufların bulunduğu “gelecek gelir” zihinsel hesabından yapılacak harcamaların ise daha az tercih edildiğini ifade etmektedirler.

Zihinsel muhasebenin üçüncü ve son bileşeni, çoklu alternatiflerle karşı karşıya kaldıklarında insanların olayları birlikte gruplandırmayı tercih edip etmediğini açıklayan *seçim basamaklaması* (Thaler, 1999). Seçim basamaklamasının yaygın bir örneği, bireylerin pozisyonlarını daha sık değerlendirmeleri halinde, kazançlardan çok kayıplara karşı daha yüksek düzeyde hassasiyet göstereceklerini ileri süren miyopik kayıptan kaçınma durumudur (Thaler ve diğ., 1997). Çalışmamızda, bireylerin zihinsel muhasebe kapsamında seçim basamaklama davranışı miyopik kayıptan kaçınma eğilimleri üzerinden ölçümlenmektedir.

Bu tez çalışmasında, zihinsel muhasebe, finansal kaygı ve finansal okuryazarlığın bireyin finansal karar alma davranışını şekillendirmedeki muhtemel etkileri göz önünde bulundurularak bir teorik model (bkz. Şekil 4.1) ve aşağıda yer alan hipotezler öne sürülmektedir:

- H1:** Bireyin finansal kaygı düzeyi ile hedonik çerçeveleme davranışı arasındaki ilişki doğru orantılıdır.
- H2:** Finansal kaygı düzeyi ile isteğe bağlı tasarruflar arasındaki ilişki ters orantılıdır.
- H3:** Finansal kaygı düzeyi ile, miyopik kayıptan kaçınma davranışı arasındaki ilişki doğru orantılıdır.
- H4:** Bireyin nesnel ve öznel finansal okuryazarlık düzeyi ile hedonik çerçeveleme eğilimi arasındaki ilişki ters orantılıdır.
- H5:** Nesnel ve öznel finansal okuryazarlık düzeyi ile isteğe bağlı tasarruflar arasındaki ilişki doğru orantılıdır.
- H6:** Nesnel ve öznel finansal okuryazarlık düzeyi ile miyopik kayıptan kaçınma davranışı arasındaki ilişki ters orantılıdır.

Bu çalışma kapsamında finansal kaygı düzeyini etkileyen faktörler de araştırılmaktadır. Finansal okuryazarlığın genel finansal refah düzeyi üzerindeki yapıcı etkileri göz önüne alındığında; finansal okuryazarlığın ve belirli finansal demografiklerin finansal kaygı düzeyini azaltabileceği düşünülmektedir. Dolayısıyla, aşağıda yer alan ek hipotezler öne sürülmektedir:

- H7:** Finansal okuryazarlık düzeyi ile finansal kaygı düzeyi arasındaki ilişki ters orantılıdır.
- H8:** Ortalama aylık gelir, aylık gelir kaynakları sayısı, aylık isteğe bağlı gelir, ve finansal tatmin ile finansal kaygı düzeyi arasındaki ilişki ters orantılıdır.

Hipotezleri test etmek amacıyla, Galatasaray Üniversitesinde ve Orta Doğu Teknik Üniversitesinde eğitim gören 350 öğrenci üzerinde anket çalışması

gerçekleştirilmiştir. Anket içeriğinde, demografik bilgilerin yanı sıra, finansal kaygı düzeyini, nesnel/öznel finansal okuryazarlık düzeyini, hedonik çerçeveleme, isteğe bağlı tasarruf ve miyopik kayıptan kaçınma davranışlarını ölçmeye ve değerlendirmeye yönelik sorular bulunmaktadır. Anket verileri Kasım 2021 – Aralık 2022 tarihleri arasında toplanmıştır. Bu tez çalışmasının literatüre katkılarından biri, Türkiye’deki üniversite öğrencilerinin zihinsel muhasebe süreçlerindeki bireysel farklılıkların, zihinsel muhasebenin her bir bileşenini ayrı ayrı dikkate alınarak, ortaya koyuyor olmasıdır.

Anket verilerinin toplanmasının ardından analiz safhasına geçilmiş ve ankette kullanılan ölçeklerin güvenilirliğini ve geçerliliğini teyit etmek amacıyla iç tutarlılık testleri ve keşfedici faktör analizleri gerçekleştirilmiştir. Finansal kaygı ve bilgiye dayalı nesnel finansal okuryazarlık ölçeklerinin maddeleri, yeterli iç tutarlılık ve örnekleme yeterliliği gösterirken, tüm maddeler, ilgili değişkenlerin doğru ölçüldüğünü gösteren bileşenler etrafında kümelenmiştir. Finansal tatmin düzeyi, katılımcılara finansal durumlarından ne düzeyde memnun oldukları sorularak ve 1 (kesinlikle memnun değilim) ile 10 (kesinlikle memnunum) arasındaki bir skalada değerlendirmeleri istenerek ölçülmüştür. Benzer şekilde öznel finansal okuryazarlık düzeyi de katılımcılara finansal konulardaki bilgilerine ne düzeyde güvendikleri sorularak ve 1 (kesinlikle kendime güvenmem) ile 10 (kesinlikle kendime güvenirim) arasındaki bir skalada değerlendirmeleri istenerek ölçülmüştür. Hedonik çerçeveleme düzeyini ölçmeye yönelik sorunun maddelerine ilişkin iç tutarlılık testleri, bireylerin çoklu kazançları, çoklu kayıpları, karışık kazançları ve karışık kayıpları birbirinden bağımsız olarak çerçvelendirdiklerini göstermiştir. Bu nedenle, teorik modelimiz, her bir hedonik çerçeveleme durumu için ayrı alt hipotezler üretilerek, mevcut tüm bilgileri yansıtacak şekilde güncellenmiştir. Sonuç olarak, finansal kaygı düzeyinin ve nesnel/öznel finansal okuryazarlığın her birinin dört hedonik çerçeveleme üzerindeki etkisini incelemek üzere toplam 12 alt hipotez geliştirilmiştir. İsteğe bağlı tasarruf düzeyi, isteğe bağlı gelir olarak değerlendirilebilecek ve Davranışsal Yaşam Döngüsü hipotezinin öngördüğü şekilde cari gelir, cari varlık ve gelecek gelir zihinsel hesaplarında muhasebeleştirilebilecek bir prim ödemesi üzerinden geliştirilmiş üç farklı senaryo içeren açık uçlu bütçeleme soruları ile ölçülmüştür. Söz konusu açık uçlu sorular ile, primin farklı şekillerde ödenmesi durumunda aylık ortalama harcamalardaki artışların düzeyi öğrenilmeye çalışılmıştır. Son olarak, öğrencilerin miyopik kayıptan kaçınma davranışları üç farklı Samuelson bahis senaryosu aracılığıyla ölçülmüştür. Öğrencilere, ilk olarak, pozitif bir beklenen değere sahip olan (200 TL kazan ya da 100 TL kaybet) yazı-tura bahsini tek seferlik kabul etmek isteyip istemedikleri sorulmuş, ardından aynı bahsi 100 kez oynamayı kabul edip etmedikleri sorulmuştur. Üçüncü senaryoda ise öğrencilere, kazanç/kayıpların açık dağılım grafiği gösterilmiş ve bu bahsi 100 kez oynamayı kabul edip etmeyecekleri tekrar sorulmuştur. Hangi katılımcıların miyopik kayıptan kaçınma davranışı sergilediği ise bu bahislere verilen yanıtlara göre yapılan sınıflandırmalardan elde edilmiştir.

Finansal kaygı düzeyinin, finansal okuryazarlık düzeyinin ve demografik özelliklerin zihinsel muhasebenin bileşenleri üzerindeki etkilerini incelemek amacıyla ikili lojistik regresyon (H1, H3, H4, H6) ve çoklu doğrusal regresyon analizleri (H2, H5, H7, H8) yapılmıştır. Zihinsel muhasebe senaryoları içeren sorulara verilen yanıtlar bağımlı değişkenler olarak kullanılırken; finansal kaygı ve nesnel/öznel finansal okuryazarlık ölçekleri, H1-H6 hipotezlerini test ederken bağımsız değişkenler olarak kullanılmıştır. Kontrol değişkenler olarak cinsiyet, yaş, eğitim düzeyi, finansal eğitim geçmiş, eğitim programında geçen yıl sayısı, aylık ortalama gelir, aylık gelir kaynaklarının sayısı, isteğe bağlı gelir ve finansal tatmin ile ilgili demografik veriler kullanılmıştır. H7 ve H8 hipotezlerini test ederken, bağımlı değişken olarak finansal kaygı ölçeği kullanılırken; bağımsız değişkenler olarak finansal okuryazarlık ölçeği ve demografi değişkenleri kullanılmıştır.

Yapılan analizler sonucunda, finansal kaygı düzeyi ile hedonik çerçeveleme arasında istatistiksel olarak anlamlı bir ilişki olduğuna dair bir kanıt ulaşılamamıştır. Öte yandan, öznel finansal okuryazarlık düzeyinin karışık kayıp durumlarının çerçevelenmesinde ayırım tercihi ile ters orantılı olduğu bulgusuna ulaşılmıştır. Ayrıca, nesnel finansal okuryazarlık düzeyinin hedonik çerçeveleme sırasında çoklu kayıpların entegrasyonunu, karma kazançların entegrasyonunu ve karma kayıpların ayrılmasını olumlu bir şekilde tahmin edebildiği görülmüştür. Bu bulgu, nesnel finansal okuryazarlık düzeyinin, kayıpları içeren durumlarda zihinsel muhasebe süreçlerini etkilediğine işaret etmektedir. Ayrıca, bütçeleme davranışı üzerinde finansal kaygı düzeyinin olumsuz etkileri ve nesnel finansal okuryazarlık düzeyinin olumlu etkileri hakkında destekleyici bulgular elde edilmiştir. Sonuçlar, finansal kaygı düzeyi yüksek olan öğrencilerin daha az isteğe bağlı tasarruf yaptığını gösterirken; finansal okuryazarlık düzeyi yüksek olan öğrencilerin daha yüksek düzeyde isteğe bağlı tasarruf yaptıklarını göstermektedir.

Miyopik kayıptan kaçınmaya ilişkin regresyon modelleri, finansal kaygı düzeyi ile miyopik kayıptan kaçınma davranışı arasında istatistiksel olarak anlamlı bir ilişki olmadığını ortaya koymaktadır. Öte yandan, öznel finansal okuryazarlık düzeyi ile miyopik kayıptan kaçınma davranışı arasında istatistiksel olarak anlamlı bir negatif ilişki tespit edilmiştir. Bununla birlikte, kontrol değişkenleri dikkate alındığında, nihai modeller, miyopik kayıptan kaçınma davranışının cinsiyet farklılıkları tarafından güçlü bir şekilde etkilendiğini ortaya koymaktadır. Öyle ki, kadınlarda miyopik kayıptan kaçınma eğiliminin erkeklere göre yaklaşık üç kat daha fazla olduğu tespit edilmiştir. Miyopik kayıptan kaçınma regresyonlarında, cinsiyet etkisinin oldukça güçlü olduğu görülmekle birlikte, kontrol değişkenlerinin de dahil edildiği nihai modellerde, öznel finansal okuryazarlık düzeyinin etkisinin de istatistiksel olarak anlamsız hale geldiği görülmüştür. Son olarak, finansal okuryazarlık düzeyinin ve demografik faktörlerin üniversite öğrencilerinin finansal kaygı düzeylerini etkileyip etkilemediğini anlamak amacıyla doğrusal regresyon modelleri kullanılmıştır. Söz konusu modeller, nesnel finansal okuryazarlık düzeyi ile isteğe bağlı gelir; finansal tatmin düzeyi ile finansal kaygı düzeyi arasında ters orantı bulunduğunu göstermiştir. Ancak öznel finansal okuryazarlık düzeyi, ortalama aylık gelir ve aylık gelir kaynağı sayısının etkileri istatistiksel olarak anlamlı değildir.

Bu tez çalışması, zihinsel muhasebe, finansal okuryazarlık ve finansal kaygı literatürüne pek çok yönden katkı sağlamaktadır. Bildiğimiz kadarıyla bu çalışma, zihinsel muhasebenin üç bileşeninin de kişi bazında dikkate alınarak zihinsel muhasebedeki bireysel farklılıkların araştırıldığı ilk çalışmadır. Bu yaklaşımın, bireysel zihinsel muhasebe farklılıklarını daha kapsamlı bir şekilde anlamak için faydalı olacağına inanıyoruz. Ayrıca, zihinsel muhasebe bileşenlerini ölçmek için senaryoların kullanılmasının, bireylerin zihinsel muhasebe süreçleriyle ilgili daha iyi rafine edilmiş verilerin toplanmasına imkan tanıdığı kanaatindeyiz. Finansal kaygı ve finansal okuryazarlık perspektifinden bakıldığında, bu iki kavramın birleşik etkileri konusunda bir literatür boşluğu olduğunu gözlemlemekteyiz. Bu çalışmanın, davranışsal finans bakış açısıyla, finansal kaygı ve finansal okuryazarlığın finansal karar alma süreçleri üzerindeki etkilerine ilişkin yapılacak araştırmalara yardımcı olacağını umuyoruz. Ancak, örneklem sınırlılığı nedeni ile, araştırmamızın sonuçlarının Türkiye'deki üniversite öğrencilerinin zihinsel muhasebe süreçleri ve finansal kaygı/finansal okuryazarlık durumları özelinde değerlendirilmesi gerekmektedir. Yatırımcılar, tüketiciler, hane halkları ve finans alanında çalışan uzmanlar gibi farklı örnekleme popülasyonlarını kullanacak olan gelecekte gerçekleştirilecek araştırmaların, bireylerin zihinsel muhasebe süreçleri hakkında yeni bulgular ortaya koyacağını ve farklı sosyoekonomik geçmişlere sahip örneklemeler arasında yapılacak karşılaştırmaların, zihinsel muhasebedeki bireysel farklılıkların altında yatan mekanizmaları daha iyi açıklayabileceğini düşünüyoruz.

Anahtar Kelimeler: finansal kaygı, finansal okuryazarlık, zihinsel muhasebe, hedonik çerçeveleme, isteğe bağlı tasarruflar, miyopik kayıptan kaçınma

1 INTRODUCTION

In traditional theories of financial decision-making, the core assumption is that people are risk-averse, self-interested, rational decision-makers who optimize for the highest expected utility in decisions under risk and uncertainty (Ackert, 2014). Traditional finance theories imply that the ideal investor should be perfectly rational. As a result, the concept of “homo economicus” or the “economic man” emerges. In their critique of homo economicus, Urbina and Ruiz-Villaverde (2019) explain that homo economicus is individualistic such that they “... *only think, decide and act according to their own interests.*”; they continuously optimize to attain the highest possible utility under any conditions; they are rational and consistent when ordering their preferences.

One of the most prominent theories of decision-making in traditional finance is the expected utility theorem (EUT). The initial work regarding the EUT goes back as old as the 18th century. Bernoulli (1738/1954) states that “... *the value of an item must not be based on its price, but rather on the utility it yields*”. Bernoulli (1738/1954) also explains that similar to the expected value, the expected utility of a decision is calculated by the product-sum of each decision outcome with their corresponding probabilities. However, the most important work regarding the EUT was published in the last century. In 1944, von Neumann and Morgenstern published the *Theory of Games and Economic Behavior* which also lays the foundations of game theory. In their book, von Neumann and Morgenstern (1944, pp. 24–28), mathematically model the process of decision-making and develop the axioms of rationality that a rational decision-maker should hold.

By definition, traditional finance theories are normative; because they aim to make recommendations about how should an ideal investor make decisions. However, certain anomalies in the financial markets and decision-making have led researchers to consider that people tend to deviate from the ideal model of homo

economicus as a result of bounded rationality which states that individuals' capacity to process and grasp information is limited due to cognitive limits and information availability (Simon, 1972). Later, understanding the psychological aspects of decision-making gained significant attention after the emergence of the prospect theory in 1979.

Prospect theory, being a critique of expected utility theory, is a descriptive theory for effectively modeling how economic agents behave under uncertainty (Kahneman & Tversky, 1979). Essentially, prospect theory suggests that people are loss-averse; and the emotional load of potential losses (fear) is greater than those of potential gains (joy). Following the development of prospect theory and further advancements in behavioral economics; Thaler who was working with Kahneman and Tversky at the time later developed the concept of mental accounting. In his article *Mental Accounting Matters* (1999), Thaler describes mental accounting as “*a set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities*”. Mental accounting places the violations of the fungibility of money at its core, where individuals often label the money depending on their sources and how they spend them. According to Thaler (1999), mental accounting consists of three main components which are the framing of gains and losses, budgeting, and choice bracketing.

The framing of gains and losses by people is the first major component of mental accounting. Studies showed that people are happier when their gains are segregated and they prefer to integrate their losses (Thaler, 1985). This phenomenon is named hedonic framing (or hedonic editing hypothesis) and it is a direct result of loss aversion where mental accounting aims to be as hedonically efficient as possible (Thaler, 1999).

The second major component of mental accounting is budgeting. A clear example of this phenomenon is that people are observed to divide and label their wealth into different mental accounts. According to the Behavioral Life-cycle Hypothesis, these accounts are namely “current income”, “current assets”, and “future income” where people treat their wealth in these accounts as nonfungible and

the incentive to spend is the highest for “current income” and least for “future income” (Shefrin & Thaler, 1988).

The third and last major component of mental accounting is choice bracketing (or decision framing). It refers to the concept that when making choices, people can either broadly bracket their options that are in their interest mostly, or they narrowly bracket them where they make each decision in isolation; however, most people fail to bracket their choices broadly which may lead to adverse effects (Read et al., 1999). To this day, the equity premium puzzle has been one of the greatest questions of financial academics where it refers to the fact that considering over ninety years (1889-1978) of historical data, how stock returns extremely outperformed the treasury bills (Mehra & Prescott, 1985). Benartzi and Thaler (1995) proposed a mental accounting explanation for the equity premium puzzle based on the prospect theory where they introduced the term myopic loss aversion. It is characterized by higher sensitivity to losses than gains such that if investors with myopic loss aversion check their portfolios less frequently, they will be more inclined toward taking risks (Thaler et al., 1997).

Considering the main components and aforementioned cases of mental accounting; it is evident that it has significant practical implications; because it affects how we evaluate our decisions and distorts our perception of our financial situation, making it simpler to overspend or miscalculate during financial decision-making. Although these serious effects of mental accounting are well-known; to our knowledge, individual differences in mental accounting have been a rarely studied area in finance literature. Our literature survey indicated that financial anxiety and financial literacy have significant implications on individuals’ financial decision-making processes. Therefore, we have focused our efforts improve our understanding of financial anxiety and financial literacy.

Firstly, financial anxiety is described as a psychological condition in which people have an uncomfortable and unfavorable attitude toward thinking about, managing, and dealing with their money in an effective manner (Shapiro & Burchell, 2012). From students’ perspective, students who are anxious about their finances

face plenty of serious ramifications. Researchers have found that financially worried students incur greater student debt, possess more credit cards, and have a reduced rate of paying their credit card balances in full each month (Archuleta et al., 2013; Britt et al., 2015; Joo et al., 2008). Due to the adverse effects of financial anxiety on financial decision-making and financial status, we suspect that individuals' level of financial anxiety has a positive relationship with detrimental mental accounting tendencies.

Secondly, Lusardi & Mitchell (2014) describes financial literacy as “...*peoples' ability to process economic information and make informed decisions about financial planning, wealth accumulation, pensions, and debt.*”. Furthermore, financially literate people are able to effectively manage their income and the amount of money they have available to invest or save in the future. People with a low level of financial literacy are less likely to invest in the stock market, especially those who are inexperienced with stocks and bonds (van Rooij et al., 2011). Although research on the effects of financial literacy on specific behavioral biases is inconsistent, several studies demonstrate that financial literacy has a regulating influence on personal distinctions in behavioral biases during financial decision-making such as overconfidence, herding bias, and disposition effect (Ahmad & Shah, 2020; Baker, Kumar, Goyal, et al., 2019b; Dhar & Zhu, 2006). Considering the broad implications of financial literacy for financial well-being and the tendency to behavioral biases, we suggest that financial literacy may operate as a barrier against financial anxiety during financial decision-making.

Given the importance of financial anxiety and financial literacy over individuals' financial decision-making; surprisingly, the literature on their effects on mental accounting processes is very limited. To the best of our knowledge, although there are several studies on parameters affecting individual mental accounting (Antonides et al., 2011; Rzeszutek, 2015; Dickason & Ferreira, 2018; Muehlbacher & Kirchler, 2019; Baker, Kumar, & Goyal, 2019a); none of these studies focus on the combined effects of financial anxiety and financial literacy over the distinct components of mental accounting. Therefore, we identify a literature gap on that point. On a fundamental level, our research questions are whether financial anxiety

predicts mental accounting, and whether financial literacy help with the negative effects of mental accounting. Furthermore, we question how financial anxiety affects financial literacy and the impact of income characteristics and demographics on financial anxiety.

The scope of this study is to investigate the effects of financial anxiety and financial literacy over individual variations in mental accounting mechanisms. We expand the existing mental accounting research by means of exploring how financial anxiety and financial literacy affect and trigger distinct mental accounting mechanisms. We hypothesize that they are significant factors that influence an individual's mental accounting tendencies. Our belief is that given the adverse effects of mental accounting on personal financial decision-making and savings behavior, and thus; people's overall economic wellbeing; this study can shed light on how to alleviate these outcomes through a better understanding of the significance of financial anxiety and financial literacy over individual mental accounting processes. Therefore, in this study, the main hypotheses and contributions to the literature are as follows.

First, we contribute to the financial anxiety literature from a mental accounting perspective by providing new findings on financial anxiety's direct influence over the main components of mental accounting i.e. hedonic framing, budgeting, and choice bracketing. Our hypotheses are that given the negative effects of financial anxiety on individual financial decision-making; people who have higher levels of financial anxiety are more prone to hedonic framing behavior, they have poor budgeting skills, and they are more susceptible to myopic loss aversion and choice bracketing during financial decision-making. Also, we investigate the implications of financial stability and the general demographics of university students over the levels of financial anxiety.

Second, we also add to the literature on financial literacy from a mental accounting standpoint by testing potentially mitigating capabilities of financial literacy over the adverse effects of mental accounting. Our hypotheses regarding the relationship between financial literacy and individual differences in mental

accounting are that people who have higher levels of financial literacy should be less vulnerable to hedonic framing, they should have better budgeting skills, and they avoid myopic loss aversion and choice bracketing during financial decision-making. Additionally, we examine whether higher levels of financial literacy could be associated with lower financial anxiety.

To test our hypotheses, an online survey has been conducted on Turkish university students. The survey has been designed to collect data about the subjects' general and finance-related demographics and to measure the subjective and objective levels of financial anxiety and financial literacy. To test the individual mental accounting habits, case studies for hedonic framing, budgeting, and myopic loss aversion are presented to subjects in the mental accounting section of the user survey. All survey sections are translated into the Turkish language. To test our hypotheses and explain the relationships between financial anxiety, financial literacy, and mental accounting we performed multiple linear regression and binary logistic regression analyses.

The organization of this thesis study is as follows: In Chapter 2, to provide the details of our hypotheses generation and research methodology in a more structured manner, we begin by explaining the advancements in the literature on financial decision-making and the transition from traditional finance to behavioral finance. Chapter 3 covers the literature survey on mental accounting, financial anxiety, and financial literacy which are the main variables of this research. In Chapter 4, we explain the details of our research methodology including but not limited to the scope and limitations of this research, details of survey development and sampling, and the analyses of our results. Finally, in Chapter 5, we discuss the theoretical, practical, and social implications of this research whilst making suggestions for the advancement of the literature investigating the individual differences in mental accounting and making the concluding remarks.

2 THEORETICAL FRAMEWORK

This chapter discusses the theoretical framework upon which our hypotheses are built. To organize the information, we begin by defining the core theorems of traditional financial decision-making. Then, we will discuss some of the anomalies that classical financial theorems failed to explain at the time, which ultimately resulted in the advancements in behavioral economics and behavioral finance. Notably, traditional finance theorems are normative in essence, indicating how investors should make their judgments to get optimal outcomes. In contrast, behavioral finance seeks to explain why investors made the observed choices.

As a result, the following section after the traditional finance section reflects our review of the behavioral finance literature. Followingly, we discuss bounded rationality, and limits to arbitrage which transformed financial research by highlighting the critical role of psychology in financial decision-making. Later, we cover the prospect theory which has revolutionized the concept of utility and decisions made under risk and uncertainty.

Finally, we will provide a breakdown of psychological biases observed during financial decision-making. After providing a brief introduction, we will initially proceed to the cognitive biases, and then the emotional biases.

2.1 Traditional Finance

The traditional approach in finance was developed on the basis of classical decision theory, which claims that decision-makers are to be rational and evaluate all potential outcomes, and then, the best decision is estimated by taking the expected utility with the greatest possible value (Ackert, 2014). In terms of rational decision-making, Elster (1990) explains that “*the action should be the best way of satisfying the agent’s desires, given his beliefs*”.

Traditional finance places the *homo economicus* as the ideal agent of decision-making and it emphasizes that humans are rational decision-makers who process all available information and make decisions as described by standard expected utility theory (Bloomfield, 2010). Therefore, the method of traditional finance is normative by definition, attempting to discover the best course of action. To achieve this, the traditional finance literature deploys the utility functions where the results of decisions are demonstrated as a utility for the given outcome (Cartwright, 2018, p. 31). Utility functions have been a research topic since as early as the 18th century, and the expected utility theorem (especially the von Neumann-Morgenstern utility theorem) has been the principal theory in the finance literature (Bernoulli, 1738/1954; Von Neumann & Morgenstern, 1944). In the theoretical framework section of this thesis study, we approach traditional finance literature as the era before the emergence of behavioral finance when the psychological aspects of human decision-making were not been studied in depth at the time. In his article namely “*The History of Finance: An Eyewitness Account*” Nobel laureate economist Merton Miller (1999) pointed out the most important contributions to traditional finance in the 20th century as the following: (1) modern portfolio theory, (2) capital asset pricing model, (3) the efficient market hypothesis, (4) the Modigliani-Miller propositions, and (5) options.

Considering the research scope of the study, our focus will be on the financial decision-making aspect of traditional finance where we will proceed with the details of the expected utility theorem, and then continue with, modern portfolio theory, capital asset pricing model, and the efficient market hypothesis.

2.1.1 Expected Utility Theory

The idea that mathematical models should govern a rational decision in the face of uncertainty was first proposed and explored in the 18th century. One famous example is the St. Petersburg Paradox where the mathematician Daniel Bernoulli (1738/1954) conducted a pioneering analysis at the time on the distinction between the expected value and expected utility.

According to Bernoulli (1738/1954), expected values of decisions are calculated by multiplying the outcome of each decision by the number of ways in which it can occur and then dividing the sum of these multiplications by the total number of possibilities. In other words, the expected value of any decision is the sum of multiplications of possible outcomes with their probability of occurrence. However, Bernoulli (1738/1954) points out that although the value retained from these possibilities are equivalent; they would yield different utilities for the decision-makers in a way that the utility gained by a little increase in assets is inversely proportional to the total assets held before, implying diminishing returns of utility.

$$EV = \sum_i^n p_i EV_i$$

In the above equation, EV is the total expected value; EV_i is the expected value of the i^{th} outcome, p_i is the probability of i^{th} outcome; and, n is the total number of possible outcomes. St. Petersburg Paradox is a great instance that further illustrates this phenomenon. It is actually a game of probability where a player is offered a bet in which a coin is tossed consecutively. Every time, the coin appears heads the reward is doubled and when the coin appears tails at the k^{th} toss, the game ends and the player is given the reward of 2^k (Bernoulli, 1738/1954; Jensen, 1967; Starmer, 2000).

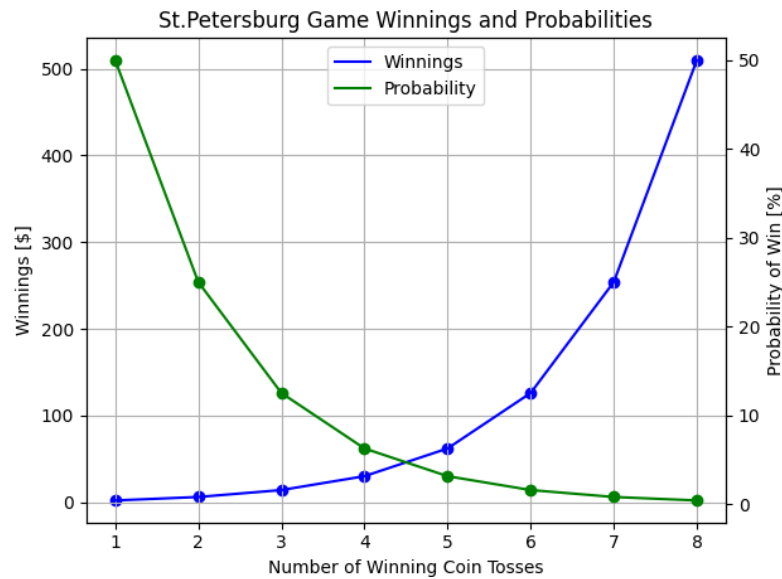


Figure 2.1: St. Petersburg game winnings and probability of win with respect to number of successful coin tosses

Figure 2.1 illustrates the potential winnings and their corresponding probabilities for a series of bets (for simulation details see Appendix 2B). The question is that what should be the fair entry price for the game? Since the game defines no boundaries, the expected value of the game grows to infinity with infinitely many possibilities such that;

$$EV = \frac{1}{2}2 + \frac{1}{4}4 + \frac{1}{8}8 + \dots + \frac{1}{2^k}2^k + \dots = 1 + 1 + 1 + \dots = \infty$$

As a result, using the expected value principle, one should be prepared to pay any amount, no matter how great, for the opportunity of playing this game. Yet, simulation results quickly demonstrate that participation in the game cannot be rational if the entry price is sufficiently large. If the entry price is 64 dollars, for example, there is only a 1 in 32 probability of recovering the price, while losing at least 32 dollars (at most 62 dollars) is a risk that can be compensated for only by the very tiny possibility of winning a very high price.

To solve the paradox, Bernoulli states that the estimation of the value should not be solely based on price; but, rather on the utility it yields. Then, he proposes a utility model where the utility of winning has a logarithmic relationship with the

player's level of wealth indicating that a fair entry price can be calculated for players since the marginal utility of money will be different with respect to the amount of wealth the player possesses (Bernoulli, 1738/1954; Jensen, 1967).

According to classical decision theory, a rational individual has consistent choices regardless of the complexity of the circumstances (Sugden, 1991). However, deciding between alternative options is not a simple task even in particular conditions where there is certainty. Nobel laureates von Neumann and Morgenstern (1944) published the *Theory of Games and Economic Behavior* where they explain the von Neumann-Morgenstern Utility Theorem which is an axiomatic theory of choice under risk and serves as the cornerstone of the expected utility theorem (EUT) and game theory since the 1940s.

According to von Neumann-Morgenstern Utility Theorem, a rational decision-maker should satisfy the four axioms of rationality which are namely: completeness, transitivity, continuity, and independence (Von Neumann & Morgenstern, 1944, pp. 26–29; Jensen, 1967; Parmigiani & Inoue, 2009, pp. 43–44):

Completeness axiom states that for any lotteries on the same set $a, b \in S$; one of the following conditions must hold: a is preferred, b is preferred, or the individual is indifferent to both a and b .

$$a \prec b, a \succ b, \text{ or } a \sim b$$

Transitivity requires that preferences remain consistent between three distinct alternatives. Therefore, for any lotteries on the same set $a, b, c \in S$; if a is preferred over b and b is preferred over c ; then a is preferred over c . Similarly, if lottery a is indifferent to b and lottery b is indifferent to c ; then, lottery a is indifferent to c .

$$\text{If } a \prec b \text{ and } b \prec c, \quad \text{then } a \prec c$$

$$\text{If } a \sim b \text{ and } b \sim c, \quad \text{then } a \sim c$$

Continuity axiom implies that for any lotteries on the same set $a, b, c \in S$; there is a point of indifference for a given middle option. In other words, if a is preferred over b and b is preferred over c ; then, there exists a probability λ for these lotteries in which choosing a and c for that probability is indifferent to b .

If $a \prec b$ and $b \prec c$, then for $\lambda \in [0,1]$

$$\lambda a + (1 - \lambda)c \sim b$$

Independence axiom asserts that the order of preference for any lottery on the same set $a, b, d \in S$; the order of preference of a, b remains constant regardless of any other outcome d with probability λ .

for any d and $\lambda \in (0,1]$

$$a \prec b \text{ iff } \lambda a + (1 - \lambda)d \preceq \lambda b + (1 - \lambda)d$$

Henceforth, for any rational von Neumann-Morgenstern individual who satisfies all four of these axioms, there exists a von Neumann-Morgenstern utility function u such that for any two lotteries on the same set $a, b \in S$, the following statement is valid: (Von Neumann & Morgenstern, 1944, p. 24).

$$a \prec b \text{ iff } u(a) < u(b)$$

In other words, the von Neumann-Morgenstern utility function allows the implementation of risk assessment during decision-making where a rational individual aims to maximize the utility instead of focusing solely on expected value. An expected utility maximizer is someone who prefers one bet over another if and only if the expected utility is greater. However, von Neumann-Morgenstern does not make strict claims regarding the nature of utility functions rather they emphasize that a numerical utility function for a rational person (who satisfies the axioms) exists but the same utility function cannot be used for multiple individuals (Von Neumann & Morgenstern, 1944, p. 16,28).

Although EUT is a powerful normative theory of rational decision-making; several studies have shown that individuals frequently break axioms of rationality where EUT has poor accuracy for describing the behavior of decision-makers under uncertainty (Battalio et al., 1990; C. F. Camerer, 1989; Kahneman & Tversky, 1979; Machina, 1987). Some of these have developed into well-known paradoxes such as the Allais and Ellsberg paradoxes which will be discussed in the Anomalies section of this chapter (Allais, 1953; Ellsberg, 1961). Furthermore, the expected utility theorem has been questioned because of being centered on an inaccurate representation of how humans make decisions in real life (Tversky & Kahneman, 1992; Kahneman & Tversky, 1979).

2.1.2 Modern Portfolio Theory

A core assumption of finance is that investors' desired rate of return would increase as the risk of the investment increases. That is because future gains from risky decisions are uncertain and there exists a risk premium for which investors may prefer to give up for avoiding the risky decisions (Ackert, 2014). A risk premium is an additional return on investment that an asset is predicted to provide above the risk-free rate of return. It compensates investors for accepting the additional risk associated with a particular investment (Villadsen et al., 2017, p. 51). In other words, investments with higher risk (i.e. higher outcome variance) should yield higher returns for decision-makers, and vice versa.

This phenomenon leads to the concept of diversification as a risk management method. Bernoulli (1738/1954) in his famous article regarding expected utility and the St. Petersburg paradox explains that risk-averse investors would prefer diversification. According to Bernoulli, *"it is advisable to divide goods which are exposed to some danger into several portions rather than to risk them all together"*. Hence, we can interpret that the diversification of assets as a risk management method was known as early as the 18th century.

In 1990, Harry Markowitz was awarded the Nobel Prize in Economics for the development of the theory of portfolio selection. In his theory namely *Portfolio Selection*, Markowitz proposes the expected returns-variance of returns rule (E-V rule), where he rejects the investment principle at the time that investors should diversify their funds among the securities with the sole consideration of maximum expected return (Markowitz, 1952). Rather, the E-V rule states that investors should select their portfolios from a set of efficient portfolios that achieve a minimum risk for a target expected return or a maximum expected return for a given level of risk (where E is the expected return and V is the variance of the portfolio) (Markowitz, 1952, 1959, p. 129). Today, this approach has become the central component of modern portfolio theory (or mean-variance portfolio theory, MPT) (Elton & Gruber, 1997).

There are five critical assumptions of MPT that are used to describe the behavior of individuals; where these assumptions are typically and implicitly made to describe the institutions' behavior as well (Beyhaghi & Hawley, 2013). These assumptions can be listed as follows:

- (1) Investors are rational; where rational investors as modeled as *homo economicus* i.e. they are utility maximizing and calculating.
- (2) Investors are risk-averse and they make their decisions consistent with the axioms of the expected utility theorem.
- (3) A monotonic investor always prefers a portfolio with a higher expected return over another portfolio with a lower expected return.
- (4) Investors are price takers who cannot influence a security price
- (5) Investors know the expected return of each asset in their portfolios.

Although the return of a portfolio is the average weighted return of each asset in that portfolio, portfolio risk cannot be estimated simply as the weighted average of individual asset risks. Elton and Gruber (1997) explain that the core idea of Markowitz's MPT was that "*... assets could not be selected only on characteristics that were unique to the security. Rather, an investor had to consider how each security co-moved with all other securities.*". As investors add multiple assets to their portfolios, they diversify some of the risks namely unsystematic risks inherited from the individual assets (Ackert, 2014). So that, investors would be able to construct optimal portfolios that possess a lesser risk for the same amount of expected return.

Modern portfolio theory provides a framework for the selection of optimal portfolios; however, monitoring the performance of portfolios has the utmost importance from investors' perspective such that adjustments, corrections, and comparisons between different portfolios would be possible. The fundamental concept behind the majority of traditional portfolio performance indicators is pretty straightforward. The measurements effectively compare the return on a managed portfolio to the return on a benchmark portfolio over a certain time period (Aragon &

Ferson, 2007). If an investor's portfolio outperforms the benchmark portfolio, this demonstrates that the investor's portfolio provides value.

It is worth noting that an *asset pricing model* is needed to determine the benchmark portfolio; since the value of a benchmark portfolio should be calculated methodically. In the next section, we will introduce the most prominent model of classical asset pricing i.e. the Capital Asset Pricing Model.

2.1.3 Capital Asset Pricing Model

In finance, the major assumption regarding the risk of financial investments is that it consists of two main components. The first one is the unsystematic risk which is specific to each asset in a portfolio (as mentioned in the previous section) such that it can be eliminated by utilizing diversification of assets. The second component is the systematic risk (or the market risk) (Ackert, 2014). Systematic risk is the component of asset volatility that cannot be removed even in the most diversified portfolios. To illustrate, if the economy experiences a crash, nearly all stocks will lose value. Although, some stocks may fall less than others; the investors' exposure to the overall state of the economy cannot be "averaged out" by diversification. (Villadsen et al., 2017, pp. 51–95).

Investors realized that with the advancements in the MPT, they can mitigate the unsystematic risks inherited from assets in their portfolios through diversification. However, even if investors hold all the shares in the stock market, diversification of assets alone is not effective for the alleviation of systematic risks which is a direct result of overall market conditions. To solve this problem, Sharpe (1964), Lintner (1965), Mossin (1966), and Treynor (1961, 1962) proposed the Capital Asset Pricing Model (CAPM) to assess systematic risk. According to CAPM, an expected return on a single asset or a portfolio is equal to its cost of capital. The fundamental equation of CAPM describes the cost of capital in terms of a risk-free rate of return and a risk premium which is often based on average market return (Sharpe, 2008, pp. 90–100).

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \text{ as in}$$

$$\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)}$$

Where $E(R_i)$ is the expected return on the i^{th} security, R_f is the rate of return on riskless assets (such as 3-month U.S. Treasury Bills), $E(R_m)$ is the expected return of the market and β_i or the beta coefficient is the sensitivity of i^{th} security's return to the market's return; in other words, the beta coefficient describes how relatively a security's returns change compared to the market's return. The beta coefficient β_i can also be expressed as the division of covariance of the rate of return of i^{th} asset and the rate of return of the market portfolio $Cov(R_i, R_m)$ with the variance of the rate of return of the market portfolio $Var(R_m)$ (Sharpe, 2008, p. 98). Perold (2004) explains that the CAPM formula connects the expected return and risk in a compatible manner with investors' behavior as described by the portfolio theory.

CAPM is built on several assumptions that describe the market conditions and investors' behavior which are as follows (Blitz et al., 2014):

- (1) There exist no constraints on leverage and short-selling.
- (2) Investors are risk-averse, expected utility maximizers of absolute wealth, and only take mean and variance of return into consideration.
- (3) Investors can make all their decisions only within identical time horizons.
- (4) Investors digest information in a complete and rational manner.
- (5) All assets are infinitely divisible; there are no transaction costs and taxes; and, investors are price-takers.

One of the core components of CAPM is the utilization of the beta coefficient as it is a relative indicator of systematic risk. In general, historical returns of assets are used to compute the beta coefficient of an asset relative to the market. To illustrate, a beta coefficient of 1.0 means that the security's returns change identically to the market whereas a beta coefficient of 0.0 means that the return of that security is completely unaffected by the market (Gitman & Zutter, 2015, pp. 382–384). Furthermore, a beta coefficient can be both positive and negative such that it shows

the direction of change in a security's return relative to the market's returns (see Table 2.1). Another important property of the beta coefficient is that a portfolio's beta coefficient can be easily calculated as the weighted product sum of individual asset beta coefficients. (Gitman & Zutter, 2015, pp. 384–386).

$$\beta_{portfolio} = \sum_{i=1}^n w_i \beta_i \quad \text{where} \quad \sum_{i=1}^n w_i = 1$$

Table 2.1: Explanations of sample beta coefficients

Beta	Direction of Movement	Meaning
2.0	Move in same direction as the market	Twice as responsive as the market
1.0		Same response as the market
0.5		Only half as responsive as the market
0.0	Security returns are <u>unaffected</u> by the market.	
-0.5	Move in opposite direction to the market	Only half as responsive as the market
-1.0		Same response as the market
-2.0		Twice as responsive as the market

Source: Gitman & Zutter, 2015, p. 383

Returning to the CAPM equation, another component is the R_f i.e. the rate of return on riskless assets. It is usually determined from the rate of return on local governments' short-term treasury bills such as 3-month or 30-day U.S. Treasury Bills (Black et al., 1972; Gitman & Zutter, 2015, p. 385). However, there is no such thing as a truly risk-free asset in reality (J. Y. Campbell, 2000).

The final component of the CAPM equation is the market risk premium (MRP) shown as $(E(R_m) - R_f)$. The MRP or sometimes called equity risk premium (ERP) is defined as “... *excess of the expected rate of return on the market over the risk-free rate*” (Villadsen et al., 2017, p. 54). To calculate the expected rate of return of the market $E(R_m)$, it is suggested to utilize the arithmetic mean of the historical returns of the common market indices that reflects the performance of well-diversified portfolios of their corresponding markets. To illustrate, some used indices are S&P 500 for the US, FTSE 350 for UK, and BIST 100 for Turkey (Villadsen et al., 2017, p. 60; Köseoğlu & Mercangöz, 2013).

The CAPM is theoretically sound and matches to the intuition of a risk-reward trade-off. CAPM makes an effort to estimate the expected return; however, it is not a

perfect model. Black et al. (1972) have found that the expected excess rates of return on assets are not in a strictly linear relationship with market beta coefficients. Furthermore, as a CAPM alternative, Fama and French (1996, 2015) proposed a three-factor and later, a five-factor asset pricing model where firm size, book-to-market ratio, profitability, and investment act as regulating parameters. Since it is very practical and easy to implement, CAPM became a well-known theory among investors (Fama, 1991). Another criticism of the CAPM is that the CAPM model assumes that there are no arbitrage opportunities exist in the market. Arbitrage is defined as “*a transaction that involves no negative cash flow at any probabilistic or temporal state and a positive cash flow in at least one state; in simple terms, it is the possibility of a risk-free profit at zero cost.*” (Ross, 2012, p.5). Ross (1976) developed the arbitrage pricing theory (APT) as an alternative to asset pricing. The essential premise of APT is the one-price rule. The theory posits that the aforementioned one-price rule must hold in a market at equilibrium because rational investors would remove arbitrage opportunities (D. Basu & Chawla, 2012).

2.1.4 Efficient Market Hypothesis

Research on how asset prices in financial markets behave has been a field of study since the early 20th century. In the early studies, the dominant consensus was that asset prices move randomly. In his Ph.D. thesis *Théorie de la Spéculation*, French mathematician Louis Bachelier (1900, p.34) concludes that “*the mathematical expectation of the speculator is zero.*”. The term *random walk* is first introduced by Pearson (1905) in the scientific letters of Nature. Cowles (1933, 1944) conducted a thorough analysis on the performance of professional investment agencies and found that stock market forecasters fail to achieve over the average returns and cannot accurately predict stock returns. Kendall (1953) examined 22 time series of asset prices that are updated in weekly terms and discovered that they were moving practically random.

The Efficient Market Hypothesis (EMH) is mostly credited to U.S. economist Eugene Fama due to his significant contributions to the subject of efficient markets.

Fama (1965a, 1965b) made the first description of efficient markets and he determined that stock prices follow a random walk by means of statistical analysis. Fama (1965b) concludes that “... *independence of successive price changes is consistent with an “efficient” market, that is, a market where prices at every point in time represent best estimates of intrinsic values*”. This concept is the core of the EMH, which has dominated the world of finance for many decades. Later, Fama (1970) published the first of his comprehensive review papers on the efficient market hypothesis. According to Fama (1970), “*A market in which prices always “fully reflect” available information is called “efficient”*”. Following years after Fama’s famous article, academic interest in efficient markets research peaked especially in the 1970s (Shiller, 2003).

In brief, a market that satisfies the following conditions can be described as an efficient market (Gitman & Zutter, 2015, p. 330):

- (1) Asset prices are in equilibrium under normal conditions which means that their valuations are fair such that expected returns and required returns are equal to each other.
- (2) Asset prices reflect all available information on corresponding companies and their assets, and they adjust rapidly in response to the newly available information.
- (3) Considering that asset prices are completely and fairly adjusted, it is futile for investors to search for mispriced assets.

However, considering the above-mentioned properties of efficient markets, there is more to it than just classifying markets as efficient or not. Grossman and Stiglitz (1980) argue that in a market where the information is costly (as in the real world), it is virtually impossible to obtain perfectly efficient markets that reflect all available information; because investors require some incentive for spending resources to collect and analyze market information. In his 1970 article, Fama sets forth three forms of market efficiency:

- (1) **Weak form efficiency:** Prices will reflect any historical information. The examination of historical pricing data is meaningless.

- (2) ***Semi-strong form efficiency***: Prices will reflect all publicly available information and historical price data. Using information releases such as financial statements and media stories, investors cannot produce abnormal returns.
- (3) ***Strong form efficiency***: Prices will reflect both private and public information, as well as historical price data. Insiders are unable to create abnormal returns.

The construct of EMH employs a total of five assumptions and together these assumptions lead to the conclusion that all prices must fully reflect all available present information; thus, the price changes in the future can result solely from information that is different and currently not available (Howden, 2009). The five assumptions of EMH can be listed as follows (Howden, 2009):

- (1) Subsequent price fluctuations are independent of the previous period
- (2) Price changes accommodate a known probability distribution
- (3) Homogeneous expectations
- (4) There are no transaction costs
- (5) Information is costless

Although EMH is one of the most impactful theories in the finance literature, several criticisms of EMH do exist. For example, Jegadeesh and Titman (1993) studied market strategies that lead to abnormal returns over 3 to 12 months holding periods. They found evidence that invalidates EMH where they have identified several market strategies that generated abnormal returns in the 1965-1989 period. To illustrate, one such strategy was to select stocks by examining their 6-month returns and holding them for 6 months which realized a compounded excess return of 12.01% per year on average. Moreover, Lee et al. (2010) studied stock market price levels between the period of January 1999 to May 2007 among 32 developed and 26 developing countries where their research showed significant arbitrage opportunities which is inconsistent with the EMH.

Sharma and Kumar (2019) explain that numerous research on the profitability of stock markets have been published throughout time, calling into doubt the validity of the EMH in understanding stock returns. They divide these criticisms toward EMH into two main categories: Stock market anomalies and studies advocating the failure of the efficient market hypothesis which we have covered some of them in detail in the next section.

2.2 Anomalies

In this section, the “Anomalies” which refer to the phenomena observed in individual decision-making and/or market trends that could not be explained by traditional models of finance will be covered. The research on financial anomalies has significant importance for the transition from normative theories of traditional finance toward the descriptive theories of behavioral finance.

An important aspect of these anomalies is that they generally result in price abnormalities in the markets that violate the CAPM or the EMH by irrational traders so that abnormal returns/losses occur, leading to market inefficiencies. In addition to market abnormalities, some anomalies are detected during individual financial decision-making where people violate the rationality axioms, deviating from the highest possible expected utility or aiming for non-optimal portfolios due to consideration of market irrationalities.

The following table shows the distinguished anomalies that we have selected for the construction of our theoretical framework.

Table 2.2: Selected Market Anomalies for Theoretical Framework

Anomaly	Literature	Significance & Comments
Allais Paradox	(Allais, 1953; Kahneman & Tversky, 1979; Machina, 1987)	Violations of EUT and Utility Functions.
Ellsberg Paradox	(Ellsberg, 1961; C. Camerer & Weber, 1992; Fox & Tversky, 1995)	Violations of EUT and Ambiguity Aversion.
Small-Firm Effect	(Banz, 1981; Reinganum, 1981; Schwert, 2003)	Market-level firm anomaly. Smaller-size firms outperform larger firms.
Neglected Firm Effect	(Arbel & Strebel, 1982; Beard & Sias, 1997)	Market-level firm anomaly. Lesser-known firms outperform well-known firms generating abnormal returns.
Value Effect	(S. Basu, 1977; Ball, 1978; S. Basu, 1983; Fama & French, 1992, 1993)	Market-level firm anomaly. Companies with a higher price-to-earnings ratio generate abnormal stock returns.
Turn-of-the-Year Effect	(Keim, 1983; Reinganum, 1983; Roll, 1983)	Market-level calendar anomaly. Stocks (especially small firms) experience price volatilities at the end of December and generate abnormal returns in the first two weeks of January
Turn-of-the-Month Effect	(Ariel, 1987; Lakonishok & Smidt, 1988)	Market-level calendar anomaly. Stock returns occur on the last day and the first few days of the trading month.
Weekend Effect	(Cross, 1973; French, 1980)	Market-level calendar anomaly. Abnormally low stock returns on Monday.
Momentum & Reversal Effects	(De Bondt & Thaler, 1985; Jegadeesh & Titman, 1993; Vayanos & Woolley, 2013)	Market-level trading anomaly. Abnormal stock returns depend on recent short-term performance.

The Allais Paradox is a decision problem initially devised by Maurice Allais (1953) to demonstrate the incompatibility of observed individual preferences with the projections of expected utility theory. Essentially, the problem is as follows (Allais, 1953; Machina, 1987):

(1) Do you prefer situation A or situation B?

Situation A: 100% *chance of winning* \$1,000,000

Situation B: $\begin{cases} 10\% \text{ chance of winning } \$5,000,000 \\ 89\% \text{ chance of winning } \$1,000,000 \\ 1\% \text{ chance of winning } \$0 \end{cases}$

(2) Do you prefer situation C or situation D?

Situation C: $\begin{cases} 11\% \text{ chance of winning } \$1,000,000 \\ 89\% \text{ chance of winning } \$0 \end{cases}$

Situation D: $\begin{cases} 10\% \text{ chance of winning } \$5,000,000 \\ 90\% \text{ chance of winning } \$0 \end{cases}$

In this experiment, Allais (1953) and later, Kahneman and Tversky (1979) found out that a significant portion of the subjects chose the gambles A-D and B-C. However, considering the EUT, a rational individual should go for the pairs of either A-C or B-D such that in mathematical terms:

In Experiment 1 for someone who prefers A over B:

$$(1.00)u(\$1,000,000) > (0.89)u(\$1,000,000) + (0.10)u(\$5,000,000)$$

$$(0.11)u(\$1,000,000) > (0.10)u(\$5,000,000)$$

In Experiment 2 for someone who prefers D over C:

$$(0.11)u(\$1,000,000) < (0.10)u(\$5,000,000)$$

In the aforementioned case when an individual goes for gambles A and D, we observe a pattern of preferences that violate the EUT. Machina (1987) explained that the Allais Paradox is an example of a systemic violation of linearity in probabilities which corresponds to the independence axiom of the EUT.

The next anomaly we will cover is the Ellsberg Paradox. Taking its name from its author, Daniel Ellsberg (1961) studied this decision phenomenon in his article namely “*Risk, Ambiguity, and the Savage Axioms*”. The focal point of the study was to understand how different people behave when faced with a “measurable uncertainty” i.e. risk and an “unmeasurable uncertainty” during decision making.

Ellsberg (1961) conducted two individual experimental studies. In the first study, subjects are provided with two urns. Urn 1 contains a total of 100 red and black balls with an unknown ratio. Urn 2, however, contains exactly 50 red and 50 black balls. The following bets are offered to the subjects (Ellsberg, 1961).

- (1) **Bet Red₁**: Win \$100 if a red ball is drawn from Urn 1, \$0 else.
- (2) **Bet Black₁**: Win \$100 if a black ball is drawn from Urn 1. \$0 else.
- (3) **Bet Red₂**: Win \$100 if a red ball is drawn from Urn 2, \$0 else.
- (4) **Bet Black₂**: Win \$100 if a black ball is drawn from Urn 2, \$0 else.

Ellsberg (1961) reports that the majority of the subjects choose the bets Red₂ and Black₂ where the ratio of the balls is known to be 1-1 and there is no significant difference between the color of preference among the subjects. The results indicate that subjects prefer known risks over uncertainties. Following the second experiment, there is a single urn that contains 30 red balls and 60 balls of unknown proportions of black and yellow balls. Subjects are asked to choose bets under two scenarios.

Scenario A:

- (1) Win \$100 if a red ball is drawn from the urn, \$0 else.
- (2) Win \$100 if a black ball is drawn from the urn, \$0 else.

Scenario B:

- (1) Win \$100 if a red or yellow ball is drawn from the urn, \$0 else.
- (2) Win \$100 if a black or yellow ball is drawn from the urn, \$0 else.

Ellsberg (1961) reveals that the most frequent bets were A1 and B2. In both of these experiments, subjects are observed to choose the bets with the probabilities they can anticipate. Ellsberg (1961) proposes the term *ambiguity* which he defines as “...a quality depending on the amount, type, reliability and “unanimity” of

information and giving rise to one's degree of "confidence" in an estimate of relative likelihoods" and explains that as the degree of ambiguity of a decision decreases, it starts to become the dominant decision. In the finance literature, this phenomenon is often described as the *ambiguity aversion* (C. Camerer & Weber, 1992; Fox & Tversky, 1995).

Following the anomalies that contradict the EUT, there are some anomalies observed at the market level. One of them is the size effect or the small-firm effect. Banz (1981) and Reinganum (1981) conducted empirical studies on NYSE-AMEX and found out that small-size firms generated continuous abnormal returns beyond the CAPM predictions, outperforming the larger firms between the periods of 1926-1975 and 1962-1975 respectively. However, since the initial publication of this anomaly, it has been observed that this anomaly was diminishing up to the point where there is no significant difference between smaller and larger firms (Schwert, 2003).

Another market-level anomaly is the neglected firm effect. It refers to the trend for certain lesser-known firms to outperform more well-known firms. The neglected firm effect posits that stocks of lesser-known firms can provide higher returns because they are less likely to be researched and investigated by market experts, enabling skillful investors to seize abnormal returns (Arbel & Strebel, 1982). Later, Beard and Sias (1997) conducted empirical research on a larger dataset collected between 1982-1995. Upon their reinvestigation, they found no support for an existing neglected firm effect. One of their possible explanations is that the effect could be simply diminished since investors exploited it (Beard & Sias, 1997).

Furthermore, there is an anomaly namely the value effect. According to Basu (1977, 1983), companies with high price-to-earnings ratios generate positive abnormal returns compared to the CAPM estimations. Anderson and Brooks (2006) found out that the price-to-earnings ratio is an even better indicator of abnormal returns when earnings are averaged over the previous 8 years.

Some market-level anomalies are associated with specific dates of the fiscal year. One of these anomalies is the turn-of-the-year effect. Keim (1983) and Reinganum (1983) demonstrated that firms generate a significant portion of their abnormal returns in January. Roll (1983) proposed that the greater volatility of small firm stocks was the cause of a greater number of them experiencing significant short-term capital losses. These are the types of losses that investors might want to realize before the end of the year to reduce their taxable income. Hence, this selling pressure causes prices of small-cap companies to fall in December; however, it may be followed by a comeback in early January when investors repurchase these equities to rebuild their investment positions.

Another market-level calendar anomaly is the turn-of-the-month effect. Ariel (1987) conducted a study on stock returns between 1963-1981 and found out that the mean returns for the second half of the month are negative. He pointed out that almost all returns occur in the first half of the trading month. Lakonishok and Smidt (1988) further investigated this phenomenon and replicated similar results for 90 years of daily data on the Dow Jones Industrial Average. Their results indicate that abnormal stock returns occur on the last and the first trading days of the trading month where they also detected similar consistent anomalies around turn-of-the-week, turn-of-the-year, and holidays as well.

The final calendar anomaly we will cover is the weekend effect. Cross (1973) and French (1980) conducted a statistical analysis of daily returns of the Standard & Poors composite portfolio between the period from 1953 to 1970 and 1977 respectively. They found out that the average return on Monday is significantly negative; whereas, the average return for the rest of the four days of trading is positive (Cross, 1973; French, 1980). French (1980) explains that this phenomenon is an indication of market inefficiency and abnormal returns could be achieved.

Lastly, momentum and reversal effects are two of the most noteworthy financial market-level anomalies. The momentum effect is the propensity for assets with strong recent performance to continue to outperform in the near future; whereas assets with poor recent performance will similarly continue to underperform in short

term (Schwert, 2003). On the other hand, the reversal effect focuses on the predictability of asset performance based on a lengthier history where assets that performed well over an extended period will probably continue to underperform in the future, and vice versa (Vayanos & Woolley, 2013). De Bondt and Thaler (1985) show that stock market participants overreact to unforeseen and shocking news that provides evidence for significant weak form inefficiencies. In a later study, they provide further evidence for systematic price reversals such that gains of past loser stocks exceed the past winner stocks where they provide evidence that it is related to investor overreaction (De Bondt & Thaler, 1987). Jegadeesh and Titman (1993) theorize that investors underreact to information about short-term outcomes whereas they overreact to information regarding long-term outcomes.

2.3 Behavioral Finance

In the previous sections, we have covered traditional theorems of finance where people are assumed to be rational decision-makers and they optimize for the highest expected utility possible (Ackert, 2014). However, some decision-making and market anomalies are observed by finance scholars whom we covered in the Anomalies section. These anomalies are an indication of human irrational behavior and cannot be explained by fundamental traditional finance theorems.

To describe human financial decision-making, behavioral finance utilizes concepts derived from various scientific and industrial fields to better grasp the choices made by investors (Ackert, 2014). In general terms, behavioral finance claims that some financial patterns may be better understood by using models in which decision-making actors are not entirely rational (Barberis & Thaler, 2005).

In this thesis study, we will start establishing the theoretical framework for behavioral finance by first covering the concept of bounded rationality which prevents people to make perfectly rational decisions due to their finite mental capabilities (Simon, 1972). According to Barberis and Thaler (2005), behavioral finance has two core elements: limits to arbitrage and psychology. Following their structure, we will proceed by covering the limits of arbitrage and then, the

psychology where we will place the emphasis on Kahneman and Tversky's (1979) prospect theory as an opposing theory against the expected utility theory. Prospect theory showed that the investors are not always rational as commonly assumed by traditional EUT economists which also renders other theorems based upon EUT such as MPT and CAPM questionable (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992).

Lastly, behavioral finance asserts that psychological factors and biases impact the financial behavior of investors and financial professionals (Nofsinger, 2017, p. 29). Pompian (Pompian, 2006, p. 44) explains that there are two separate forms of behavioral biases: cognitive and emotional biases where both types result in irrational decision-making and suboptimal outcomes. In the final section, we will provide some examples of these common psychological biases observed during financial decision-making.

2.3.1 Bounded Rationality

In terms of decision-making, a fully rational individual must have the answers to all mathematical questions and can make computations instantaneously no matter how complicated they are. Nevertheless, these qualities require unlimited mental capabilities and in reality, actual human beings are quite diverse from that ideal form. Our intellectual capabilities are restricted. Therefore, we cannot achieve full rationality due to this reason alone. Nonetheless, this does not mean that human behavior is completely irrational as well (Selten, 2002, p. 14).

In the finance literature, bounded rationality is credited to Herbert Simon, who introduced the concept of bounded rationality as an alternative framework for modeling human decision-making (Simon, 1955, 1972). Simon (1972) states that “*theories that incorporate constraints on the information-processing capacities of the actor may be called theories of bounded rationality*”. Simon (1972) points out several occurrences where there is risk/uncertainty, incomplete information about decision alternatives, and complexity which limits the rationality of the decision-maker agents. Since everyone possesses bounded rationality to a degree, Simon

(1956) states that agents do not simply maximize or optimize as modeled by traditional theorems of finance, rather; they aim to satisfy i.e. setting an aspiration level and becoming happy for reaching it while making decisions. Scholars of behavioral science do not claim that individuals are irrational when they deviate from traditional expected utility models. On the contrary, people try their best to make rational decisions, but; their resources and skills eventually prevent them from doing so (Ackert, 2014).

The impact of bounded rationality on the theoretical development of behavioral economics is enormous. Barberis and Thaler (2005) note that before the emergence of bounded rationality, decision-making behavior was either classified as rational or irrational; but, utilizing the models of bounded rationality it is now possible to make significantly more accurate descriptions of decision-making than pure rational models.

2.3.2 Limits to Arbitrage

As a financial concept, arbitrage is defined as the “*process of earning riskless profits by taking advantage of differential pricing for the same physical asset or security*” (Sharpe & Alexander, 1990, p. 284). In traditional finance where the decision-makers are assumed to be rational, the price of an asset is equal to its discounted sum of projected future cash flows considering all investors properly process all available information (Barberis & Thaler, 2005).

Contrarily, behavioral finance disputes that some deviations from the fundamental levels of asset prices are a direct result of economic agents who are not totally rational (Ritter, 2003). In that sense, limits to arbitrage is a concept in behavioral finance where professional arbitrage traders are not able to fully rectify the price deviations from fundamental levels for prolonged periods of time mainly because they try to avoid excessively volatile arbitrage opportunities (Shleifer & Vishny, 1997).

Barberis and Thaler (2005) explain that an arbitrage trader (or an *arbitrageur*) faces categorically two types of risks that limit the arbitrage. First is the fundamental risk which is bound to the fundamental value of a stock. Fundamental risk is manageable to a degree for arbitrageurs only if they can find near-perfect substitutes like the example of Ford and General Motors. To illustrate, if the arbitrageur trades Ford stocks, shorting General Motors will protect against unforeseen detrimental developments in the automotive industry.

The second is the noise trading risk which is the price fluctuations caused by irrational traders (De Long et al., 1990). Noise traders do not benefit from any fundamental information; rather, they try to trade according to noise which is the “*opposite of information*” and “*diversified arrays of unrelated causal elements to explain what happens in the world*” (Black, 1986). De Long et al. (1990) show that noise traders increase the arbitrage risk in the short run. The price volatility caused by noise traders may force arbitrageurs to liquidate their positions prematurely, causing substantial losses (Barberis & Thaler, 2005).

2.3.3 Prospect Theory

One of the most prominent theories of behavioral finance is the prospect theory. Initially published by Kahneman and Tversky (1979) in their seminal paper namely “*Prospect Theory: An Analysis of Decision under Risk*”, it offers a more precise explanation of real-life decisions than normative models of EUT, because it accounts for the psychophysics of judgment and choice.

As components of prospect theory, Kahneman and Tversky (1979) demonstrate three behavioral effects in decision-making:

- The *certainty effect*; in which people will favor certainty over risk;
- The *reflection effect*; where the preference of negative prospects mirrors the image of positive prospects’ preferences
- The *isolation effect*; where people are more concerned with the disparities between decisions alternatives than with the similarities.

Based on these findings, prospect theory suggests a value function that demonstrates the utility of losses and gains for decision-makers where the origin is the reference point at the moment of decision. Essentially, the value function replaces the utility function of EUT (Kahneman & Tversky, 1979).

The value function of the prospect theory has an asymmetrical S-shaped curve where it is concave in the positive region; but, convex in the negative region. The asymmetrical definition of the value function relies on the experimental data. The positive region retains the fundamental economic law of diminishing marginal returns. However, in the case of losses, there exists a much steeper curve in the negative region demonstrating a clear loss aversion for economic agents. In other words, for a fixed amount of wealth, individuals feel a much higher emotional load when faced with losses compared to gains (Altman, 2010; Kahneman & Tversky, 1979).

Tversky and Kahneman (1992) further developed the prospect theory and proposed an extended version namely cumulative prospect theory. In this version, it is possible to model uncertain and risky prospects with a variety of outcomes, and the implementation of different weighting functions for gains and losses is now possible (Tversky & Kahneman, 1992). Today, the prospect theory is still one of the most widely utilized theorems in finance and insurance (Barberis, 2013).

2.3.4 Psychological Biases in Behavioral Finance

In the previous sections, we have covered that financial decision-makers do not behave as rational agents in real life as modeled by traditional theorems and EMH. Tversky and Kahneman (1974) explain that individuals tend to utilize certain heuristics to decrease the mental load of complex tasks. Heuristics can be simply described as “rules of thumb” that aid us to manage overwhelming amounts of information (Montier, 2007, p. 19). However, this simplification may cause serious and systematic errors that lead to cognitive biases (Tversky & Kahneman, 1974).

According to Pompian (2006, p. 44), there are two distinct categories of behavioral biases which are cognitive and emotional biases where both lead to irrational decision-making and sub-optimal results. Cognitive biases are often the result of flawed logic; hence, they could be overcome by counseling and improved knowledge. On the other hand, emotional biases stem from intuition or instinct rather than deliberate assessments; so it is challenging to correct them (Pompian, 2006, p. 44). A critical point regarding behavioral biases is that even if there are no constraints on a person's information collecting and processing capabilities, as in bounded rationality, including the emotions in behavioral models alone would cause certain irrational behavior which eventually leads to errors and behavioral biases during decision-making (Altman, 2014, p. 45).

In this thesis study, we will follow Pompian's (2006) categorical structure for the classification of biases in behavioral economics. Note that, although Pompian (2006) has included mental accounting, framing, and loss aversion in his book, they will not be covered in this section since they will be extensively explained in the upcoming literature survey.

2.3.4.1 Cognitive Biases

In this section, we will define and provide examples of twelve cognitive biases common in financial decision-making.

Overconfidence Bias: It is defined as a person's excessive belief in his/her own thinking, judgments, and cognitive abilities. People showing overconfidence bias tend to believe that they are more intelligent and they possess better information than they actually do (Pompian, 2006, p. 51). Overconfident people trade more which causes fewer returns. Men tend to trade 45% more than women (Barber & Odean, 2001).

Representativeness Bias: Individuals underweight long-term averages. People have a tendency to place excessive significance on the latest information. This is sometimes referred to as the "law of small numbers." (Ritter, 2003). To illustrate,

Chen et al. (2007) studied investor decision-making in China stock market and they found that a portion of Chinese investors demonstrate representativeness bias where these investors believe that past returns are an indicator of future returns.

Anchoring and Adjustment Bias: People often utilize a reference point or an initial/default number which is called an anchor when compelled to approximate an unknown value. The approximation is done by adjusting the anchor which leads to errors and biased results (Tversky & Kahneman, 1974). Campbell and Sharpe (2009) investigated this bias among stock market forecast specialists and they showed that a large number of forecasters were significantly biased toward the previous month's data.

Cognitive Dissonance Bias: People feel a certain mental discomfort when their newly obtained knowledge disagrees with their previously held beliefs. Consequently, individuals suffer a cognitive dissonance bias where they try to neutralize this mental discomfort by adjusting their actions and thoughts where these modifications are not fully rational and are not always in their own best interests (Pompian, 2006, pp. 83–84). Goetzmann and Peles (1997) studied the mutual fund investors' attitudes toward past fund performances and showed that they exhibit cognitive dissonance holding a positive bias towards their past performances.

Availability Bias: Tversky and Kahneman (1974) explain that people sometimes evaluate the frequency of a situation depending on how easily that foreseen situation is realized in their minds. This phenomenon is called availability which is a useful heuristic for estimating the frequency of events. However, when people rely on availability, it often leads people to calculable biases. An evidence of availability bias is presented by Barber and Odean (2008) who showed that among many listed companies in the stock market; individual investors significantly prefer to buy attention-grabbing stocks.

Self-Attribution Bias: People who demonstrate this bias have a tendency to believe that any success or an event with a positive outcome happened mainly because of their qualities such as talent and foresight; however, any negative outcome is due to

other external influences out of their control like bad luck (Pompian, 2006, p. 104). From a behavioral economics perspective, Gervais and Odean (2001) conclude that self-attribution bias is highest among new traders whilst; more experienced traders may develop more accurate self-assessments. Doukas and Petmezas (Doukas & Petmezas, 2007) studied the acquisitions of overconfident managers and found that it is common among managers to credit themselves the initial success to their own abilities which leads them to be more overconfident and engage in more deals.

Illusion of Control Bias: As the name suggests, the thought when people assume that they can influence the outcome of a random event while in reality, they could not is referred to as illusion of control (Grou & Tabak, 2008). However, the illusion of control might negatively impact portfolio selection. For example, employees who believe that they have a significant contribution to their companies' performance, may have portfolios with poor diversification and excessively own the stocks of their own companies (Fellner, 2009).

Conservatism Bias: People who demonstrate conservatism are simply those who are attached to their previous ideas and predictions even though there is newly available information on the subject (Pompian, 2006, p. 119). In behavioral economics, common implications of conservatism are investor overreaction and investor underreaction where investors become excessively optimistic or pessimistic over the news about the stocks they want to invest in (Barberis et al., 1998).

Ambiguity Aversion Bias: In the Anomalies section, we have covered the Ellsberg paradox and the concept of ambiguity. According to Ellsberg (1961), people place higher preferences over decision options with less ambiguity where the outcomes are foreseeable. An empirical study conducted by Dimmock et al. (2016) shows that ambiguity aversion is inversely correlated with stock market participation, and foreign stock ownership; whereas, it has a positive relationship with own-company stock ownership.

Recency Bias: Individuals who remember and give more importance to recent developments and impressions over those that happened in the distant past are

considered to demonstrate recency bias (Pompian, 2006, p. 216). Hao et al. (2016) studied the effects of a 52-week price high on investors and recency bias in the Taiwan stock market. They showed that investors are significantly more affected if the 52-week price high has happened more recently.

Confirmation Bias: Confirmation bias implies “*the seeking or interpreting of evidence in ways that are partial to existing beliefs, expectations, or a hypothesis in hand*” (Nickerson, 1998). Fisher and Statman (2000) argue that confirmation bias can be remedied by considering all available information on a subject even if it is contradictory to one’s self-views. Park et al. (2013) conducted a survey study on 502 investors via stock message boards. Their results show that investors are prone to confirmation bias where they treat the provided messages according to their personal beliefs. Also, those who are prone to confirmation bias tend to be more overconfident such that they trade more actively and expect higher market returns.

Hindsight Bias: This is a bias that refers to the propensity of individuals to modify their judgment of the inevitable nature of an event after they know its conclusion (Christensen-Szalanski & Willham, 1991). Biais and Weber (2009) studied the hindsight bias among finance professionals in London and Frankfurt, and they showed that financial agents forget their ignorance after they are shown actual outcomes of events. Furthermore, they conclude that hindsight bias causes poor risk management and results in inefficient portfolios and losing trades.

2.3.4.2 Emotional Biases

Emotional biases are derived from feelings and intuition. In this section, we will cover five emotional biases namely endowment bias, self-control bias, optimism bias, regret aversion bias, and status quo bias.

Endowment Bias: Thaler (1980) describes the pattern where people value the assets they own significantly higher than they are worth as the endowment effect. Kahneman et al. (1991) theorize that endowment is a by-product of loss aversion where people believe that the disutility of losing an object is significantly higher than the utility of gaining it. Kahneman, Knetsch, and Thaler (1990) explain that the

endowment effect results in reduced gains in a market environment for everyone; because the endowment effect induces loss aversion which slows down trading activity.

Self-Control Bias: In behavioral economics, self-control bias is a behavioral trait that is often associated with driving people to spend rather than save for the future (Pompian, 2006, p. 150). However, As part of their Behavioral Life-Cycle Hypothesis, Shefrin and Thaler (1988) explain that sustaining self-control over one's spending behavior has a mental cost so economic agents come up with numerous methods like pension plans to support saving for the future.

Optimism Bias: Optimism is an agent's disproportionate positive beliefs toward upcoming future events and it has strong correlations with one's professional choices, retirement plans, and self-control (Puri & Robinson, 2007). Additionally, people who demonstrate optimism bias may overinvest in their employers' company stocks and also, believe that they are better investors compared to their peers (Pompian, 2006, p. 167).

Regret Aversion Bias: People who display regret aversion refrain from taking definitive action out of fear that they try to avoid the regret associated with poor decision-making (Pompian, 2006, p. 227). In behavioral economics, a clear example of this bias is the investors who cling to their losing position for too long without acknowledging their mistakes and accumulating losses (Fairchild, 2014).

Status Quo Bias: In a series of tests, Samuelson and Zeckhauser (1988) developed the phrase status quo bias to explain the excessive preference for the status quo among people who prefer to maintain their current decision states. The most common research themes about status quo bias are pension and personal finance planning, choices about health, and insurance where agents try to uphold their initially selected plans (Dowling & Lucey, 2010). Brown and Kagel (2009) provided evidence that individual investors are prone to status quo bias where they ignore information regarding stocks that could provide higher returns and continue to hold onto the same stocks.

3 LITERATURE REVIEW

In this study, we divided our main research themes into three main topics: financial anxiety, financial literacy, and mental accounting.

In Section 3.1, we covered the most prominent research on the financial anxiety literature. After providing a detailed definition of this concept, we further investigated the variables that are in a significant statistical relationship with financial anxiety. Within the scope of this thesis study, the parameters we investigated were as the following: debt levels, savings, financial planning, and susceptibility to behavioral biases. We have presented our findings in literature survey tables (see Table 3.1 and Table 3.2)

In Section 3.2, we focused on financial literacy and presented our findings on the most influential studies on financial literacy. Following the same methodology as financial anxiety, we started by defining the main concepts of financial literacy and summarized the most impactful literature on financial literacy. Then, we prepared literature survey tables to present our findings regarding how financial literacy affects individual debt levels, savings, financial planning, susceptibility to behavioral biases, and financial anxiety (see Table 3.3 and Table 3.4).

Finally, in Section 3.3, we presented our review of mental accounting literature. We began by explaining the initial development of mental accounting and its development in the previous decades. Then, following Richard Thaler's (1999) famous article on "*Mental accounting matters*" we covered the three core components of mental accounting. Lastly, we reported and tabulated our literature findings on individual differences in mental accounting such as its relationship with individual debt levels, savings, financial planning, financial anxiety, and financial literacy (see Table 3.5 and Table 3.6).

3.1 Literature Survey on Financial Anxiety

Financial anxiety is characterized as “*a psychosocial syndrome whereby individuals have an uneasy and unhealthy attitude toward engaging with, and administering their personal finances in an effective way*” (Shapiro & Burchell, 2012). A study conducted by Tran et al. (2018) found that financial stress is significantly correlated with general anxiety. However, Shapiro and Burchell (2012) showed that although financial anxiety is affected by general psychological anxiety and low mood, it is a distinct behavioral phenomenon where the mood is directly affecting the level of financial anxiety; whereas, general anxiety indirectly affects financial anxiety through mood. Furthermore, Grable et al. (2015) theorized that financial anxiety is essentially longer-term financial stress felt by individuals where they avoid seeking financial services and force themselves into a form of self-helplessness.

Financial anxiety is a recent research theme in which scientists who specialize in the fields of financial planning, financial counseling, and financial therapy are interested (Archuleta et al., 2020). Shapiro and Burchell (2012) concluded that financial anxiety is a behavior similar to phobia where people unknowingly regulate their anxiousness levels by avoiding fear-inducing stimuli. In other words, people try to cope with their financial anxiety by avoiding finance-related matters. Archuleta et al. (2013) explained that financial stress and financial anxiety could be viewed as individual components of financial mental health.

Table 3.1 lists our literature survey on financial anxiety in chronological order. Table 3.2 shows the list of studies finding a statistically significant relationship between financial anxiety and the study parameters.

Table 3.1: Literature survey on financial anxiety in chronological order

Article	Subject	Sample	Analysis	Main Findings
Lange & Byrd (1998)	Financial distress and psychological well-being	237 Students	Path analyses	DEBT Higher future debt induces chronic financial strain. Lower perception of financial control induces anxiety and depression
Norvilitis et al. (2003)	Credit card debt levels and anxiety	227 Students	Multiple Regression	DEBT Credit card debt increases anxiety
Grable & Joo (2006)	Racial background, Credit card debt levels, and financial stress	110 Students	t-test, Ordinary Least Squares	DEBT Credit card debt increases financial stress.
Gambetti & Giusberti (2012)	Effects of trait anxiety on investment perceptions and decisions	214 Employed Individuals	Hierarchical Multiple Regression	SAVINGS Trait anxiety causes people to invest less and keep their money in current accounts BEHAVIORAL BIAS Trait anxiety creates a proneness to avoid risk-taking and a selective attentional bias towards threatening stimuli.
Shapiro & Burchell (2012)	Reaction times of people with financial anxiety toward financially loaded words	2 Clinical Studies w/ 38 and 79 volunteers	Repeated Measures ANOVA	BEHAVIORAL BIAS Financial anxiety acts like a phobia and people use avoidance as a defense mechanism
Archuleta et al. (2013)	Student debt levels and financial anxiety	180 Students	Hierarchical Multiple Regression	DEBT Financial satisfaction, student loan debt, and gender are associated with financial anxiety
Sages et al. (2013)	Financial behaviors and financial anxiety	312 Students	Ordinary Least Squares	DEBT Higher financial anxiety induces negative financial behavior
Grable et al. (2015)	Financial planning intention and financial anxiety	Clinical Study, 20 Individuals	Mann-Whitney U test, Kruskal-Wallis test, MANOVA	FINANCIAL PLANNING Higher financial anxiety and lower physiological arousal reduce financial planning intention
Choi et al. (2016)	Financial situations, debt levels, and financial stress	554 Students	t-test, Ordinary Least Squares, Binary Logistic Regression	DEBT Higher debt levels and negative financial situations increase financial stress

Table 3.1 (Cont.): Literature survey on financial anxiety in chronological order

Article	Subject	Sample	Analysis	Main Findings
Barboza et al. (2017)	Credit card repayment behavior, financial literacy, and financial anxiety	3 Study 402,466,281 Students	Ordered Probit Model	DEBT Being unable to pay credit card debt in full and bad payment habits contribute to higher financial anxiety levels BEHAVIORAL BIAS Higher surprise levels toward credit card balances and frequent overspending have a positive relationship with financial anxiety levels which implies higher present bias and lack of self-control FINANCIAL LITERACY No significant relationship was detected.
Ahn et al. (2018)	Effects of cognitive biases and financial anxiety over credit misuse	1146 Students	Multiple Regression, Moderation Analysis	DEBT Higher financial anxiety induces credit misuse BEHAVIORAL BIAS Higher financial anxiety magnifies the effects of unexpected optimism and financial planning time preference on credit misuse. Financial anxiety amplifies the concerns about present finances
Archuleta et al. (2020)	Financial goal-setting therapy and financial anxiety	Clinical Study 57 Individuals	Paired t-tests, Wilcoxon Signed-Rank test	FINANCIAL PLANNING Financial goal-setting helps to reduce financial anxiety levels.
Kim et al. (2020)	Mediating effects of financial self-efficacy and financial anxiety in depression symptoms	130 Refugees	Mediation Analysis	FINANCIAL PLANNING Financial self-efficacy has an inverse relationship with financial anxiety
Sachin et al. (2021)	Effects of household finances on financial anxiety levels	62 Rural Households	ANOVA	SAVINGS Fewer financial resources and higher debt cause higher financial anxiety levels
Hasler et al. (2021)	Effect of household demographics on financial anxiety	19108 Individuals	Multiple Regression	DEBT Debt, income uncertainty, and excessive spending are driving factors of financial anxiety SAVINGS Financially anxious people are less likely to plan for retirement
Talwar et al. (2021)	Retail investors' trading activity and financial anxiety	404 Retail Investors	ANOVA, Artificial Neural Network	BEHAVIORAL BIAS Financial anxiety impacts risk aversion during crisis events.

Lange and Byrd (1998) explored the relationship between university students' financial stress, financial strain (negative effects of debt), perception of financial control, and psychological well-being. They identified a literature gap on the relationship between financial stress and the psychological well-being of university students. The motivation of the study was to understand and mitigate the adverse effects of the university students' financial situation. They hypothesized a theoretical model where students' daily and chronic financial strain negatively impacts psychological well-being by impairing their sense of control over financial matters. To test their claims, they conducted a survey study among 237 students. The dependent variables of the study were psychological well-being where they administered questionnaires to assess the levels of anxiety, depression, and overall mental health. Furthermore, they collected information regarding students' age and socioeconomic status to estimate future debt levels after graduation. Also, they administered a questionnaire to evaluate the students' sense of coherence, perception of control over financial matters, self-esteem, daily financial stress, and chronic financial strain which the authors measured to assess the "*participants' perception of their anxiety regarding their financial situation*". They conducted path analyses to identify the relationship between these factors and presented regression results. This pioneering work revealed that high levels of debt are associated with higher chronic financial strain, reduced self-esteem, and decreased sensation of controlling personal finances which leads to greater feelings of anxiety and depression.

In another study, Norvilitis et al. (2003) examined the effects of money attitudes, impulsivity, locus of control, life satisfaction, and stress over credit card debt among college students. They explained that credit card companies are issuing credit cards to college students in an uncontrolled manner which causes significant consumer debt problems that affect a large number of students. They hypothesized that students with higher levels of impulsivity, more external locus of control, lower life satisfaction, and more symptoms of depression and stress have higher levels of credit card debt. To test these claims, they conducted a survey study among 227 students. Students' debt-to-income ratio was the dependent variable of the study which was calculated by using students' annual income and current credit card debts.

As for the independent variables, they administered questionnaires for measuring financial well-being (8 items), money attitudes (34 items), impulsivity (23 items), psychological well-being (19 items), and internal-external locus of control (23 items). They reported that students with higher debt levels become anxious about it; however, the factors leading students to debt remained unclear. A disturbing fact they found is that students who request and obtain credit cards from on-campus vendors reported greater debt levels compared to those who got their credit cards from other sources. They also predicted that students' financial knowledge can also be a factor affecting levels of debt.

Later, Grable and Joo (2006) investigated the relationship between race, credit card debt, financial behaviors, and financial stress. They explained that although there are similar studies investigating the relationship between the aforementioned parameters; there is a literature gap on the effects of racial background. The research aimed to provide evidence on the potential effects of student racial differences in credit card debt, financial behaviors, and financial stress. As a research methodology, they organized financial workshops and counseling sessions where they collected socio-economic demographics (gender, age, class standing, work status, marital status, debt levels) and administered a questionnaire to measure individual financial behaviors (9 items) and financial stress (1 item). The total number of participants was 110 students who attended the workshops and 53% of the sample was African-American. Three analyses were conducted. First, a t-test for evaluating the effect of racial background on credit card debt level was performed, then; two ordinary least squares regression analyses for estimating the effects of racial background on financial behaviors and financial stress have been performed. Racial background was the dependent variable of the first analysis where credit card debt was the independent variable. The dependent variables of the other two analyses were financial behaviors and financial stress where racial background and other collected socio-economic demographics were the independent variables. The results showed that credit card debt levels have a statistically significant positive relationship with negative financial behaviors and financial stress where African-American students reported higher levels of financial stress.

Gambetti and Giusberti (2012) investigated how people's dispositional tendency to engage in specific emotions such as anger or anxiety affects their financial decision-making. The purpose of the study was to investigate the relationship between personality traits and real-life investment decisions where the authors identified a literature gap. Gambetti and Giusberti (2012) hypothesized that anger predicts risky decision-making; whereas, anxiety predicts conservative financial decision-making. To test their hypotheses, researchers conducted a survey study among 214 employed individuals. They collected demographic information on gender, age, marital status, employment status, education level, and household income. Two questionnaires were used to evaluate anger (10 items) and trait anxiety (20 items). Lastly, they administered an investment questionnaire consisting of two sections where the first section evaluates the participants' investment perceptions (6 items) and the second section evaluates the participants' investment decisions (3 items). To analyze their results, they conducted a hierarchical multiple linear regression analysis where the dependent variables of the study were investment perceptions and investment decisions. In the study, the key finding of our interest was that trait anxiety was associated with not to invest savings where people with higher levels of trait anxiety prefer current accounts and/or deposit books. The authors explained that trait anxiety is associated with a proneness to avoid risk-taking and a selective attentional bias towards threatening stimuli, and a low sense of personal control over a situation.

Previous research indicates that financial anxiety has direct consequences on human psychology as well. Shapiro and Burchell (2012) conducted two exploratory studies to evaluate the measurement of financial anxiety. In both studies, participants are asked to fill out a 12-item financial anxiety questionnaire on a 4-point Likert-type scale. In the first study with 38 volunteers, they utilized the Emotional Stroop Test which is a commonly used method to demonstrate attentional biases in a wide spectrum of psychological disorders. In the Emotional Stroop Test, certain words are shown to subjects with colors, and subjects are shown to have slower response times when identifying the colors for the words that emotionally disturb them (Williams et al., 1996). Shapiro and Burchell (2012) hypothesized that levels of financial anxiety

would increase the participants' reaction times in the Emotional Stroop Test for the financially loaded words. The results of the t-test revealed that people with higher levels of financial anxiety displayed a reaction latency which implies a subconscious bias toward the processing of financially loaded words. In the second study with 79 volunteers, the Dot-Probe Paradigm test was used. It was developed by MacLeod et al. (1986). In Shapiro and Burchell's (2012) Dot-Probe Paradigm test participants were asked to stare at a fixed dot on a computer screen; two financially loaded words were shown on the screen for 500 milliseconds. Then, these two words disappeared and a dot replaced the position of one of the two words shown. The difference in reaction times when financially loaded words were replaced with the dot indicates either avoidance or attentional capture of the words perceived as a threat. The selected financially loaded words were classified as positive words like "Bonus", negative words like "Debt", or neutral words like "Finance". The full list of words used as stimuli was provided in the article. Also, participants completed Spielberger's State-Trait Anxiety Inventory and the Center for Epidemiologic Studies Depression Scale on a 4-point Likert-type scale for the assessment of anxiety and mood respectively. A repeated measures ANOVA was used to assess significant differences in reaction times during the Dot-Probe Paradigm test. Results revealed that people who reported higher financial anxiety displayed greater reaction latencies. Shapiro and Burchell (2012) explained that financial anxiety behaves like phobia where people attempt to reduce their anxiousness by avoiding the fear-relevant stimuli.

Archuleta et al. (2013) conducted an exploratory study to understand the potential associations of financial anxiety with the main focus on debt levels. The motivation of the study was to expand the literature on students' financial anxiety as an aspect of financial mental health. In short, their major hypotheses were as follows: Financial satisfaction has a negative association with financial anxiety; total debt, student loan debt, and other debt levels are positively associated with financial anxiety; financial knowledge is negatively associated with financial anxiety; females experience higher levels of financial anxiety; and, income is negatively associated with financial anxiety. To test these hypotheses, a survey among 180 students was

conducted. A 7-item Financial Anxiety Scale where respondents are asked on a 7-point Likert-type scale was developed to estimate financial anxiety levels. As for the independent variables, the authors collected information regarding gross income, marital status, age, gender, ethnicity, student loans, and other debt. The total debt levels were calculated as the sum of student loan debt and other debt. To estimate financial satisfaction and financial knowledge levels, participants responded to two questions “*How satisfied are you with your overall financial situation?*” and “*How would you rate your financial knowledge level?*” on a scale of 1 (lowest) to 10 (highest) respectively. Reliability analysis on the Financial Anxiety Scale has been performed and a high internal consistency was reported. Then, they conducted two hierarchical multiple regression analyses to explore the relationship between financial anxiety levels and the independent variables being demographics, debt levels, financial knowledge, and financial satisfaction. The results of the final model revealed that financial satisfaction, student loan debt, and gender are associated with financial anxiety.

Sages et al. (2013) investigated the relationship between financial anxiety and personal financial management decisions. They hypothesized that background characteristics, resource availability (income, debt level, net worth), financial knowledge (subjective and objective financial literacy), and financial anxiety significantly influence financial behaviors. They conducted a survey study among 312 students who sought assistance from the campus financial counseling center of a large mid-western university in the US. The dependent variable of the study was the prevalence of six financial behaviors where participants are asked on a 5-point scale. As for the independent variables, they collected the following socio-economic demographic information regarding gender, race, monthly gross income, credit card debt, student loan debt, and perceived net worth information. The subjective financial literacy score was obtained using a single question on a 10-point scale asking “*How knowledgeable do you think you are about personal finances compared to others?*”. The objective financial literacy score was estimated using True/False finance questions about annual credit reports, insurance premiums, annuities, mutual funds, pension plans, and returns of stocks and bonds. The anxiety score was

calculated by adding the scores of a 7-item questionnaire on a 7-point scale where respondents are asked about their general anxiety levels, difficulty sleeping, ability to concentrate, level of irritability, difficulty of controlling worries, muscle tension, and fatigue due to financial situation. They conducted an ordinary least squares regression analysis for each of the six financial behaviors. Their results identified that financial anxiety amplifies negative financial behaviors such as spending beyond earnings, difficulty in paying bills due to insufficient funds, and reaching the maximum limits on owned credit cards.

Grable et al. (2015) conducted a clinical study to explore the extent of financial anxiety and physiological arousal over financial planning intention. They explained that understanding financial anxiety and physiological arousal play an important role in shaping consumer intentions of future financial planning activity. The study hypothesized that financial anxiety and physiological arousal are predictors of the likelihood and level of financial planning intention. To test the hypotheses, the authors performed a clinical study with 20 individuals. The dependent variable of the study was the financial planning intention where participants are asked a single question on a scale of 1 (very unlikely) to 10 (absolutely certain) that states: *“If an opportunity arose to meet with a financial planner, how likely is that you would be willing to set up an appointment to meet with a financial planner?”*. As for the independent variables, participants were asked to complete a questionnaire to assess financial anxiety, wealth, risk tolerance, and financial knowledge. Levels of financial anxiety were measured by a single question on a 10-point scale asking their current perceived financial anxiety. After the questionnaire, participants were relocated to clinical rooms. Participants were connected to physiological assessment devices that measure peripheral skin temperatures and interview sessions with clinic staff have been performed. During the analysis, the likelihood of financial planning compared to financial anxiety and physiological arousal levels were tested using a non-parametric test namely the Mann-Whitney U test. Then, participants are classified into four (2-by-2) categories: Low anxiety/low arousal, high anxiety/low arousal, low anxiety/high arousal, and high anxiety/high arousal. Then, the non-parametric Kruskal-Wallis test and multivariate analysis of variance (MANOVA) test were used

to explore the relationship between these four groups and financial planning intention. Results showed that financial anxiety levels have a negative relationship with financial planning intention where the low anxiety/high physiological arousal group has the highest, and the high anxiety/low arousal group has the lowest financial planning intention scores.

In a more recent study, Choi et al. (2016) examined financial stress among college students. The purpose of the study was to evaluate how various financial situations affect the financial counseling needs of students. The researchers posited the following questions: *“What are the financial situations that clients face when seeking counseling?”*, *“To what extent are different financial situations associated with financial stress?”*, and *“What are the roles of sociodemographic factors in predicting financial situation and financial stress?”*. To answer these questions, they conducted a survey study among 554 college students/clients who visited a Midwestern university-based financial counseling center for the first time between the years 2005 and 2012 in the US. Sociodemographics for age, gender, marital status, race, education level, employment, student loans, other debt, investments, and counseling preferences were collected. Next, participants were asked to fill out a 9-item questionnaire where they responded with “yes” or “no” for predetermined financial situations such as “no saving or spending plan” or “overspending”. For financial stress levels, participants were asked from 1-to-10, “how would you rank your current level of financial stress?” where 1 is the lowest and 10 is the highest. A t-test was utilized to find statistically significant differences between financial stress levels and each one of the financial situations. Then, an ordinary least squares regression and a binary logistic regression analysis were performed to explore the effects of sociodemographics on financial stress levels and the prevalence of financial situations respectively. The key results of interest were that the number of financial situations was a powerful predictor of financial stress, and students with higher levels of debt reported higher financial stress.

Barboza et al. (2017) studied the determinants of financial anxiety and the role of anxiety on consumers’ credit card repayment habits. The study aimed to contribute to the literature on three main topics: financial anxiety and its effects on credit card

repayments, how consumption behavior catalyzes financial anxiety, and the effects of transgenerational financial knowledge in the credit card markets. A survey was administered to three groups of students consisting of 402, 466, and 281 students enrolled in US universities. Demographic information regarding age, gender, race, and academic status was collected. Certain credit card repayment behavior parameters were collected such as levels of anxiety during repayment, frequency of payments, number of missed payments in a year, whether parents pay for the credit card or not, surprise levels at the end of the billing cycle, how often they make overspending and number of credit cards. Furthermore, participants completed a financial literacy and parental financial education questionnaire that consists of 5 items and 7 items respectively. The authors posited that individuals who can pay their credit card debts in full, who receive financial support from their families, who are less surprised when checking their balances, who overspend less, and who have higher levels of financial literacy should demonstrate lower levels of financial anxiety. Of particular interest, Barboza et al. (2017) stated that the level of surprise when checking credit card bills and how frequently overspending occurs demonstrates the levels of present bias, impatience, and self-control issues. During the analysis, a theoretical model was derived using an Ordered Probit Model. The results revealed that although a higher financial knowledge is preferable it does not translate into less financial anxiety regarding credit card payments. Also, students who were more surprised regarding their credit card balances and who overspent more frequently reported higher levels of financial anxiety which implies higher levels of present bias, and a lack of self-control where authors commented that these issues have a connection to poor mental accounting. Finally, being unable to pay credit card debts in full and inefficient payment habits were found to be positively correlated with higher levels of financial anxiety due to being unable to fulfill financial obligations.

Ahn et al. (2018) investigated the effects of certain cognitive biases (i.e. time preference, goal attainment expectation, unrealistic optimism, and overconfidence) and financial anxiety on credit misuse among college students. The authors hypothesized that the students who demonstrate the aforementioned cognitive biases

and students with higher financial anxiety will engage in more credit misuse. Moreover, they posited that there would be an interaction between cognitive bias factors and financial anxiety levels where the relationship between cognitive bias factors and credit misuse will be stronger with higher financial anxiety levels. A survey study among 1146 fourth-year college students was performed. Financial anxiety was measured by questions on a scale from 1 (never) to 5 (daily) asking how frequently they experienced certain concerns (e.g. “worry that you won’t get a good job in the future”, “worry that you may not have enough money to pay for things”). Credit misuse was assessed by questions on a scale from 1 (never) to 5 (very often) asking whether they took a cash advance by credit, whether they used payday loan service, whether they maxed out their credit card limits, and whether they paid credit card bills on time each month. Time preference of financial planning was assessed by asking the students what time period from 1 (next month) to 6 (longer than 10 years), they believed was most appropriate when planning their finances. Authors noted that these responses are reverse coded so that higher scores represent present bias and lower scores represent future bias. Goal attainment expectation was evaluated by asking the students when they thought they would achieve financial independence on a scale from 1 (within 5 years) to 5 (not likely to achieve). Unrealistic optimism was estimated by asking the students how much they expect to earn five years after graduation in a range from \$17,000 to \$1,000,000. Overconfidence levels were calculated as the difference between subjective and objective financial literacy. Subjective financial literacy was assessed by asking the students to which degree they understand seven financial concepts like interpreting credit reports and the return rate of saving bonds. Objective financial literacy was measured by utilizing 15 True/False questions related to money management, credit, and savings. Ahn et al. (2018) conducted a hierarchical multiple regression analysis and a moderator analysis to model the relationship between credit misuse, cognitive biases, and financial anxiety. The authors confirmed a statistically significant positive relationship between credit misuse and cognitive biases of goal attainment expectation, unrealistic optimism, and overconfidence. Additionally, they found that students with higher financial anxiety engaged in more credit misuse. The results of

the moderator analysis revealed significant interactions between financial anxiety and cognitive bias factors. Specifically, the authors reported that higher financial anxiety amplified the effect of unrealistic optimism on credit misuse while higher financial anxiety was associated with shorter time preferences i.e present bias. Ahn et al. (2018) explain that this could be a result of financial anxiety magnifying concerns about present finances. Another explanation they provided was that people with higher financial anxiety may feel insecure or uncertain about their future, resulting in a present-time preference during financial decision-making.

In another exploratory study, Archuleta et al. (2020) investigated whether financial goal-setting therapy by utilizing Solution-Focused Financial Therapy (SFFT) can help professionals interact with clients to create change and improve well-being. The main research objective was to discover whether or not financial anxiety levels could be reduced after clients participated in a brief SFFT financial goal-setting session. The main hypotheses of the study were that there would be a significant difference between pre-measures and post-measures of financial anxiety components and overall financial anxiety levels after attending an SFFT goal-setting session. A clinical study was performed among 57 individuals. The data was collected between 2010 and 2016 at a financial clinic at a Midwestern university in the US. To measure financial anxiety levels, a questionnaire consisting of 5 items of the Financial Anxiety Scale (Archuleta et al., 2013) was utilized. During the financial goal-setting sessions, participants are questioned about their best hopes for their financial future; what they were already doing for achieving these goals; and, what small steps they were planning to immediately take to achieve these goals. These questions were aimed to help clients visualize their financial goals and identify ways clients can use to work towards achieving them. Paired t-tests using Wilcoxon Signed-Rank Test were performed to analyze the significance of the statistical difference between pre- and post-measures of financial anxiety. They reported statistically significant reductions in financial anxiety levels after SFFT financial goal-setting sessions.

Moreover, Kim et al. (2019) studied the post-resettlement challenges among African refugees in the southern US; specifically, they investigated the relationship

between financial self-efficacy and financial anxiety. Kim et al. (2019) described financial self-efficacy as “*the capacity to make sound financial decisions for financial well-being*”. In the study, researchers posited that financial anxiety and financial self-efficacy mediate financial stress and depression symptoms whereas financial self-efficacy is negatively associated with financial anxiety. To test these claims, the authors performed a survey study among 130 African refugees. They have collected sociodemographics regarding age, gender, length of stay in the US, country of origin, marital status, education level, and employment status. The dependent variables of the study were the symptoms of depression which were measured by the Patient Health Questionnaire-9 scale (Kroenke et al., 2001) using a 4-point Likert-type scale where scores of 5, 10, 15, and 20 indicate mild, moderate, moderately severe, and severe depression respectively. The mediating variables of the study were financial anxiety levels which were measured by Financial Anxiety Scale (Archuleta et al., 2013) on a 4-point Likert-type scale, and financial self-efficacy levels which were measured by Financial Self-efficacy Scale (Dietz et al., 2003) on 4-point Likert-type scale. Financial stress was the independent variable of the study and was measured by a short version of the Financial Stress Scale (Heckman et al., 2014) on a 4-point Likert-type scale. Length of stay in the US and education levels were the control variables. A mediation analysis was performed and a theoretical model was developed for the relationship between financial stress and symptoms of depression where financial self-efficacy and financial anxiety were the mediating factors. Results showed that financial stress was negatively associated with financial self-efficacy and positively associated with financial anxiety. Also, financial self-efficacy was shown to be negatively associated with depression and financial anxiety which implies that financial anxiety impairs the ability to make sound financial decisions. Finally, financial self-efficacy and financial anxiety were significant parameters for symptoms of depression.

Sachin et al. (2021) investigated financial anxiety among low-income households. The authors explained that low-income households lack access to even basic financial services like owning a bank account in India and poverty produces pressure on the families which leads to financial anxiety. Therefore, the objective of

the study was to assess the effects of sociodemographic conditions on financial anxiety. A survey was conducted among 62 rural poor households and the Financial Anxiety Scale (Archuleta et al., 2013) was used to assess financial anxiety levels. The socio-demographics and household financial information regarding income, expenditure, savings, and loan amounts were collected. Analysis of variance (ANOVA) was conducted to assess the statistical significance. Authors reported that higher levels of financial anxiety correlate with higher levels of debt, fewer assets, and fewer financial resources; because, these households lack the financial resources to protect themselves in case of an emergency.

Hasler, Lusardi, and Valdes (2021) prepared a report on financial anxiety and stress among US households for the FINRA Investor Education Foundation. The purpose of the report was to show that even before the COVID-19 pandemic a significant portion of US households was facing anxiety and stress due to financial matters. A survey study has been conducted among 19108 participants. Dependent variables of the study were financial anxiety and stress levels which were measured by single questions of “*Thinking about my personal finances can make me feel anxious*” and “*Discussing my finances can make my heart race or make me feel stressed.*” on a 7-point Likert-type scale were used respectively. Sociodemographic information regarding household income, age, education level, gender, race, marital status, financially dependent children, employment status, and financial literacy were collected. A multiple linear regression analysis was conducted to assess the relationship between sociodemographics and individual levels of financial anxiety and financial stress. The authors reported that people who are financially stressed and financially anxious have less inclination toward planning for retirement. The results also revealed that income uncertainty, excessive expenses/monthly bills, and debt are significant driving factors of financial anxiety and financial stress.

Talwar et al. (2021) studied how financial attitude affects the financial behavior of retail investors. Specifically, Talwar et al. (2021) examined the effects of financial anxiety, optimism, financial security, deliberative thinking, interest in financial issues, and the need for precautionary savings on the trading activity of retail investors during the COVID-19 pandemic period. The dependent variable of

the study was the trading activity of the retail investors and the aforementioned aspects of the financial attitude were the independent variables. Financial anxiety was assessed by a 4-item questionnaire; financial security, optimism, and trading activity were measured by a 3-item questionnaire; and, deliberate thinking, interest in financial issues, and needs for precautionary savings were measured by a 2-item questionnaire where all questionnaires were responded on a 5-point Likert-type scale. Data is collected from 404 retail investors in India. The significance of relationship between independent and dependent variables were tested using an ANOVA. Then, an artificial neural network was used to model the relationship among them. Of particular interest, The authors reported that although not dominantly, financial anxiety has an influence over the trading activities of retail investors. They theorized that financial anxiety impacts the risk aversion during extraordinary events where financially anxious investors trade more during the crisis events.

3.1.1 Summary of Literature Survey on Financial Anxiety

Table 3.2 outlines the study parameters that were found to have a statistically significant relationship with financial anxiety. Considering the adverse effects of financial anxiety on financial decision-making, the literature survey indicates that parameters related to higher debt levels, fewer savings, and poor financial planning behavior were associated with higher financial anxiety levels. Gambetti & Giusberti's (2012) results showed that general anxiety was associated with more conservative financial decision-making and a preference to hold savings in current accounts; where the authors explain that individuals with general anxiety avoid risk-taking, and display an attentional bias toward distressing situations. Lastly, financial anxiety literature provided evidence that people with financial anxiety display behavioral biases more frequently.

Table 3.2: Literature survey on the parameters having a statistically significant relationship with financial anxiety.

Parameter	(+) Literature Finding Positive Relationship	(-) Literature Finding Negative Relationship
Debt	Hasler et al. (2021), Ahn et al. (2018), Barboza et al. (2017), Choi et al. (2016), Sages et al. (2013), Archuleta et al. (2013), Grable & Joo (2006), Norvilitis et al. (2003), Lange & Byrd (1998)	-
Savings	<i>General Anxiety</i> Gambetti & Giusberti (2012)	Hasler et al. (2021), Sachin et al. (2021)
Financial Planning	-	Archuleta et al. (2020), Grable et al. (2015) <i>Financial Self-Efficacy</i> Kim et al. (2020)
Susceptibility to Behavioral Biases	Talwar et al. (2021), Ahn et al. (2018), Barboza et al. (2017), Shapiro & Burchell (2012), Gambetti & Giusberti (2012)	-

3.2 Literature Survey on Financial Literacy

By definition, financial literacy is “*peoples’ ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions*” (Lusardi & Mitchell, 2014). In the literature, the term financial literacy is often used interchangeably with another term, financial knowledge (Huston, 2010). Today, financial literacy is of growing relevance where a person’s financial literacy is a significant factor in understanding economic or financial behavior (Aren & Aydemir Dinç, 2015). Previous studies show that financial literacy has a negative relationship with making suboptimal personal finance decisions such as risky credit behavior, missing credit payments, and the use of payday loans (Liu & Zhang, 2021; Balasubramnian & Sargent, 2020; K. T. Kim & Lee, 2018). On the other hand, financial literacy has a positive relationship with beneficial financial decision-making such as higher stock market participation (Arrondel et al., 2015), seeking financial help from professionals (Gaudecker, 2015), and having more savings which helps them deal with macroeconomic shocks (Klapper et al., 2013).

In financial literacy literature, there is a common distinction between objective financial literacy and subjective financial literacy. Objective financial literacy is to what extent the person knows about financial matters; whereas, subjective financial literacy is the people’s self-perception of how financially literate they are (Nejad & Javid, 2018). Nejad and Javid (2018) explain that people’s beliefs about whether they can make good financial decisions affect how they make their decisions and how they perceive the corresponding risks.

Lusardi and Mitchell (2011) denoted that financial literacy around the globe is very low and it has no correlation with the development of financial markets in those countries. Nonetheless, Hung et al. (2009) present evidence that certain demographic factors like higher education and income are predictors of higher financial literacy. Table 3.3 chronologically outlines the studies covered in the literature survey on financial literacy.

Table 3.3: Literature survey on financial literacy in chronological order

Article	Subject	Sample	Analysis	Main Findings
Hilgert et al. (2003)	Financial behaviors and financial literacy	1004 Individuals	Logistic Regression	SAVINGS Higher financial literacy improves individual saving behavior FINANCIAL PLANNING Higher financial literacy improves credit and investment management behavior
Diacon (2004)	Comparison of risk perceptions between financial experts and non-expert savers	123 Individual savers, 41 financial experts	One-way ANOVA	BEHAVIORAL BIAS Expert financial advisers perceive lower risks in financial products and are prone to affiliation bias
Dhar and Zhu (2006)	Individual differences in disposition effect	Trading records and demographics of 7965 investors	Multiple Regression	BEHAVIORAL BIAS Investors who have higher incomes and complex occupations (technical/managerial) display less disposition effect due to supposedly higher financial literacy.
Lusardi and Mitchell (2007)	Comparison of financial planning and wealth distributions of early boomers in 2004 and individuals in the same age group in 1992. The effects of financial/political literacy on financial planning	4580 Individuals from (1992) 2635 Early baby boomers from (2004)	Probit Model, Ordinary Least Squares, Median Regression	FINANCIAL PLANNING Individuals who have higher financial/political literacy are more likely to plan for their retirements which leads to more wealth accumulation for the retirement
Howlett et al. (2008)	Effects of self-regulatory state, financial knowledge, and future orientation on retirement planning and attitudes of risky investments	89 Students	Multivariate and Univariate ANOVA	FINANCIAL PLANNING Individuals who have basic financial knowledge and higher future orientation are more likely to contribute to 401(k) retirement plans and have less favorable attitudes toward risky investments.
Lusardi & Mitchell (2008)	Effect of financial literacy in retirement planning among women	785 Women	Multivariate Regression	FINANCIAL PLANNING Women who possess higher levels of financial literacy tend to have better financial planning attitudes toward their retirement.

Table 3.3 (Cont.): Literature survey on financial literacy in chronological order

Article	Subject	Sample	Analysis	Main Findings
Wang (2009)	Effects of gender, subjective and objective financial knowledge in risk-taking during mutual fund investments	524 Investors	MANCOVA, Multiple Regression	BEHAVIORAL BIAS Subjective financial knowledge has a positive relationship with risk-taking in mutual fund investments where the author argues investors could be displaying overconfidence. No significant relationship was found between objective financial knowledge and risk-taking.
Sabri and MacDonald (2010)	Effect of financial literacy on savings behavior and financial problems	2519 Students	ANOVA	SAVINGS Higher financial literacy was associated with favorable savings behavior among students. FINANCIAL PLANNING Students who have lesser financial literacy reported greater financial problems
Wang et al. (2011)	The relationship between investors' financial knowledge and their risk perceptions on financial products	558 Investors	MANCOVA	BEHAVIORAL BIAS Investors who have higher subjective financial knowledge may underestimate the associated risks of financial products and vice versa.
Gathergood (2012)	Effects of self-control and financial literacy in household over-indebtedness	1234 Households	Probit Model	DEBT Lower financial literacy and self-control problems are associated with higher household over-indebtedness

Table 3.3 (Cont.): Literature survey on financial literacy in chronological order

Article	Subject	Sample	Analysis	Main Findings
van Rooij et al. (2012)	Effect of financial literacy on household net worth	1091 Households	Ordinary Least Squares, Multiple Regression	SAVINGS Financially literate households (especially those with advanced financial literacy) accumulate significantly more wealth. FINANCIAL PLANNING Households with higher financial literacy possess a wide variety of financial products and more diversified portfolios compared to households with lower financial literacy
Babiarz and Robb (2014)	Effect of objective and subjective financial knowledge on emergency savings	25765 Individuals	Probit Model	SAVINGS Both objective and subjective financial knowledge levels have a statistically significant positive relationship with the likelihood of having 3 months' worth of emergency savings.
Lusardi and Tufano (2015)	Implications of debt literacy and subjective financial literacy on overindebtedness	1000 Individuals	Multinomial Logit Analysis	DEBT Higher debt literacy and subjective financial literacy positively affect debt management behavior.
Ateş et al. (2016)	Effect of financial literacy on behavioral biases	596 Investors	Multiple Regression	BEHAVIORAL BIAS Financial literacy induces over-optimism, confirmation, and representativeness while hindering overconfidence, cognitive dissonance, framing, and loss aversion biases.
Mudzingiri et al. (2018)	Implications of objective financial literacy over subjective financial literacy, financial behavior, confidence, time preferences, and risk preferences.	191 Students	t-test, Ordinary Least Squares	BEHAVIORAL BIAS Lower financial literacy is associated with more risk-seeking, more overconfident, and more impatient financial behavior.

Table 3.3 (Cont.): Literature survey on financial literacy in chronological order

Article	Subject	Sample	Analysis	Main Findings
Ottaviani and Vandone (2018)	Effects of financial literacy and impulsivity on debt levels	445 Individuals	Hierarchical Regression, Mediation Analysis	DEBT Financial literacy and impulsivity are positively associated with debt levels. However, the effect of financial literacy diminishes when both factors are considered simultaneously
Skagerlund et al. (2018)	Effects of financial anxiety, mathematics anxiety, self-efficacy, cognitive reflection, and numeracy on financial literacy levels	2063 Individuals	Ordinary Least Squares	FINANCIAL ANXIETY Financial anxiety has a statistically significant negative relationship with financial literacy levels.
Artavanis and Karra (2020)	Effect of financial literacy on students' expected salaries after graduation and their ability to pay student debt.	1040 Students	Logistic Regression, Ordinary Least Squares	DEBT Students with lower financial literacy reported lower expected salaries after graduation and they significantly underestimated the financial burden of their loan payments which were estimated by payment-to-income ratios.
Balasubramnian & Sargent (2020)	Implications of subjective financial literacy and the difference between subjective and objective financial literacy on consumer financial behavior	27564 Individuals	Multiple Regression	FINANCIAL PLANNING Higher levels of subjective financial literacy are associated with stronger consumer financial behavior BEHAVIORAL BIAS Individuals who have higher subjective literacy and significantly lower objective financial literacy demonstrate illusion-of-control bias which leads to sub-optimal consumer financial behavior.

Table 3.3 (Cont.): Literature survey on financial literacy in chronological order

Article	Subject	Sample	Analysis	Main Findings
Potter et al. (2020)	Predictors of financial anxiety among college students	3339 Students	t-test, Ordinary Least Squares	FINANCIAL ANXIETY Subjective financial literacy has a positive relationship with students' financial anxiety levels. One explanation was that higher subjective financial literacy leads to heightened awareness of the financial position that triggers financial anxiety.
Lind et al. (2020)	Effects of subjective and objective financial knowledge in financial anxiety and financial behavior	2063 Individuals	Ordinary Least Squares	FINANCIAL PLANNING Subjective and objective financial knowledge has a positive relationship with sound financial behavior. FINANCIAL ANXIETY Subjective and objective financial knowledge has a negative relationship with financial anxiety levels.
Celiktas and Yilmaz (2021)	Effect of financial literacy on money illusion bias	236 Students	Multiple Regression	BEHAVIORAL BIAS People with higher financial literacy exhibit lesser money illusion tendencies. Students with higher subjective financial literacy displayed lower scores on objective financial knowledge measures implying overconfidence.
Tinghög et al. (2021)	Mediating factors of the gender gap in financial literacy levels	4 Studies among (40662), (1989), (1989), and (2063) individuals	Mediation Analysis	FINANCIAL ANXIETY Financial anxiety has a significant negative relationship with financial literacy levels regardless of gender.

Hilgert et al. (2003) explored the relationship between financial knowledge and financial behavior in terms of what consumers know and what they do regarding their financial management activities: Cash-flow management, credit management, saving, and investment. The analysis was conducted by using the University of Michigan's monthly Surveys of Consumers data consisting of 1004 survey responses which were collected between the November 2001 – December 2001 period. The survey collected information regarding the individuals' financial practices, their financial knowledge, and their learning experiences. The authors categorized the collected financial practices information as cash-flow management, credit management, saving, investment, and other financial experience and calculated index scores for each respondent. Then, these scores classified under three brackets being “high”, “medium”, and “low”. The study utilized the financial knowledge component of the University of Michigan's Surveys of Consumers which consists of 28 True/False type questions covering cash-flow management, general credit management, saving, investment, mortgages, and other financial-management topics. Respondents were asked about where did they learn about financial topics; the most important way learned about personal finance; and, effective ways to learn to manage money with multiple options such as “personal finance experience”, “friends and family”, “media”, “internet”, and so on. Logistic regression analyses were used to examine the relationship between financial knowledge scores and each of the financial behavior index scores. Hilgert et al. (2003) reported positive, statistically significant relationships between financial knowledge scores on the corresponding financial behavior categories (e.g. financial knowledge on saving vs. savings behavior) except for cash-flow management. The results indicated that increases in financial knowledge lead to improvements in financial practices.

Diacon (2004) conducted a comparative study on the investment risk perceptions of expert financial advisers and consumers. The author hypothesized that there would be a significant difference between the risk perceptions of financial experts and average consumers. Diacon (2004) explained that this is a crucial aspect of financial markets where regulatory authorities determine how investment products should be marketed and the amount of information and advice that needs to be

provided for different products. Characteristics of perceived risk and the extent of risk perceptions were measured by a questionnaire administered to 123 UK individual savers and 41 expert financial advisers between 1997 and 1999. The first sociodemographic information regarding the participants' age, gender, children, homeownership, pension status, employment, retirement status, and the number of financial products they have was collected. To assess the risk perceptions, Participants were given a 27-item questionnaire on a 7-point scale for each of the financial products they possessed ranging between five to nine products. The results of one-way ANOVA revealed that for the vast majority of the items on the risk perceptions questionnaire, expert financial advisers reported significantly lower average scores indicating that experts perceive these financial products to be less risky than non-expert individuals implying lesser loss aversion. Diacon (2004) explained that the specific responses to risk-related questions revealed that experts may be prone to affiliation bias which he defined as "*trusting the services and salesmen more than lay investors do*"; also, expert financial advisers believe that financial products are less complex, and they trust more to the advice and protection given by the regulators.

Dhar and Zhu (2006) examined the trading records of a brokerage house to investigate the disposition effect which they defined as "*the tendency to sell stocks that appreciated in price sooner than stocks that trade below the purchase price*". The main objective of the study was to identify the individual differences in disposition effect and explain the underlying factors causing them. They hypothesized that investors' financial literacy and trading frequency can predict the individual disposition effect. More specifically, they posited that trading frequency has a negative relationship with the individual disposition effect. Also, individuals with higher incomes who work in complex occupations like technical/managerial/administrative (which they coded as 'professional') would display a smaller disposition effect. They explained that certain occupations are more likely to correspond to a higher level of education and consequently, higher financial literacy. The data was collected from the trading records of a large brokerage company between 1991 and 1996. The data included the investors' demographic

information regarding age, gender, income level, profession, and residential location. The magnitude of the disposition effect was calculated as the difference between the proportions of gains realized and the proportions of losses realized based on observations on trading records. The authors noted that they excluded December trading data from analyses due to tax-selling considerations. A multiple regression analysis was performed to model the relationship between the magnitude of the disposition effect, trading frequency, and investor demographics. Dhar and Zhu (2006) reported statistically significant results that indicate higher trading frequency has a negative relationship with the magnitude of the disposition effect. Moreover, they showed that investors who have ‘professional’ occupations with higher incomes demonstrate lesser individual disposition effects.

Lusardi and Mitchell (2007) conducted a comparative study on the financial planning habits of the baby boomer generation with survey data collected in 1992 and 2004. The main research questions of the study as follows: (1) What do their wealth level and wealth composition tell about baby boomers’ financial position compared to their prior cohorts; (2) Are financially literate and sophisticated individuals are more likely to plan for retirement; and, (3) How financial planning affects wealth accumulation. The authors analyzed the data collected from a US national study namely Health and Retirement Study that represents Americans over the age of 50. Starting from 1992, the survey has been administered every 2 years. The analyzed data were collected from 2635 early baby boomer generation and 4580 earlier cohorts from 1992 wherein both groups, the participants were selected to be between the age of 51 and 56 at the time of the interview. Regarding the wealth information, The authors analyzed respondents’ total net worth, home equity which refers to their net house equity minus the mortgage debt, and non-business-non-housing wealth which they calculated by subtracting house and business equity from respondents’ total net worth. Financial planning intention was assessed by using a module from the Health and Retirement Study that states “*How much have you thought about retirement?*” on a 4-point scale where the answer options were “*A lot*”, “*Some*”, “*A little*”, and “*Hardly at all*”. Financial literacy information was collected for the 1992 early baby boomer participants during the 2004 survey. Early baby

boomers' financial literacy was evaluated using three questions about percentage calculation, lottery division, and compound interest concepts. Participants' political literacy was also measured by using a single question that asks about the current US president and vice president. The authors performed probit, ordinary least squares, and median regression analyses to model the relationship between wealth distributions, financial planning intention, and financial/political literacy. The results revealed that those who reported that they financially planned for their retirements had much higher wealth levels. Furthermore, both financial and political literacy were found to have a statistically significant positive relationship with financial planning intention, and wealth levels even after controlling several sociodemographic factors.

In the following study, Lusardi and Mitchell (2008) investigated the role of financial literacy in women's retirement planning. They utilized the data from the 2004 Health and Retirement Study where 785 women participants' responses were analyzed. Women's financial literacy was evaluated by using a 3-item module that measures financial literacy regarding the concepts of interest rates, inflation, and risk diversification. Then, women's ability to do retirement planning calculations was measured by using another 3-item module that asked about whether they have ever tried to figure out how much they have to save for retirement (yes/no); whether they developed a plan for retirement saving (yes/more or less/no); and, how often were they able to stick to their saving plan (always/mostly/rarely/never). The authors classified the participants into three groups according to their planning attitudes which were simple planners, serious planners, and committed planners. Then, they conducted a multivariate regression analysis to model the relationship between financial literacy and retirement planning. The results showed that financial literacy has a statistically significant positive relationship with financial planning among women.

In another study, Howlett et al. (2008) examined how psychological self-regulatory state, future orientation, and financial knowledge influence consumers' retirement investment decisions. The authors performed an experimental study with

89 fourth-year university students in the US. The experiments were conducted under 8 different conditions: 2 (induced financial knowledge: present/absent) x 2 (self-regulatory focus: high/low) x 2 (future orientation: high/low). One group of subjects was given a text about how 401(k) pension plans operate to induce financial knowledge and others were given a text on an irrelevant topic. The self-regulatory state conditions were shaped by two text-based tasks where one requires a higher self-regulatory focus while the control group's task requires minimal self-regulation. Participants' future orientations were evaluated by utilizing a 12-item measure namely Consideration of Future Consequences (CFC) developed by Strathman et al. (1994) on a 7-point Likert-type scale. Before the analyses, the authors performed a median split onto the results of the CFC measure that divided the participants into two groups with high/low CFC scores. The dependent variables of the study were the likelihood of contributing to a 401(k) retirement plan and the attitude towards risky investments where both dependent variables were assessed by 2-item measures on a 7-point scale. The authors performed multivariate and univariate ANOVA to test the effects of self-regulatory state, future orientation, and financial knowledge on the likelihood of 401(k) contribution and attitude towards risky investments. Howlett et al. (2008) concluded that individuals who possess basic financial knowledge with higher future orientation expressed a higher likelihood of contributing to 401(k) retirement plans and have less-favorable attitudes towards risky investments.

Wang (2009) explored the role of gender and financial knowledge on investors' financial behavior. The study posits the following research questions: (1) Whether gender is a differentiating factor on the levels of subjective/objective financial knowledge, and risk-taking in mutual fund investments; (2) What are the relations among subjective/objective financial knowledge levels and risk-taking in mutual fund investments; (3) Whether investor age income, education, experience, and personal involvement influence subjective/objective financial knowledge levels, and risk-taking in mutual fund investments. A survey study was administered to 524 participants from a wide range of groups whose members specialized in finance and investing between the period February 2007 – April 2007. The study measured three dependent variables. Subjective financial knowledge was measured by using a 3-item

questionnaire asking respondents about their knowledge of investing in mutual funds, their familiarity with investing in mutual funds, and their understanding about which financial characteristics are important when investing in mutual funds. Objective financial knowledge, on the other hand, was measured by utilizing a 37-item questionnaire composed of 27 True/False, and 10 multiple-choice questions. Wang (2009) analyzed the data by performing a multivariate analysis of covariance (MANCOVA) and multiple regression. Results revealed that male investors had higher subjective and objective financial knowledge levels compared to their female counterparts. Wang (2009) reported that higher objective financial knowledge improved subjective financial knowledge levels. However, the results of multiple regression analysis showed that although higher subjective financial knowledge induces risk-taking behavior, the effect of objective financial knowledge on risk-taking was found to be insignificant. Wang (2009) argues that investors who consider themselves unfamiliar with investing in mutual funds may find taking risks undesirable; whereas investors with higher subjective financial knowledge may be overconfident in taking risks.

Sabri and MacDonald (2010) investigated the relationship between financial literacy, financial problems, and savings behavior among 11 colleges and universities. The authors hypothesized that financial literacy has a positive relationship with effective savings behavior; whereas lower levels of financial literacy are associated with greater financial problems. A survey study was conducted among 2519 students. Demographic information regarding age, ethnicity, place of origin, parents' education level, number of siblings, private or public college, and spending patterns were collected. The dependent variables of the study were savings behavior and financial problems. Savings behavior was measured by a 3-item Yes/No type questionnaire. Also, a 10-item questionnaire on a 5-point Likert-type scale was administered to measure the financial problems experienced by students. The independent variables of the study were childhood consumer experience, financial socialization, and financial literacy. Childhood consumer experience was measured by asking participants when they became involved in financial activities (e.g. receiving an allowance, having a savings account, etc.).

Financial socialization was measured by asking participants how much socialization agents (e.g. parents, peers, siblings, etc.) influenced their financial behaviors on a scale from 0 (no influence) to 11 (high influence). Financial literacy was measured by a 25-item questionnaire on financial concepts like financial records, savings, investments, retirement, banking, time value of money, wills, insurance, education loan, and personal finance. The authors performed ANOVAs and multiple regression analyses to test and model the relationship between independent and dependent variables. The authors noted that before the regression analyses, samples were reduced to 1574 and 1560 cases due to missing data for savings behavior and financial problems respectively. Sabri and MacDonald (2010) reported that students who have higher levels of financial literacy are more inclined toward savings behavior and have lesser financial problems.

Wang et al. (2011) examined how investors' financial knowledge of financial products affects their risk perceptions. A survey study was conducted. After sample reduction, the final survey data consisted of 558 investors' responses collected in the German-speaking part of Switzerland in 2006. Participants were asked to rate 20 investment products on 7 items to measure their risk perceptions on a 5-point scale. Specifically, the first 3 items measured the participants' familiarity with selected financial products including their subjective financial knowledge of them; and, the last 4 items measured the statistical risk perceptions of the same financial products. The authors performed a MANOVA to test the significant difference in perceived risk ratings on the 20 investment products. Wang et al. (2011) reported that knowledge-related questions were highly correlated with overall perceived risk. They argued that perceived financial knowledge of financial products is an important predictor of perceived risk where clients might be prone to overestimate the risk of certain investments due to their lack of knowledge; or, they might be overconfident due to higher subjective financial knowledge and underestimate the associated investment risks.

Gathergood (2012) investigated the relationship between self-control, financial literacy, and credit card over-indebtedness among UK consumers. A survey was administered to 3041 UK households where after sample reductions, 1234

households were utilized as the analysis sample. Demographic information regarding age, gender, marital status, education leaving age, employment status, dependent children status, and homeownership status were collected. Furthermore, participants were asked about their household finances, consumer credit holdings, over-indebtedness indicators, financial planning behavior characteristics, and financial literacy. A probit model was developed to explain the relationship between demographics, financial and behavioral characteristics, and over-indebtedness. Gathergood (2012) reported that financial literacy has a significant negative relationship with the over-indebtedness indicators; however, the results were only significant for those who miss their credit payments for one month. The results showed that higher levels of over-indebtedness are strongly predicted by self-control problems.

van Rooij, Lusardi, and Alessie (2012) explored the effects of financial knowledge on household net worth. The authors explained that the relationship between financial literacy and household financial behavior is important as the individuals' responsibilities for their financial well-being and retirement preparation are growing. A survey study was performed where participants' financial literacy was assessed by using two sets of questions. The first set measured basic financial literacy and the second set measured advanced financial literacy. After sample reductions, the final data was composed of 1091 households' responses. To measure the household net worth, participants reported their private savings, investment accounts, housing wealth, other real estate, durable goods, net of mortgages, and other financial debts. Ordinary least squares and multivariate regression analyses were performed to identify the relationship between the variables. The results revealed that financially literate households possess a variety of financial assets and hold more diversified portfolios. To illustrate, although home ownership is prevalent even in households with low financial literacy, stocks or bonds investments are almost absent in households with low financial literacy. Furthermore, van Rooij, Lusardi, and Alessie (2012) reported that both advanced and basic financial literacy levels have a statistically significant positive relationship with household net worth when regression analyses were conducted individually. However, they noted that the

influence of advanced financial literacy on household net worth is so large that it wipes out the significance of basic financial literacy on a multiple regression analysis. The authors argued that this could be because the basic financial literacy questionnaire targeted simple daily financial skills whereas the advanced financial literacy questionnaire targeted rather complicated financial concepts. In conclusion, the authors confirmed their hypothesis that financial literacy has a strong positive influence on household wealth accumulation.

Babiarz and Robb (2014) examined the correlations between subjective and objective financial knowledge and the probability of having adequate savings to cover 3 months of typical expenses. The authors utilized the 2009 National Financial Capability Survey (NFCS) data which is a multi-dimensional state-by-state survey that measures the US population's financial literacy, demographic, behavioral, and attitudinal characteristics. The working sample of the analysis consisted of 25,765 respondents. The dependent variable of the study was having enough savings to cover 3 months' expenses measured by a single question. The independent variables of the study were objective and subjective financial literacy levels. The objective financial literacy was assessed by 5-item multiple-choice questions about fundamental concepts of compound interest, inflation, bond pricing, mortgage loans, and portfolio diversification. The subjective financial knowledge was measured by a single question asking *"On a scale from 1 to 7, where 1 means very low and 7 mean very high; how would you assess your overall financial knowledge?"*. A series of probit models were developed to explain the interactions between financial knowledge and the reported status of emergency savings. The authors reported that both types of financial knowledge are important predictors of having 3-month emergency savings. Babiarz and Robb (2014) explained that the likelihood of having emergency savings increased with the number of correct responses supplied for the objective financial knowledge questions.

To explore the influence of financial literacy over debt load, Lusardi and Tufano (2015) proposed the concept of debt literacy which they defined as *"a component of broader financial understanding that measures knowledge about debt and self-assessed financial knowledge"*. A survey study was conducted in November

2007 where data is collected via phone interviews from a sample of 1000 US residents. Demographics regarding age, gender, ethnicity, marital status, employment, region of residence, family size, income, and wealth were collected. In addition to a financial literacy module, the authors utilized three new multiple-choice questions to measure the debt literacy of the participants regarding the power of interest compounding, the workings of credit card debt, and their preference for means of payment. Also, participants were asked to assess their subjective financial literacy levels on a 7-point scale. A financial experiences questionnaire was administered to characterize the participants' financial behavior i.e. how they engage in different types of borrowing and lending. The authors hypothesized that certain wealth-depleting financial behaviors should have a negative relationship with financial skills. To measure overindebtedness, participants were asked a single multiple-choice question to describe their debt positions. Multinomial logit analyses were conducted to investigate the relationship between debt literacy, subjective financial literacy, overindebtedness, and demographics. Lusardi and Tufano (2015) showed that individuals who have higher levels of subjective financial literacy mostly reported that they have no problem handling their debt burdens indicating a negative relationship between subjective financial literacy and overindebtedness. The authors also reported similar trends for the relationship between debt literacy and overindebtedness where those with lower debt literacy display difficulties managing their debt levels.

Ateş et al. (2016) surveyed Turkish stock investors' financial literacy and behavioral biases affecting their financial judgments. The research question of the study was "*is there a relationship between a decision maker's financial literacy level and the level of behavioral bias?*". A survey study with three modules was conducted among 596 Turkish Investors. The first module measures the investors' stock investment experience, financial information sources, and investors' self-assessment of their financial literacy, and demographics. The second module measured the investors' objective financial literacy with a 20-item financial knowledge scale. The third and final module measured the investors' tendency of displaying 15 unique behavioral biases with a 30-item questionnaire on a 5-point Likert-type scale. The

dependent variable of the study was the tendency of behavioral biases. The independent variable of the study was financial literacy levels. The collected demographic factors were the control variables. Multiple regression analyses were performed to model the relationship between each of the behavioral biases, financial literacy, and demographic factors. Ateş et al. (2016) found that the level of financial literacy has a statistically significant positive relationship with over-optimism, confirmation, and representativeness biases; while financial literacy has a statistically significant negative relationship with overconfidence, cognitive dissonance, framing, and loss aversion biases. The authors concluded that education and financial literacy alone may not be sufficient enough to eliminate some behavioral biases.

Mudzingiri et al. (2018) investigated the implications of objective financial literacy over subjective financial literacy, financial behavior, confidence, time preferences, and risk preferences. A survey study among 191 students was performed. Research data regarding students' personal information, financial behavior, subjective financial literacy, and objective financial literacy were collected. Students' confidence level was estimated as the difference between subjective and objective financial literacy scores. Students were asked to participate in experimental tasks to measure their risk and time preferences. The authors performed a series of t-tests and an ordinary least squares analysis to model the relationship between financial behavior, financial literacy, and demographics. Mudzingiri et al. (2018) concluded that students with lower financial literacy are associated with more risk-seeking, more overconfident, and more impatient behavior.

Ottaviani and Vandone (2018) examined the relationship between debt burden, financial literacy, and impulsivity. A study of 445 participants among people who are customers of banks, traders, and asset managers was conducted over the course of 2 years. The financial literacy scores were estimated by a 5-item financial literacy questionnaire that evaluates participants' knowledge about financial products, time dedicated to digest financial information, awareness about the returns of financial investments, and the costs of indebtedness. Participants' demographics and economic information were collected. The impulsivity was measured by the Barratt Impulsiveness Scale-11 (Patton et al., 1995) which consists of 30 items on a 4-point

scale. Hierarchical regression and mediation analyses were performed to model the relationship between debt burden, financial literacy, impulsivity, and demographics. Ottaviani and Vandone (2018) reported that poor financial literacy and impulsivity are both positively associated with higher debt. However, the authors noted that when both financial literacy and impulsivity are simultaneously considered, impulsivity is found to be a full mediator of the relationship between financial literacy and debt, eliminating the effect of financial literacy on debt. Ottaviani and Vandone (2018) argued that financial education programs should target non-impulsive individuals or develop effective ways of reducing impulsive behavior.

Skagerlund et al. (2018) explained that although being financially literate is a crucial life skill; interventions to increase the financial literacy of financially illiterate individuals were ineffective. Skagerlund et al. (2018) hypothesize that the relationship between financial literacy and financial behavior could be mediated by an unknown variable such as cognitive ability. Thus, they investigated the role of numeracy (i.e. the ability to process basic numerical concepts) and emotional attitude toward numbers (i.e. mathematics anxiety) over financial literacy. An online survey study was performed among 2063 Swedish adults where they collected demographics concerning age, education, and income. Participants' financial literacy was measured by a 4-item knowledge-based questionnaire where they noted that they adapted these questions from Lusardi and Mitchell (2014) and van Rooij et al. (2012). The levels of financial anxiety were assessed by a 4-item questionnaire on a 5-point Likert-type scale adapted from Fünfgeld and Wang (2009). Furthermore, Skagerlund et al. (2018) administered additional questionnaires to measure the participants' cognitive reflection, numeracy, mathematics anxiety, and self-efficacy. The dependent variable of the analysis was financial literacy. An ordinary least squares analysis was conducted to model the correlations between financial literacy and the independent variables being numeracy, cognitive reflection, self-efficacy, mathematics anxiety, and financial anxiety. The authors reported that financial literacy has a significant negative relationship with both financial anxiety and mathematics anxiety. Furthermore, Skagerlund et al. (2018) showed that numeracy has a critical contribution toward achieving financial literacy.

Artavanis and Karra (2020) examined the financial literacy levels of college students and its implication on student debt repayments. A survey study among 1040 college students was conducted. The financial literacy of the students was measured by a set of questions known as the 'Big Three' in financial literacy literature (Hastings et al., 2013). Demographic information regarding students' age, gender, ethnicity, characteristics, class rank, and major was collected. Furthermore, self-reported information regarding students' debt and students' expected starting salaries were collected. Logistic regression and Ordinary least squares regression analyses were used to model the relationship between financial literacy/expected starting salaries, and financial literacy/students' ability to pay their loans respectively. The authors defined two variables. First, they defined the expected payment-to-income (PTI) which was calculated as the ratio of expected loan payments and expected starting salaries. Second, the actual PTI which was defined as the ratio of annual loan payments calculated from the self-reported loan characteristics and expected starting salaries. The expected and actual PTIs were used to assess the students' expected and actual ability to pay their loans after graduation where higher PTIs indicate a higher financial burden. Later, PTIs and financial literacy levels were used in the ordinary least squares regression analysis. Artavanis and Karra (2020) reported that students with lower financial literacy expected significantly less starting salaries and underestimated their future loan burdens which can impair their ability to repay student debts.

Balasubramnian and Sargent (2020) investigated whether inflated subjective financial literacy affects financial decision-making. The authors hypothesized that larger differences between objective financial literacy and subjective literacy could predict weaker financial decision-making behavior. They utilized the 2015 State-by-State NFCS survey data which provided a sample of 27,564 American adults' responses to estimate objective and subjective financial literacy levels. In addition to objective/subjective financial literacy levels, a composite score of 19 household financial behaviors was used. The authors explained that they coded overconfident individuals with very high subjective financial literacy and lower objective financial literacy as *blind spots* while the individuals who were underconfident about their

financial literacy were coded as *tentative*. A dependent variable namely *strong financial behavior score* was calculated using NFCS study questions about managing household finances (4 questions), credit card behavior (8 questions), use of informal debt (4 questions), bank account behavior (3 questions), and judgement of whether they believed they had too much debt (1 question). A multiple regression analysis was performed to model the relationship between strong financial behavior, the existence of blind spots, and subjective financial literacy. The results showed that individuals who have higher subjective financial literacy levels display stronger financial behavior. Furthermore, the authors reported that blind spots in financial literacy have a statistically significant negative relationship with strong financial behavior scores. Balasubramnian and Sargent (2020) concluded that individuals with blind spots demonstrate the illusion of knowing bias that is highly correlated with sub-optimal consumer financial behaviors.

Lind et al. (2020) studied the link between individual differences in objective/subjective financial knowledge, numeric ability, cognitive reflections of financial behaviors, and feelings toward financial matters. The hypotheses of the study were that objective/subjective financial knowledge, numeracy, and cognitive reflections have a positive relationship with sound financial behavior; also, objective/subjective financial knowledge, numeracy, and cognitive reflections are positively associated with increased levels of financial satisfaction measured as financial security and financial anxiety. A survey study among 2063 adult Swedish individuals was conducted where sound financial behavior, financial anxiety, financial security, objective financial knowledge, subjective financial knowledge, numeracy, cognitive reflection, and self-control were measured by multiple scales adopted from the literature. An ordinary least squares analysis was performed to test the relationship between objective/subjective financial knowledge, sound financial behavior, and financial satisfaction. Lind et al. (2020) found evidence that higher subjective and objective financial knowledge have a statistically significant positive relationship with sound financial behavior. On the other hand, higher subjective/objective financial literacy was found to be linked to lower financial anxiety levels.

Potter et al. (2020) investigated the predictors of financial anxiety among college students within the context of students' self-concepts, basic financial needs (i.e. perceptions of current income and ability to meet financial needs), and interdependence (i.e. interactions with others and the giving and receiving of social support). The authors classified the students' self-concepts into the following categories: students' perceptions of their financial standing compared to peers, subjective financial knowledge, and mastery which is a psychological term defined as "*the extent to which people see themselves as in control of the forces that importantly affect their lives*" (Pearlin et al., 1981). The researchers hypothesized that basic financial needs, students' self-concepts including their subjective financial literacy, and interdependence would be negatively associated with financial anxiety. A survey of 3339 undergraduate college students was conducted in the 2014 spring semester at a large public university in the Midwest region of the US. The dependent variable of the study was the financial anxiety levels where 7 items from the Financial Anxiety Scale (Archuleta et al., 2013) on a 7-point scale were adapted. Subjective financial literacy levels were assessed by asking the participants how would they rate their financial knowledge relative to their peers on a scale from 1 to 10. In the other components of the survey, demographics information (age, gender, class year, first-generation status, race, employment), perception of current income (1 item), ability to meet financial needs (15 items), financial standing compared to peers (1 item), mastery (7 items), and interdependence (3 items) were measured. During the analyses, a series of t-tests to detect significant differences among variables, and ordinary least squares regression analysis to model the relationship between the financial anxiety and the independent variables were performed. Potter et al. (2020) found that subjective financial literacy has a significant positive relationship with financial anxiety. They theorized that people who have higher financial literacy may have higher awareness regarding their financial status which may induce financial anxiety; where another explanation was that students' overstating their subjective financial literacy compared to their objective financial literacy levels. They noted that higher levels of objective financial literacy can decrease anxiety and might influence the perceptions of financial mastery.

Celiktas and Yilmaz (2021) examined the implications of financial literacy and education over the money illusion which is defined as the “*tendency to focus on nominal rather than real worth*” (Shafir et al., 1997). A survey study was conducted among 236 students at Bogazici University in Turkey. A questionnaire was administered to measure the money illusion tendency and financial literacy of the participants. Demographic information regarding age, grade point average, gender, department, class, financial management course history, income level, and financial situation was collected. Financial literacy was measured under three aspects which are financial knowledge of personal finance topics, positive financial behaviors, and positive financial attitudes. The authors performed a multiple regression analysis to identify the relationship between demographics, financial literacy, and money illusion tendency. Celiktas and Yilmaz (2021) reported that financial literacy inhibits the money illusion problem where students with higher financial literacy tend to suffer less from money illusion. Also, the results showed that students who think they are knowledgeable on financial matters displayed lower scores on objective financial knowledge questions indicating overconfidence.

Tinghög et al. (2021) explored the mediating factors of gender differences in financial literacy levels. They conducted a series of studies where they attempted to explain the differences in financial literacy levels among genders by testing for reading comprehension of financial matters, comprehension of financial terminology, displayed confidence in financial literacy, and financial anxiety. In the first study, the authors concluded that there is a significant gender gap in reading comprehension, and gender differences in financial literacy. The second study also revealed supporting results for the first study where women performed significantly worse than men on comprehension of financial terminology where the authors concluded that the gender differences in financial literacy are beyond the numerical capabilities. In the third study, the authors tested for displayed confidence, and stereotype threat which they described as “*the psychological predicament in which group stereotypes influence the way in which individuals evaluate themselves, which in turn may affect their performance of tasks that substantiate those stereotypical beliefs*”. The third study provided evidence that stereotype threat contributes to the observed gender gap

in financial literacy levels. On the other hand, the authors found no support for the hypothesis that confidence is a contributing factor to the gender gap in financial literacy. These results led the authors to hypothesize that if the stereotype threat is linked to the gender gap in financial literacy levels, there should be an indirect effect of gender on financial literacy through financial anxiety. In the fourth study, an online survey was conducted among 2063 Swedish individuals where demographics regarding age, education, and income level were collected. Financial literacy was measured by a 4-item knowledge-based questionnaire. Financial anxiety was measured by a 4-item questionnaire on a 5-point Likert-type scale which was adapted from Fünfgeld and Wang (2009) and Strömbäck et al. (2020). A mediation analysis was performed to explain the relationship between gender, financial anxiety, and financial literacy. Results confirmed that financial anxiety was affected by gender and financial anxiety was affected by financial literacy regardless of gender. The authors concluded that increased anxiety women felt toward financial matters could explain the gender gap in financial literacy.

3.2.1 Summary of Literature Survey on Financial Literacy

Table 3.4 outlines the study parameters that were found to have a statistically significant relationship with financial literacy. As expected, higher financial literacy levels were associated with parameters regarding lower debt levels, higher savings, and better financial planning behavior. Our literature survey revealed mixed results regarding the relationship between individuals' financial literacy levels and their susceptibility to behavioral biases during financial decision-making. Some results showed that financial literacy alters individuals' risk perceptions; making them less loss-averse (Diacon, 2004), more risk taker (A. Wang, 2009), and overconfident (M. Wang et al., 2011). On the other hand, Dhar and Zhu (2006) found that individuals with sophisticated occupations whom the authors associated with having higher financial literacy display a lower disposition effect. Celiktas and Yilmaz (2021) showed that people with higher financial knowledge scores demonstrated lesser money-illusion bias; whereas, they also reported that students who have higher subjective financial literacy were less financially literate than they think which implies overconfidence. Balasubramnian and Sargent (2020) focused on the illusion

of knowing in financial literacy rather than investigating subjective and objective financial literacy separately; and, they showed that people whose perception of their financial knowledge is well-calibrated, even if their financial knowledge is lower, are more likely to have positive financial behavior than those with blind spots. Ateş et al. (2016) reported mixed effects of financial literacy depending on the type of behavioral biases. Regarding financial anxiety, the findings indicate a negative correlation between financial literacy and financial anxiety with one exception. Potter et al. (2020) reported that higher subjective financial literacy is positively correlated with financial anxiety among students where they explain that this could be due to students overstating their financial skills or it may imply a heightened awareness toward one's financial position which induces financial anxiety for students.

Table 3.4: Literature survey on the parameters having a statistically significant relationship with financial literacy.

Parameter	(+) Literature Finding Positive Relationship	(-) Literature Finding Negative Relationship	(?) Literature Finding Mixed Results
Debt	-	Artavanis & Karra (2020), Ottaviani & Vandone (2018), Lusardi & Tufano (2015) Gathergood (2012),	-
Savings	Babiarz & Robb (2014), van Rooij et al. (2012), Sabri & MacDonald (2010), Hilgert et al. (2003)	-	-
Financial Planning	Balasubramnian & Sargent (2020), Lind et al. (2020), van Rooij et al. (2012), Sabri & MacDonald (2010), Howlett et al. (2008), Lusardi & Mitchell (2008) Lusardi & Mitchell (2007) Hilgert et al. (2003)	-	-
Susceptibility to Behavioral Biases	Wang et al. (2011), Wang (2009), Diacon (2004)	Mudzingiri et al. (2018), Dhar & Zhu (2006)	Celiktas & Yilmaz (2021), Balasubramnian & Sargent (2020), Ateş et al. (2016)
Financial Anxiety	Potter et al. (2020)	Tinghög et al. (2021), Lind et al. (2020) Skagerlund et al. (2018)	-

3.3 Mental Accounting

Mental accounting is “*the set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities*” (Thaler, 1999). The preliminary work regarding mental accounting goes back to Thaler’s (1980) paper namely “*Toward a positive theory of consumer choice*” where he mentions a “psychic accounting system” while investigating the thought process that produces the sunk cost effect. Later, Thaler (1985) coined the term “mental accounting” as a framework for the consumer behavior model by utilizing cognitive psychology and microeconomics.

According to Thaler (1999), there are three distinct components of mental accounting:

- Framing of the gains and losses
- Budgeting
- Choice bracketing.

Although money is fungible (it is interchangeable with another of its kind (e.g. a dollar can be divided into four quarters); each mental accounting component violates the principle of fungibility (Thaler, 1999). Several studies show that there are mental accounting patterns where people violate the fungibility of money in certain cases such as the house-money effect during gambling, consumption choices, and sunk cost fallacies (Thaler & Johnson, 1990; Shafir & Thaler, 2006; Haita-Falah, 2017).

In the following sections, we will provide our literature survey regarding these three components of mental accounting and explain specific cases where these components of mental accounting are prominent. Lastly, we will provide a review of the literature on individual differences in mental accounting.

3.3.1 Framing of Gains and Losses

A frame refers to a mental model utilized by people to solve a given problem. It contains the specifics of the components of the given problem and provides its context (Soman, 2004). However, even if the information of the particular problem is identical; the problem can be perceived, structured, and understood differently; resulting in different solutions by different individuals at different times (Soman, 2004). Therefore, the process of mental accounting is used by people to organize the outcomes of transactions; which could explain some of these consumer behavior anomalies (Kahneman & Tversky, 1984). Thaler (1999) classifies the framing of gains and losses as the first component of mental accounting. This component attempts to explain how individuals perceive and evaluate the outcomes of the decisions they have made. The input information regarding the problem is evaluated through mental accounting and cost-benefit analyses are conducted on an *ex-ante* (i.e. expected future outcome) and *ex-post* (i.e. realized future outcome) basis; then, the final decision can be explained using the value function (Thaler, 1999).

Essentially, mental accounting utilizes the value function postulated by prospect theory which is developed by Kahneman and Tversky (1979). As explained by Thaler (1999) the value function provides three core principles that are utilized widely in mental accounting:

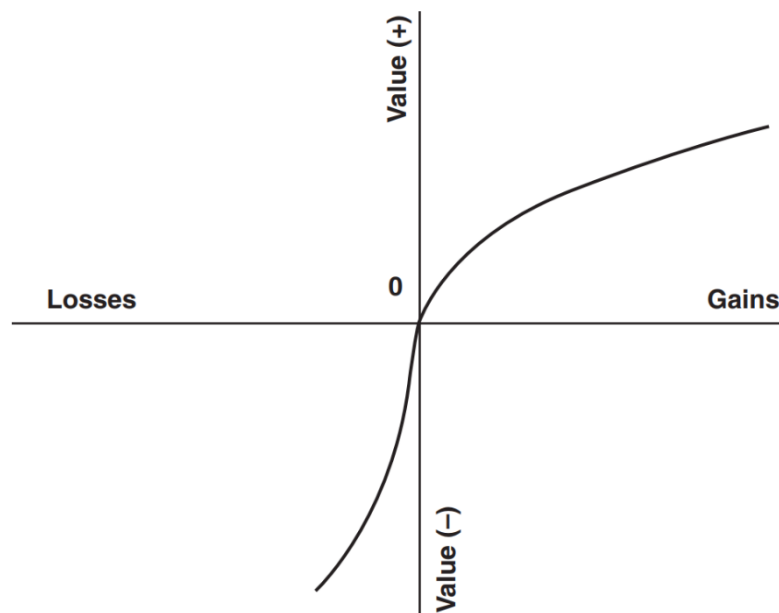
- (1) The value function is defined over a reference point in terms of gains and losses. People focus on relative changes rather than absolute changes in utility as opposed to expected utility theory.

Gains and losses both have diminishing sensitivity as it is shown in the value function where the gain function is concave and the loss function is convex (see

Source: (Kahneman & Tversky, 1979)

- (2) Figure 3.1).
- (3) People are loss averse. To illustrate, the emotional load of losing \$100 is higher than the emotional load of winning \$100.

In his article titled “*Mental Accounting Matters*”, Thaler (1999) identifies several cases of framing of gains and losses such as transaction utility, opening-closing mental accounts, sunk costs, advance purchases, payment depreciation, and payment decoupling. Furthermore, Thaler (1999) explains that mental accounting arithmetic requires a psychophysics approach to model how individuals mentally evaluate their gains and losses. The *hedonic framing hypothesis* attempts to explain this phenomenon by describing how people code the outcomes of events by integration and segregation to maximize their happiness (Thaler, 1999).



Source: (Kahneman & Tversky, 1979)

Figure 3.1: Kahneman and Tversky's value function

The shape of the value function implies that the values of gains and losses are calling for either segregation or integration (Thaler & Johnson, 1990). For two joint outcomes (x, y) , Thaler (1985) investigates the following four combinations:

- (i) **Multiple Gains:** Let $x > 0$ and $y > 0$. Since v is concave, $v(x) + v(y) > v(x + y)$; segregation is preferred.
- (ii) **Multiple Losses:** Let the outcomes be $-x$ and $-y$ where x and y are still positive. Then since $v(-x) + v(-y) < v(-(x + y))$; integration is preferred.
- (iii) **Mixed Gains:** Consider the outcome $(x, -y)$ where $x > y$ so there is a net gain. Here, $v(x) + v(-y) < v(x - y)$. So, integration is preferred. In fact, it

is possible that $v(x) + v(-y) < 0$ while $v(x - y)$ must be positive since $x > y$ by assumption. Thus, for mixed gains integration amounts to *cancellation*

- (iv) **Mixed Losses:** Consider the outcome x and $-y$ where $x < y$, a net loss. In this case, we cannot determine without further information whether $v(x) + v(-y) \geq v(x - y)$. Segregation is preferred if $v(x) > v(x - y) - v(-y)$. This is more likely the smaller is x relative to y . Intuitively, with a large loss and a small gain (e.g. \$40, -\$6000) segregation is preferred since v is relatively flat near -\$6000. This will be referred to as the “silver lining” principle. On the other hand, for (\$40,-\$50) integration is probably preferred since the gain of the \$40 is likely to be valued less than the reduction of the loss from \$50 to \$10, nearly a case of cancellation.

This phenomenon is called the *hedonic framing hypothesis* (Thaler, 1999). To illustrate, hedonic framing asserts that a person who gained two prizes of \$50 and \$25 in a short time would be happier than a person who gained a single prize of \$75. On the other hand, the emotional load of a person who lost \$75 would be lesser than the one who lost \$50 and \$25 in two events that occurred in a short period of time. For mixed gains and losses, people will aim to cancel their losses except for large losses (Thaler, 1985).

Although the rules for gain outcomes are still valid, Thaler (1999) notes that the losing outcomes for the hedonic framing hypothesis fail for extended temporal separation where subjects prefer segregation of losses. Thaler (1999) theorizes that this is because; prior losses make people more sensitive toward subsequent losses; and, people prefer that losses must be felt one by one. Linville and Fischer (1991) have also studied temporal separation from a personality and social psychology perspective and they have also reached similar results indicating that people prefer to temporally separate large gains, large losses, and small losses. On other hand, people prefer to temporally combine large gains with small losses and small gains with large losses.

3.3.2 Budgeting

The first component of mental accounting (framing of gains and losses) mostly focuses on the decision-making process at an individual transactions level. The second component of mental accounting is budgeting (or categorization/labeling) which covers how people categorize their expenses into budgets (i.e. food, rent, etc.), allocate their wealth into accounts (earnings, savings, pension, etc.), and group their income (regular, bonus, etc.) (Thaler, 1999). The core idea of budgeting is that these mental accounts are not fungible as opposed to traditional finance theorems (Thaler, 1999).

Heath and Soll (1996) explain that budgeting in mental accounting is a self-control mechanism to constrain consumption and reduce people's cognitive load on how to spend their money. Moreover, the budgeting process is significantly affected by expense tracking where expenses must initially be noticed, and then must be properly assigned to their corresponding budgets (Heath & Soll, 1996).

The effects of hedonic framing are also visible in the consumption budgets where temporal reframing of expenses such as framing a \$100 annual expense as 27 cents per day significantly changes the budgeting behavior where small ongoing expenses are preferred over large infrequent expenses (Gourville, 1998; Thaler, 1999). Heath and Soll (1996) emphasize that labeling the accounts causes people to behave differently which essentially leads to the violation of fungibility. To illustrate, Heath and Soll (1996) provide their experimental results conducted on MBA students. The students are asked whether they would buy a \$25 theater ticket in two groups: the first group is told that they have spent \$50 on a basketball game earlier, and the second group is told that they have found a \$50 parking ticket on their cars. The results show that majority of students who previously purchased a \$50 basketball game ticket preferred not to buy a \$25 theater ticket later; because, having entertainment earlier led them to under-consume. Thaler (1999) also points out that violations of fungibility also occur on the cases where individuals are setting budgets too low for improving their self-control or they may overvalue the gifts they receive.

To explain the budgeting of wealth accounts from a mental accounting perspective, Shefrin and Thaler (1988) have developed the Behavioral Life-cycle Hypothesis where they explain the hierarchy of wealth accounts depending on how likely a household is to spend from that corresponding account. Their findings show that the account that people most easily spend from is the “current income” which is usually the salary or other types of regular income (Shefrin & Thaler, 1988). It is followed by current assets where people use some of their willpower to make discretionary savings, and the least preferred spending account is the future income which can be a pension fund. Thaler (1999) notes that a powerful ability of mental accounting is that it can model how people do savings by transferring funds from tempting accounts to less tempting ones.

It is theorized that the tendency for violation of money fungibility in these mental accounts is a result of human cognitive evolution to help individuals to save (Shefrin & Thaler, 1988). On the other hand, people with self-control are more likely to save money as proposed in the Behavioral Life-cycle Hypothesis (Strömbäck et al., 2017).

Another aspect of the budgeting process is the income accounts which are used to model how people label their incomes. O’Curry and Strahilevitz (2001) explain that people’s spending behaviors are significantly impacted by their income source. To illustrate a windfall gain that is obtained without expectation is more likely to be spent on hedonic options; while, regular income like a salary is more likely to be spent on utilitarian options such as rent and utility bills. Another example of income account non-fungibility is found by Epley et al. (2006) who showed that when people are given an unexpected income, they are more oriented towards saving if they label that unexpected income as a “tax refund” rather than “bonus income”.

3.3.3 Choice Bracketing

Up to this point, we have covered the framing of gains and losses which models how people conduct mental accounting for their transactions, and budgeting which models how people label their mental accounts of consumption, wealth, and

income. The third component of mental accounting is choice bracketing which refers to whether people when faced with multiple decision options, choose to group them together (Thaler, 1999). Here, Thaler uses the terminology from Read, Loewenstein, and Rabin's (1999) research article entitled "*Choice Bracketing*" where the authors investigated how people assess the consequences of their decisions.

A prominent case of choice bracketing is observed during decision-making while having prior gains or losses. Thaler and Johnson (1990) studied how prior gains and prior losses affect risk-seeking behavior. Their results showed that prior gains before a decision may induce risk-seeking behavior on the same mental account. They call this phenomenon the *house money effect* since the gamblers call their winnings from a casino (i.e. the house) as house money. On the other hand, they found that prior losses induce risk-seeking only in the possibility of breaking even. In a later study, Ackert et al. (2006) studied the house money effect on a market setting and found supportive results where prior gains significantly influenced the traders' bids, price predictions, and market prices.

3.3.3.1 Narrow Framing

Considering the effect of prior gains/losses over risk-seeking and decision-making behavior, this essentially leads us to a more general conclusion that how choices are bracketed significantly affects the attractiveness of the bets (Thaler, 1999). Read et al. (1999) explain that ideally, people should broadly bracket their decisions. More specifically, they should assess all the potential outcomes of their decisions grouped together, which usually leads to higher utility. However, they found that people often fail to broadly bracket; rather, they narrowly bracket their decisions in isolation which significantly impacts their behavior (Read et al., 1999). In their article entitled "*A Survey of Behavioral Finance*", Barberis and Thaler (2005, p. 1073) explain that narrow framing is a core feature of mental accounting which leads people to treat each gamble they faced as it is the only gamble in the world rather than considering the whole big picture while making their decisions.

3.3.3.2 Myopic Loss Aversion

The equity premium puzzle, which refers to how stock returns significantly exceeded treasury bills' returns when taking into account over ninety years (1889–1978) of historical data, continues to be one of the most perplexing issues facing financial scholars today (Mehra & Prescott, 1985). Based on the prospect theory, Benartzi and Thaler (1995) provided a mental accounting solution for the equity premium puzzle in which they coined the term for a mental accounting behavior called "myopic loss aversion."

Myopic loss aversion is characterized by more sensitivity to losses than profits. Investors who demonstrate myopic loss aversion will be more risk-seeking if they examine their portfolios less often (Thaler et al., 1997). Benartzi and Thaler (1995) explain that although people are loss-averse; the attractiveness of risky assets is bound by the investment's time horizon, and as long as the investors check their portfolios infrequently their tendency to hold risky assets will increase. The authors claim that people are assumed to evaluate their decisions frequently and they are assumed to be risk-averse where they call this combination of loss aversion and short evaluation periods as myopic loss aversion (Benartzi & Thaler, 1995). According to Thaler (1999), myopic loss aversion is an example of narrow framing being a more general concept.

3.3.4 Literature Survey on Individual Differences in Mental Accounting

One of the focal points of this thesis study is the individual differences in explaining mental accounting behavior. In this section, we followed a similar methodology as we did in the financial anxiety (Section 3.1) and financial literacy (Section 3.2) sections. In terms of individual mental accounting differences, we focused on the following study parameters: debt, savings, financial planning, financial anxiety, and financial literacy. We provided a review of the literature and tabulated our findings. Table 3.5 summarizes our literature review on individual differences in mental accounting in chronological order.

Table 3.5: Literature survey on individual differences in mental accounting chronologically

Article	Subject	Sample	Analysis	Main Findings
Hirst et al. (1994)	The effect of framing of gains and losses on consumer borrowing decisions	131 MBA Students	Chi-Square tests	DEBT Consumers prefer to purchase long-lived assets by loans; because, framing of gains and losses enhances the utility of credit purchases.
Antonides et al. (2011)	Implications of demographics, household wealth, debt, having saving goals, financial management habits, and financial knowledge of mental budgeting	2862 Individuals	Instrumental Variable Regression	DEBT Less wealth and more debt are associated with more mental budgeting. SAVINGS Having saving goals has a positive effect on mental budgeting. FINANCIAL PLANNING Financial management is positively affected by mental budgeting. FINANCIAL LITERACY Financial knowledge of financial products and investments was found to positively influence mental budgeting

Strömback et al. (2017)	Effect of self-control on financial behavior, financial anxiety, and financial security from a Behavioral Life-cycle Hypothesis perspective.	2063 Individuals	Ordinary Least Squares	SAVINGS People with good self-control are more likely to do savings regularly. FINANCIAL ANXIETY Good self-control has a negative relationship with financial anxiety
Xiao & O'Neill (2018)	The behavioral hierarchy of mental budgeting in terms of economic resources, financial literacy, and financial well-being.	27564 Individuals	Chi-Square tests, Binary Logistic Regression, Ordinary Least Squares	DEBT People who have debt are more likely to demonstrate budgeting. SAVINGS Budgeting behavior has a negative relationship with one's economic resources. FINANCIAL PLANNING Desirable financial behavior and financial satisfaction are positively correlated with budgeting behavior. FINANCIAL LITERACY Lower objective financial literacy and higher subjective financial literacy are positively associated with budgeting behavior
Baker et al. (2019a)	The relationship between the Big Five Personality Traits and behavioral biases of individual investors.	501 Investors	Factor Analysis, Multiple Regression	GENERAL ANXIETY The neuroticism personality trait which was associated with anxiety does not have a statistically significant relationship with mental accounting.
Durand et al. (2019)	The effect of personality traits and subtraits (e.g. anxiety) on myopic loss aversion	Experimental study 128 Individuals	Mann-Whitney Test, Random Effects Tobit	GENERAL ANXIETY Anxious people have more propensity to demonstrate myopic loss aversion
Muehlbacher and Kirchler (2019)	The effects of the Big Five personality traits, impulsivity, time orientations, and financial literacy on individual differences in mental accounting	Three studies with (165), (114), and (373) individuals	Logistic Regression, Principal Components, Analysis, Ordinary Least Squares	FINANCIAL PLANNING Non-planning impulsivity which is associated with a lack of future orientation has a positive relationship with mental accounting FINANCIAL LITERACY Individuals with higher financial literacy display higher levels of mental accounting

Ong et al. (2019)	Implications of debt mental accounting on cognitive and psychological functioning	196 Debt-Relief Program Beneficiaries	t-tests	GENERAL ANXIETY Reducing the number of debt accounts significantly reduces general anxiety
Ramirez (2019)	Individual mental accounting differences in perceptions of debt and saving among different country groups.	182 Austrian and Peruvian Individuals	Kruskal-Wallis Test, Ordinary Least Squares	SAVINGS There are individual differences in consumer perceptions toward savings among Austrian and Peruvian people.
Sui et al. (2021)	The effects of mental accounts of wealth, saving goals, and expense forecasting in overspending behavior	6248 Individuals	Multinomial Logistic Regression	SAVINGS Having mental accounts for saving goals reduce consumer income overspending behavior FINANCIAL PLANNING Individuals who hold mental accounts for savings, and investments tend to resist income overspending, expected overspending, and credit overspending behavior,

Hirst et al. (1994) explored the role of temporal contiguity (the co-occurrence of multiple outcomes) in mental accounting during consumer borrowing decisions. They predicted that if a gain exceeds a loss, as in a voluntary credit purchase, the integration of gains and losses maximizes the utility. Four experimental studies among 131 MBA students from two major public universities were conducted. These experiments focused on the following issues: Association of loan terms with asset lives (N=56), temporal contiguity versus tangibility (N=75), prepaying a loan (N=42), and incurring costs to match loan terms with asset lives (N=56, same students from experiment 1). The authors performed Chi-Square tests and the results revealed that consumers prefer to associate loans with long-lived assets (experiment 1), regardless of whether the purchased assets are tangible or intangible (experiment 2). Furthermore, the loan repayment behavior was influenced by the future asset benefits which could be integrated with loan payments (experiment 3). Finally, the results showed that people would be willing to pay for out-of-pocket costs to enhance the likelihood for loan costs and benefits would co-occur in time (experiment 4). Hirst et al. (1994) concluded that streams of costs and benefits would be more likely

to be integrated if they were contiguous in time; and, integration of gains and losses enhances the utility of credit purchases.

Antonides et al. (2011) investigated the association between mental budgeting and general education, saving goals, financial knowledge, time orientation, and financial situation among the Dutch population. The authors hypothesized that having higher education, higher financial knowledge, higher income, higher wealth, older age, and being a male would reduce mental budgeting; whereas, an increase in debt levels may lead to more mental budgeting. Antonides et al. (2011) posited that mental budgeting would positively affect both consumers' overview of the financial situation and household financial management. Lastly, the authors speculated that they expect a relationship between mental budgeting, future time orientation, and goal-saving behavior. In the fall of 2007, a survey was conducted among 4280 Dutch individuals and finally, 2862 valid observations were acquired after listwise deletion of missing observations. Information regarding participants' socio-demographics and several opinions and attitudes concerning financial behavior was collected. Participants were also asked about how often they check the balance of their current checking accounts; how precisely they know this balance; and, whether they have an overview of expenses. A financial management attitude scale was administered to collect information about organizing one's daily financial affairs, the temptation to buy things without having the money for them, paying bills on time, and preference for paying on credit rather than paying from savings. Also, the survey questionnaire included two time orientation scales, each consisting of 4-items, to measure short-term and long-term time orientations. The participants' financial knowledge levels were assessed by using two financial knowledge scales where the first scale focused on financial products and the second scale focused on investments. Lastly, a mental budgeting scale was developed to measure the mental separation of expenditure categories, allocated budgets for categories of expenses, economizing after spending, and economizing in the next month after spending in the current month. The mental budgeting scale was composed of 4 items to which participants responded on a 5-point Likert-type scale. The endogenous variables of the study were mental budgeting and financial management. The authors performed instrumental variables

regression where mental budgeting was instrumented by education level, and having saving goals. Socio-demographics, time orientation, and financial knowledge were included as the exogenous variables which might influence both mental budgeting and financial management. The results showed that mental budgeting has a positive influence on financial management whereas people who have higher education display lesser mental budgeting compared to those who have lower and intermediate education. Moreover, having saving goals has a positive relationship with mental budgeting since saving goals induce the labels for mental accounts. The authors reported that short-term time orientation is negatively associated with mental budgeting whereas long-term time orientation has a positive effect on mental budgeting. Also, less wealthy participants with more debt levels demonstrated more mental budgeting. Participants' financial knowledge (of both financial products and investments) was found to positively influence mental budgeting. In the end, the authors concluded that mental budgeting has a significant influence on financial management and achieving financial capability which leads to financial security and financial well-being.

Strömback et al. (2017) explored the impact of individual differences in self-control on financial behavior, and financial well-being. The authors explained that self-control is one's ability to break negative habits, resist temptations, and overcome first impulses. Following the Behavioral Life-cycle Hypothesis, the authors hypothesized that self-control will have a positive relationship with general financial behavior and financial well-being. A web-based survey study was conducted among 2063 individuals in May 2016. Demographics regarding age, gender, income, and education were collected. The authors measured the participants' financial behavior by using a 12-item questionnaire namely the Financial Management Behavior Scale in which the participants were asked to rate how often they engaged in certain financial behaviors in the past six months on a scale from 1(not at all) to 5 (always). Financial well-being was measured under two separate variables namely financial anxiety, and perceived financial security. Financial anxiety was measured by a 4-item questionnaire adopted from Fünfgeld and Wang (2009). A 3-item questionnaire was used to measure financial security. Self-control was measured by a 9-item

questionnaire which was adapted from Brief Self-Control Scale (Tangney et al., 2004), and Short-Term Future Orientation Scale (Antonides et al., 2011). The survey also measured the participants' optimism (5 items) and deliberativeness (2 items) levels. Lastly, participants' financial literacy was measured by using a 4-item knowledge-based questionnaire adapted from van Rooij et al. (2012). The authors conducted a series of Ordinary Least Squares regressions to analyze the relationship between self-control/savings behavior, self-control/good financial behavior, and self-control/financial well-being. The authors reported that people who have good self-control were more likely to regularly save money from their paychecks, which makes them better equipped to manage unforeseen expenses and more likely to have enough money for their retirements which is in line with the Behavioral Life-cycle Hypothesis. Moreover, the results suggested that self-control was also positively associated with general financial behavior even with controlling financial literacy, and income. In the study, the authors did not perform an analysis to investigate the relationship between self-control and financial literacy. On the other hand, better self-control scores were also associated with lower levels of financial anxiety, and higher levels of financial security. Thus, the authors stated that self-control has a positive effect on overall financial well-being. In compliance with the Behavioral Life-cycle Hypothesis, the authors concluded that self-control has a positive effect on savings behavior and general financial behavior where people with good self-control suffer from lesser financial anxiety and feel more secure toward their finances.

Xiao and O'Neill (2018) examined the characteristics of budgeting behavior from a behavioral hierarchy perspective which is related to mental accounting. The authors explained that the assumption of behavioral hierarchy is as follows: When economic resources change, consumers' behaviors change while meeting their needs; and, budgeting is a basic step in financial planning and counseling. They hypothesized that budgeting behavior is negatively associated with economic resources; and, positively associated with financial capability and financial well-being. They also claimed that budgeting behavior should be at the low end of the behavioral hierarchy. Data used in the study were acquired from the 2015 NFCS Study in which responses from 27,564 American adults were collected. The

dependent variable of the study was budgeting behavior which was assessed by a question asking “*Does your household have a budget?*” in which responses were coded as 1 (having a budget) or 0 (other). Financial behavior information regarding underspending, saving for an emergency, long-term planning, and calculating retirement needs were collected by using 4 items. The authors also utilized objective financial literacy (6 items, knowledge-based quiz), subjective financial literacy (1 item on a scale from 1 to 7), and perceived financial capability (1 item on a scale from 1 to 7) as financial capability variables. The participants' financial well-being was measured using household income, and financial satisfaction variables. During the analyses, several demographics and other financial variables were also used. The authors performed Chi-square tests, binary logistic regression, and ordinary least squares regression analyses to test their hypotheses. The results showed that respondents who owe all types of debt (i.e. mortgage, home equity, auto loan, unpaid medical bills, credit card debt, student loan, and high-cost loan) were more likely to be a budgeter. When all factors were included in the logistic regression analysis, the authors reported that people with higher incomes were less likely to perform budgeting behavior. Lower levels of objective financial literacy and higher levels of subjective financial literacy were associated with more budgeting behavior. The authors argued that budgeting behavior is negatively correlated with economic resources; whereas, desirable financial behaviors are positively associated with budgeting behavior.

Baker et al. (2019a) studied the effects of the Big Five Personality Traits (agreeableness, openness, extroversion, neuroticism, and conscientiousness) on the following behavioral biases: overconfidence, disposition effect, anchoring, representativeness, mental accounting, emotions, and herding. Essentially, Baker et al. (2019a) hypothesized that each one of the Big Five Personality Traits will have a statistically significant influence on the aforementioned biases. A survey study was conducted with a final dataset of 501 Indian investors. The questionnaire used in the survey was composed of three sections. In the first section, demographic information regarding gender, age, marital status, education, occupation, annual income, and stock market investment experience were collected. The second section focused on

participants' behavioral biases when making decisions on a 5-point Likert-type scale. In the third section, participants' personality traits were assessed in terms of neuroticism (5 items), extroversion (4 items), openness (5 items), agreeableness (3 items), and conscientiousness (5 items) on a 5-point Likert-type scale. Among the personality traits utilized in the study, Baker et al. (2019a) described the neuroticism trait as “*anxiety, impulsiveness, tenseness, and shy*”. The authors performed a structural equation modeling which combines factor analysis and multiple regression analysis to examine the relations between the measured variables and latent constructs. In the study, only the openness personality trait was found to have a statistically significant relationship with mental accounting where the authors explained that “*individuals high in openness are likely to be imaginative, curious, open to new ideas and reflect higher intelligence*”. Although neuroticism was found to have a positive relationship with mental accounting, the relationship was statistically insignificant.

Durand et al. (2019) explored the individual differences in myopic loss aversion in terms of gender and the Big Five personality traits being neuroticism, extraversion, openness, agreeableness, and conscientiousness. They initially proposed a model to define the relationship between myopic loss aversion behavior and each one of the Big Five personality traits. Then, they extended their analyses by replacing the personality traits extraversion, and neuroticism with their sub-traits. Neuroticism was replaced with anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability subtraits; whereas extraversion is replaced with warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotions sub-traits. The authors hypothesized that anxious people would get worried and become frightened more often which may lead them to be more risk-averse, and they might prefer evaluating their portfolios over longer intervals which eases their apprehension implying higher myopic loss aversion. An experimental study under 2x2 between-subjects conditions (male-female and frequent/infrequent bet placements) among 128 participants was conducted where 32 individuals of the same gender were allocated to each one of the experimental conditions. The participants were asked the complete a 240-item personality

inventory before joining the experiment in person. In the study, the subjects were asked to play a total of 9 rounds of bets where the experimental protocol was adapted from Gneezy & Potters (1997) and Haigh & List (2005). During the experiment, frequent group subjects were allowed to play each round individually, and infrequent group subjects were allowed to play 3 rounds at a time. Cash equivalents of bet winnings were paid to the subjects where the mean winnings per subject were approximately 76.84 Hong Kong Dollars. The authors performed Mann-Whitney tests for detecting statistically significant differences among experimental groups; then, multiple models were proposed by using the random effects tobit method. The authors reported that investors' tendency to display myopic loss aversion varies. The extraversion personality trait was positively associated with risk and reduced myopic loss-aversion. On the other hand, the neuroticism personality trait was negatively associated with risky behavior and increased myopic loss aversion. Further analysis of the neuroticism subtraits showed that higher anxiety levels were related to less risky behavior and more propensity to myopic loss aversion on a 10% statistical significance.

Muehlbacher and Kirchler (2019) investigated the relationship between individual differences in mental accounting and personality characteristics. The authors hypothesized that since mental accounting is a theory about self-control; impulsive individuals with low self-control are less likely to engage in mental accounting. Also, Muehlbacher and Kirchler (2019) posited that mental accounting can be a byproduct of a deliberate decision process; thus, it should be associated with emotional stability and conscientiousness. They claimed that mental accounting should correlate with extraversion, agreeableness, neuroticism, and openness. Lastly, the authors claimed that as a cognitive process, money management should be associated with conscientiousness since highly conscientious individuals manage their finances more carefully, and they have a positive attitude toward financial issues and stronger future time orientation. To test these claims, Muehlbacher and Kirchler (2019) conducted three studies. The authors developed a 5-item mental accounting scale to assess the individual differences in mental accounting where participants responded on a 7-point Likert-type scale. Participants' demographics

regarding gender, age, education, and income were collected. The personality characteristics were assessed in terms of the Big Five personality traits (extraversion, agreeableness, conscientiousness, emotional stability, and openness), the three types of impulsivity (motor impulsivity, non-planning impulsivity, and attentional impulsivity), financial literacy, short-term time orientation, and long-term time orientation. The first study focused on confirming that individual differences in mental accounting exist. Data were collected in 2016 and the final sample consisted of 165 individuals' responses. In the first study, participants completed the mental accounting scale and they were presented with one of the two scenarios of the theater-ticket problem adapted from Kahneman and Tversky (1984). The authors performed a logistic regression analysis to develop two regression models for the relationship between participants' responses to theater-ticket problem (lost ticket vs. lost banknote), and the mental accounting scale. The results revealed that whether they lost a ticket or lost a cash equivalent mattered only for the participants who scored higher on the mental accounting scale.

Muehlbacher and Kirchler's (2019) second study was focused on investigating the impact of income sources on the framing of gains. The authors hypothesized that money from serious/frivolous sources would likely be spent on serious/frivolous expenses; also, the source of income only matters when dealing with larger amounts of money; and, scores on the mental accounting scale would moderate the effects described above. Data were collected in 2012 and the final data consisted of 114 participants' responses. The study was organized as an experiment under a 2 (income source: casino winnings vs. tax refund) by 2 (amount: €25 vs €250) between-subjects design where each participant is randomly assigned to one of the overall 4 experimental conditions. After the experimental conditions were introduced to the participants, they were asked to evaluate the two sources of income by how boring-exciting and amusing-serious were they on a 7-point scale where these data were used to form an index ranging from 1(serious) to 7(frivolous). Then, the participants were asked to rank how would they spend this income under several spending opportunities such as buying a birthday present, paying the bills, and saving the money. Similar to income sources, participants were asked to rate each spending

alternative on how boring-exciting and amusing-serious were they on a 7-point scale where an index was formed ranging from 1(serious) to 7(frivolous). The authors performed a principal component analysis to classify which of the expenses can be considered serious or frivolous. Presents for oneself, birthdays, Christmas, and clothing expenses were coded as frivolous; whereas, expenses made for paying the bills and savings were coded as serious. Substituting the collected data, the authors computed a spending category index ranging from -3.5 to +3.5 where negative values indicate that money described in the scenario would be spent on frivolous expenses and positive values show that money would more likely be spent on serious expenses. In the last section of the second study, sociodemographics were collected and participants completed the mental accounting scale. To test their hypotheses, Muehlbacher and Kirchler's (2019) utilized ordinary least squares regression analysis. The results showed that spending categories are significantly influenced by income sources where casino earnings were more likely to be spent on frivolous expenses; whereas, money from tax refund was more likely to be spent on serious expenses. The authors reported that the participants' decisions were not affected by the amount of income. The results of the regression analysis between the mental accounting scale and spending category index revealed that for people with weaker mental accounting disposition, the source and amount of income did not matter; while people with stronger mental accounting disposition were more likely to spend money from a frivolous source for a frivolous expense, and money from serious source for a serious expense.

In the third study, Muehlbacher and Kirchler (2019) explored the factors correlating with mental accounting. During the third study, the effects of sociodemographics (gender, age, education, income), the Big Five personality traits (extraversion, agreeableness, conscientiousness, emotional stability, openness), and the three types of impulsivity (motor impulsivity, non-planning impulsivity, attentional impulsivity) on mental accounting were investigated. The authors also noted that they measured the participants' financial literacy and short-term/long-term time orientations in an exploratory rationale and their findings should be considered preliminary. The study was conducted among 383 individuals in 2014. A 10-item

questionnaire on a 7-point Likert-type scale was administered to assess the Big Five personality traits. As in previous studies, the mental accounting scale was administered to participants. Participants' impulsivity was measured by a 15-item questionnaire (5 items for each type of impulsivity) where respondents' impulsivity was coded under three 7-point scales from 1 (low impulsivity) to 7 (high impulsivity). Participants' financial literacy was measured by the Big Five questions identified by Hastings et al. (2013) which tests the financial knowledge about compounding interest, real rates of return, risk diversification, mortgage interest, and bond prices. Adapted from Antonides et al. (2011), the last two scales measured the participants' short-term (4 items) and long-term (4 items) time orientations. The authors utilized multiple regression analysis to examine the relationship between mental accounting and the other variables. The results showed that being female, conscientiousness (being orderly, responsible, and dependable), and having higher financial literacy were positively correlated with higher scores on the mental accounting scale. On the other hand, higher education levels and non-planning impulsivity which is associated with a lack of future orientation or forethought (Ottaviani & Vandone, 2018) were found to be negatively correlated with individual mental accounting levels. No significant correlations between the mental accounting scale scores and short-term/long-term time orientations were detected. Muehlbacher and Kirchler (2019) commented that although some of the behavioral implications of mental accounting could be seen as irrational in terms of economic theory; individuals seem to apply the mental accounting principles to prevent impulsive spending, to keep track of financial activities and to facilitate the money management.

Ong et al. (2019) examined the mental accounting of chronic debt and its implications on psychological functioning. The authors explained that people do not think about personal finances in a consolidated manner; instead, people prefer to think narrowly about the gains and losses under separate mental accounts such as a mortgage, car loans, and other debts. Ong et al. (2019) theorized that debt structure matters where debt mental accounting creates a bandwidth tax (i.e. a cognitive load) that impairs cognitive functioning; and, multiple debt accounts cause psychological

pain among people. The authors hypothesized that a debtor who owes more debt accounts will suffer greater bandwidth costs because mental accounting will cause each debt account to become a separate source of cognitive load. To test their hypothesis, a survey study among 196 debt relief beneficiaries from a Singapore-based charity in 2015 was conducted. The participants were surveyed before receiving the debt relief and 3 months after the debt relief. The effects of debt relief were measured by studying the pre-post changes in psychological functioning and economic decision-making. The psychological functioning of the participants was assessed by using a cognitive functioning test, and a generalized anxiety disorder questionnaire where the authors interpreted the general anxiety symptoms as a psychological response to poverty and indebtedness rather than a mental disorder diagnosis. Furthermore, participants' risk aversion and time discounting behavior were evaluated by using a lottery-choice, and a money-earlier-or-later type experiments respectively. The authors performed multiple t-tests to detect the statistical differences between pre-post debt relief periods and showed that chronic debts significantly impair psychological functioning and increase risk aversion and present bias. Also, relieving debts reduced anxiety levels among the participants. Then, they utilized the administrative data from the debt-relief program to explore the role of debt structure in creating bandwidth taxes. The results revealed that reductions in debt accounts significantly and strongly improved the psychological and cognitive functioning. Specifically, the authors reported that improvements in anxiety were significantly linked to clearing debt accounts; whereas, there were no effect of debt-relieve amount on the anxiety levels. The authors concluded that novel debt collection policies that consider mental accounting costs and combine debt accounts together could be effective. Given the results of this study, our interpretation is that individuals who integrate their losses, as in the hedonic framing hypothesis, suffer less from anxiety.

Ramirez (2019) investigated the effect of mental accounting on debt and savings decisions. By implementing the double-entry model developed by Prelec and Loewenstein (1998), he characterized the individuals' decision-making processes and explored their implications on perceptions toward debt and savings. Specifically,

the study questioned how general perceptions and cultural characteristics influence the perceptions of debt and savings. He conducted a survey study among 183 individuals from Austria and Peru. Demographics regarding country, gender, age, and education were collected. A survey questionnaire that presented an unconventional consumption situation was administered. In the questionnaire, the participants were offered 3 weeks of holiday in a hotel that costs €2460; they can select any week within summer through the next 4 years, and they can divide their payments without any interest throughout the next 4 years; however, they were required to pay a minimum of €820 each year. To illustrate, one option was having one week of holiday in the first year and making the first payment of €820; and, next year taking two weeks of holiday and paying the remaining amount of €1640. The participants were tasked with rating their preferences for 10 different payment schedules and vacation options on a scale from 0 (lowest) to 10 (highest). Ramirez (2019) performed non-parametric Kruskal-Wallis tests to show that there were statistically significant differences in preferences of payment and consumption among Austria and Peru, age (total and Austria group), and education (Austria group) groups; however, no statistically significant differences between gender groups were found. The author utilized linear regression and logit models to demonstrate the relationship between payment and consumption preferences, country, age, and education. The results indicated that people displayed a strong debt aversion regardless of country of origin. On the other hand, the author reported that the willingness to increase savings may differ among Peru and Austria groups.

Sui et al. (2021) explored how overspending behavior is affected by mental accounts of wealth, saving goals, and expense forecasting. The authors stated that according to their knowledge, very few studies investigated how to control overspending behavior; and, one of their aims is to explain the relationship between overspending behaviors and mental accounting. They explained that mental accounting is a self-control mechanism individuals utilize to prevent overspending behavior. The study posited four hypotheses.

- Low-stake financial mental accounts (liquid assets) are positively associated with overspending; while, high-stake financial mental accounts (savings, investments, retirement, and insurance) are negatively associated with overspending;
- Individuals who have a specific expenditure forecasting are more likely to overspend;
- Individuals who have a specific saving goal are less likely to overspend.
- Income overspending should be associated with financial mental accounts (wealth allocation), expenditure forecasts, and saving goals; while, expected overspending should be associated with expenditure forecasts and saving goals; and, credit overspending should be associated with financial mental accounts.

The authors used data from the *2016 Survey on Consumer Finances* (SCF). The data were collected from 6248 US respondents. The survey study administered three questions as dependent variables to assess the participants' overspending behaviors i.e. consumer overspending patterns (when spendings exceed income), expected overspending patterns (when actual spending exceeds expected spending in a year), and credit overspending patterns (when consumer rarely pays off monthly credit balances). The independent variables of the survey were mental accounts of wealth allocation, expenditure forecasting, and saving goals. Additionally, demographics regarding age, educational background, income level, family size, and home/vehicle purchases were utilized as the control variables. The authors applied multinomial logistic regressions to examine whether consumer overspending was influenced by mental accounting. The study provided evidence that establishing mental accounts, mental budgets, and mental savings can aid consumers to control their overspending behavior. The results showed that individuals who maintain savings and investments display a tendency to resist income overspending, expected overspending, and credit overspending. Furthermore, saving goals help consumers to control income overspending; however, it does affect the expected overspending and credit overspending behaviors. Also, expenditure forecasting or budget setting affects income overspending and expected overspending behaviors. Sui et al. (2021) argued that mental accounts are self-control mechanisms to prevent overspending.

3.3.4.1 Summary of Literature Survey on Individual Differences in Mental Accounting

Table 3.6 outlines the study parameters that were found to have a statistically significant relationship with the propensity to demonstrate mental accounting bias. Individual differences in mental accounting are a relatively new field of study where a majority of research belongs to the post-2010 period. Our literature survey indicates that mental accounting is often utilized by individuals who have higher debt levels (Xiao & O'Neill, 2018; Antonides et al., 2011) or individuals who prefer taking loans for purchasing assets (Hirst et al., 1994). In terms of savings and financial planning behavior, we observed that mental budgeting is a cognitive tool used by consumers to allocate their resources; whereas, Ramirez (2019) demonstrated that mental accounting differences in savings behavior exist among populations from different countries. Furthermore, we found a significant research gap on the implications of financial anxiety over individual differences in mental accounting where there was no consensus. Considering financial literacy, previous research focused on mental budgeting habits and how it was affected by individual financial literacy levels. While knowledge of financial products (Antonides et al., 2011), subjective financial literacy (Xiao & O'Neill, 2018), and objective financial literacy (Muehlbacher & Kirchler, 2019) were positively associated with mental budgeting; Xiao and O'Neill (2018) reported that individuals with low to middle range (2-4 on a 6-point scale) objective financial literacy were more likely to perform mental budgeting.

Table 3.6: Literature survey on the parameters having a statistically significant relationship with mental accounting.

Parameter	(+) Literature Finding Positive Relationship	(-) Literature Finding Negative Relationship	(?) Literature Finding Mixed Results
Debt	Xiao & O'Neill (2018), Antonides et al. (2011), Hirst et al. (1994)	-	-
Savings	Sui et al. (2021), Xiao & O'Neill (2018), Strömback et al. (2017)	-	Ramirez (2019)
Financial Planning	Sui et al. (2021), Xiao & O'Neill (2018), Antonides (2011)	-	-
Financial Anxiety	<u>General Anxiety</u> Durand et al. (2019)	Strömback et al. (2017) <u>General Anxiety</u> Ong et al. (2019)	<u>General Anxiety</u> Baker et al. (2019a)
Financial Literacy	Muehlbacher & Kirchler (2019), Antonides et al. (2011)	-	Xiao & O'Neill (2018)

4 RESEARCH METHODOLOGY

In the following sections, we provide the details of our research methodology. Section 4.1 explains our research objectives where we list our research questions for this thesis study. In Section 4.2, we define our hypotheses generation and show the grounds on where we based our hypotheses. We introduce our user survey and explain our data collection process in Section 4.3. Next, we explain the details of the data analysis methodology and present our results in Section 4.4.

4.1 Research Objectives

This study investigates whether an individual's level of financial anxiety is a substantial factor in triggering the mental accounting mechanisms such as hedonic framing, budgeting, and myopic loss aversion. Furthermore, we examine the effect of financial literacy on people's financial anxiety levels and mental accounting disposition which often leads to negative financial outcomes.

The focus of this research is to investigate the following research questions:

1. Can people's level of financial anxiety predict individual differences in mental accounting?
2. Is having basic financial literacy effective for handling the negative outcomes of mental accounting?
3. Is there a relationship between levels of financial anxiety and financial literacy?
4. What are the implications of individuals' income profiles and demographics over the levels of financial anxiety?

4.2 Hypotheses

The first main component of mental accounting is the framing of gains and losses by individuals. In mental accounting literature, hedonic framing is described as how people code the gains and losses in a way that they maximize psychological attractiveness while minimizing pain and regret during decision-making. This indicates that two smaller gains are valued more highly than a single larger gain of equal worth. Equivalently, the integration of two distinct losses into a single greater loss will be viewed as less painful (Thaler, 1999). This is due to the value function

for losses being convex, resulting in a higher emotional load for losses when compared to gains and people will attempt to maximize their happiness by framing these outcomes such that they will separate positive outcomes and merge negative outcomes for the psychological benefits (Kahneman & Tversky, 1979; Thaler, 1985).

Additionally, previous research indicates that anxious people exhibit an attentional bias toward threat-related information causing them to become more sensitive to evaluations of situational outcomes and they have induced perceptions of uncertainty (Bar-Haim et al., 2005; Gu et al., 2010). Gambetti and Giusberti (2012) find that high levels of anxiety induce the perceptions of risks in a given situation due to individuals' disproportional sensation about loss outcomes (Gambetti & Giusberti, 2012). Since the main purpose of mental accounting is to reduce the individual's cognitive load while following personal finances and framing the gains and losses in a hedonically efficient way (Thaler, 1999).; we suspect that financial anxiety could cause significant individual differences in mental accounting. Therefore, we hypothesize that hedonic framing is a mechanism used by people to cope with the negative emotional load of financial anxiety and stress. So, the first hypothesis of the study is as follows:

H1: Individuals' level of financial anxiety has a positive relationship with the prevalence of hedonic framing behavior.

Second, money is fungible where the value of money in an account is identical to the money in another account as in financial reports. That is, "dollar is a dollar". However, one of the core components of mental accounting is that people categorize their budgets into distinct accounts such as consumption categories, income, and wealth accounts where they violate the fungibility of money mainly due to self-control biases (Heath & Soll, 1996; Thaler, 1990, 1999). A direct result of this phenomenon is that people label their incomes with respect to the sources i.e. the way they are acquired and these labels are governing factors of how people want to spend these funds (McGraw et al., 2003; Levav & McGraw, 2009). For example, an experimental study conducted by Epley et al. (2006) showed that when people are

given an unexpected income, they are more oriented towards saving if they label that unexpected income as a “tax refund” rather than “bonus income”.

According to the Behavioral Life-cycle Hypothesis, people classify their wealth into three mental accounts: “current income”, “current assets” and “future income” where the propensity to spend from these funds is highest in the “current income” and lowest in the “future income” (Shefrin & Thaler, 1988). Also, it has been theorized that the disparities of rules governing these mental accounts are not random; rather, they are evolved as a means of assisting individuals to save more and it requires self-control i.e. individual willpower to maintain funds during financial decision-making (Thaler & Shefrin, 1981; Shefrin & Thaler, 1988, 2004). Shefrin and Thaler (1988) theorize that people’s resistance to unhealthy spending and saving behavior due to mental accounting can be characterized by a willpower variable where people with higher willpower will have a less marginal propensity to consume. Their study reveals that the willpower cost is lowest in the “future income” accounts (reluctance to spend, easier to resist temptation) and highest in the “current income” accounts (easier to spend, difficult to resist temptation).

Strömback et al. (2017) explored the effects of self-control on people’s financial behavior and expanded the Behavioral Life-cycle Hypothesis to overall financial behavior where they showed that people with good self-control are more likely to save money, have better general financial behavior, and have lower anxiety due to financial matters. Moreover, Peltier et al. (2016) conducted a study on college students and developed a framework explaining that self-control mistakes often lead to credit card debt accumulation and financial anxiety. Based on this premise, due to the lack of literature on the direct effects of financial anxiety on the mental accounting of discretionary savings, the study’s second hypothesis is as follows:

H2: As individuals’ financial anxiety levels increase; their inclination towards discretionary savings decreases during mental accounting.

The third main component of mental accounting is choice bracketing which is the cognitive mechanism of how people determine the boundaries when they have to

make a series of decisions; whether they make them one at a time or bracket them (Read et al., 1999; Thaler, 1999). Previous studies showed that people try to evaluate risky decisions depending on prior outcomes being prior gains or prior losses; where prior gains are observed to be stimulating risk-seeking behavior during decision-making and prior losses did not induce risk-seeking unless it provides a chance to break even (Thaler & Johnson, 1990; Thaler, 1999; Harinck et al., 2012). Furthermore, the way how these choices are bracketed significantly influences the attractiveness of particular decisions. A famous and vigorously studied example of this phenomenon is “Samuelson’s bet” in which a bet of 50/50 chance of either winning 200\$ or losing 100\$ is offered (P. A. Samuelson, 1963). Although the expected utility theorem, normative in nature, favors accepting the bet; it turns out most people reject the gamble, and interestingly, whereas they reject a single bet, some educated individuals are willing to accept the bet when it is repeated multiple times (P. A. Samuelson, 1963; Benartzi & Thaler, 1999).

Considering the implications of choice bracketing, Thaler et al. (1997) brought up the notion of myopic loss aversion in mental accounting. Myopic loss aversion is a pattern of financial behavior where people exhibit loss aversion and narrow framing i.e. frequently assessing the outcomes of their decisions within short terms (Thaler et al., 1997; Thaler, 1999; Rabin & Thaler, 2001). Previously, since myopic loss aversion is a descriptive theory and it explains human economic behavior more accurately than the expected utility theorem, it was commonly used for explaining multiple financial phenomena by various studies including but not limited to equity premium puzzle, disappointment aversion, and stock investment decisions (Benartzi & Thaler, 1995; Rabin & Thaler, 2001; Fielding & Stracca, 2007; B. Lee & Veld-Merkoulova, 2016).

Considering myopic loss aversion is a direct result of loss aversion and narrow framing, we believe these behavioral differences can predict one's susceptibility to myopic loss aversion. In fact, some studies showed that investors who evaluate their portfolios often and make frequent adjustments are observed to be more risk-averse than their counterparts and prefer less risky assets for their investments where

authors speculate that myopic loss aversion plays a significant role (Gneezy & Potters, 1997; Gneezy et al., 2003; Charness & Gneezy, 2010). Furthermore, as a part of disappointment aversion theory people who are anxious are more prone to check their investment portfolio often to make corrections (Fielding & Stracca, 2007).

Durand et al. (2019) experimented on individual differences in myopic loss aversion and compared its propensity concerning gender differences and Norman's 5 personality traits. Their results showed that when individuals' level of anxiety significantly contributes to their neuroticism levels (where anxiety is a subcomponent of neuroticism), they start to worry about their portfolios, and become more risk-averse than their low-anxiety counterparts. Based on these findings, we hypothesize that individuals' financial anxiety which is a distinct but interrelated construct of general anxiety would play an important role in predicting individual differences in myopic loss aversion. Thus, the third hypothesis of the study is as follows:

H3: People with higher levels of financial anxiety tend to exhibit myopic loss aversion more frequently during financial decision-making.

People with a greater degree of financial literacy are more likely to have a favorable risk perception and approach toward financial investments which leads to a higher financial behavioral intention to invest (Lim et al., 2018). Moreover, financially literate individuals are better equipped to manage their income and the amount they can invest or save in the future. People with a poor degree of financial literacy, particularly those who are unfamiliar with stocks and bonds, are less likely to invest in the stock market (van Rooij et al., 2011). Efforts to promote financial literacy can also play a role in enhancing savings rates and better allocation of capital within society (Cole et al., 2011). In contrast, people with a lack of financial literacy may suffer negative effects as a result of their financial actions and may lose money (Lusardi & Mitchell, 2007).

Although there are conflicting findings about the effects of financial literacy on certain behavioral biases; several studies show that financial literacy has a

moderating effect on individual differences in behavioral biases such as overconfidence, and disposition effect during financial decision-making (Dhar & Zhu, 2006; Jonsson et al., 2017; Ahmad & Shah, 2020). Baker et al. (2019b) argue that financial literacy has a positive relationship with mental accounting tendency; however, their survey data measures the individual tendency of mental accounting with only three self-reported survey items where the focus is on the diversification heuristic, ignoring other fundamental components of mental accounting.

To our knowledge, there is a gap in the literature about individual differences in mental accounting and its dominant factors. Considering the overall implications of financial literacy on financial well-being and the predisposition of behavioral biases; we hypothesize that financial literacy might be a mediator for negative outcomes of mental accounting during financial decision-making. Therefore, the study's following hypotheses are as follows:

H4: Individuals who have higher levels of financial literacy are less likely to demonstrate hedonic framing.

H4A: Objective financial literacy levels have a statistically significant negative relationship with the prevalence of hedonic framing behavior.

H4B: Subjective financial literacy levels have a statistically significant negative relationship with the prevalence of hedonic framing behavior.

H5: People who have higher levels of financial literacy will prefer higher amounts of discretionary savings during mental accounting than people who don't have basic financial literacy.

H5A: Objective financial literacy levels have a statistically significant positive relationship with the discretionary savings tendency during mental accounting process.

H5B: Subjective financial literacy levels have a statistically significant positive relationship with the discretionary savings tendency during mental accounting process.

H6: Individuals who have higher levels of financial literacy are less likely to engage in myopic loss aversion during financial decision-making.

H6A: Objective financial literacy levels have a statistically significant negative relationship with the tendency of myopic loss aversion during financial decision-making.

H6B: Subjective financial literacy levels have a statistically significant negative relationship with the tendency of myopic loss aversion during financial decision-making.

The mediating effect of one's financial knowledge over that person's financial anxiety is a controversial topic investigated in multiple studies. Several studies argue that financially anxious people feel lower levels of perceived control (mastery) and have negative perceptions of their financial situation in comparison to their peers, and have inaccurate subjective assessments of their financial knowledge (Potter et al., 2020; Britt et al., 2016, 2015).

Furthermore, Lind et al. (2020) report that subjective and objective financial literacy independently affects financial anxiety, and individuals having lower financial literacy feel more anxious about financial matters than those with higher financial literacy. Interestingly, Britt et al. (2016) argue that subjective financial literacy has a positive relationship with financial stress levels, and objective financial literacy has been found to have no effect on financial stress. Contrarily, Liu and Zhang (2021) report that objective financial literacy improves financial confidence and self-control, hindering risky financial behavior while subjective financial literacy still has a higher impact on risky credit behavior than objective financial literacy. According to Allgood and Walstad (2016), combining the effects of subjective and objective financial literacy provides a better model to understand the positive implications of financial literacy over financial behavior. Additionally, Shapiro and Burchell (2012) explain that financial illiteracy and mismanagement correlate to a strong negative emotional response to financial anxiety.

Based on these findings, we contemplate that one's financial anxiety, although governed by various other factors, is likely affected by her/his financial literacy. Hence, the next hypothesis of the study is as follows:

H7: Financially literate people experience lower levels of financial anxiety.

H7A: Objective financial literacy levels have a statistically significant negative relationship with individuals' financial anxiety levels.

H7B: Subjective financial literacy levels have a statistically significant negative relationship with individuals' financial anxiety levels.

Multiple studies examined the relationship between financial well-being and personality traits. For instance, anxiety is shown to have a strong correlation with poor financial well-being and excessive debt accumulation (Norvilitis et al., 2003; Drentea, 2000; Lange & Byrd, 1998). Furthermore, Tokunaga et al. (1993) report that unsuccessful credit users have poor self-control, perceive money as a source of power, and had more anxiety about financial matters than successful users.

In addition, individuals who are worried about their finances face plenty of unfavorable repercussions. For example, students who are financially stressed take on greater student loan debt, have more credit cards, and are less likely to pay off their credit card amounts in full each month (Britt et al., 2015; Archuleta et al., 2013; Joo et al., 2008). For this reason, we hypothesize that individuals' income profiles i.e. variety of income sources and income levels are significant factors affecting financial anxiety. So, the last hypotheses of the study are:

H8: Income levels, income source variety, and self-reported financial satisfaction levels have a negative relationship with the individual's financial anxiety levels.

H8A: As the individuals' monthly income increases, they demonstrate lower levels of financial anxiety.

H8B: People who have multiple sources of income exhibit lower levels of financial anxiety.

H8C: The amount of discretionary income has a negative relationship with an individual's financial anxiety levels.

H8D: People who have higher levels of financial satisfaction demonstrate lower levels of financial anxiety.

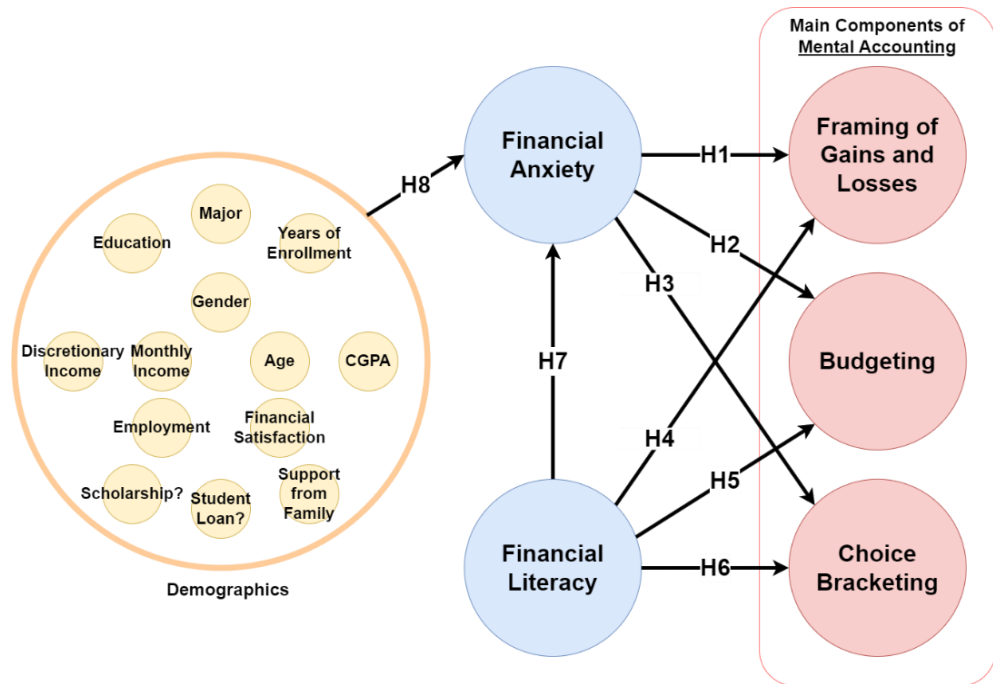


Figure 4.1: Theoretical model of the study

Figure 4.1 shows the theoretical model of this study and its corresponding hypotheses. The research questions and their corresponding hypotheses are presented in Table 4.1.

Table 4.1: Matching of research question with corresponding hypotheses

Research Question	Hypotheses
Can people's level of financial anxiety predict individual differences in mental accounting?	H1, H2, H3
Is having basic financial literacy effective for handling the negative outcomes of mental accounting?	H4, H5, H6
Is there a relationship between levels of financial anxiety and financial literacy?	H7
What are the implications of individuals' income profiles and financial satisfaction over the levels of financial anxiety?	H8

4.3 Sampling and Data Collection Method

In this section, we present our sampling and data collection methodology employed in the survey study. In Section 4.3.1, we explain our sampling technique, the prerequisites for survey participants, and the details of research data collection. In Section 4.3.2, we explain the design of the survey questionnaire administered to participants and list the questionnaire items. In Section 4.3.3, we provide the definitions of the dependent, independent, and control variables utilized in our data analyses.

4.3.1 Sampling

This study focused on investigating the relationship among financial anxiety, financial literacy, mental accounting, and socio-economic demographics. The population of the study was defined as students, over the age of 18, who are currently enrolled in higher education programs in Turkey. During the sampling process, our criterion was having an active enrollment record in either one of the associate degree, bachelor's degree, master's degree, or doctoral degree programs in universities.

To effectively manage the time, cost, and accessibility limitations convenience sampling which is a non-probabilistic sampling method was utilized. In convenience sampling, researchers use the samples they find most convenient without a certain sampling pattern (Galloway, 2005). An online questionnaire was designed and sent to 356 university students from Galatasaray University and Middle East Technical University. Participants were contacted individually and an URL was given to those who agreed to participate in the study. 6 participants have been filtered out from the survey due to inconsistent information leaving a dataset of 350 participants. All participants were unpaid volunteers. The research data were collected between November 2021 – December 2022.

4.3.2 Questionnaire Design

An online survey was administered to the participants. Students from Galatasaray University and Middle East Technical University responded to the questionnaire that consisted of four main blocks: (1) Demographics (2) Financial Anxiety Measurement (3) Financial Literacy Measurement (4) Mental Accounting Cases. The survey study was conducted in the Turkish language. There were no imposed time limits for the respondents.

Firstly, students were asked to fill out a 12-item demographics form which collected the following information: gender, age, enrolled program, grade point average, whether the student has ever taken a finance-related course, years enrolled in the current program, employment status, average monthly income level, employment status, scholarship status, student loan status, allowance from family or friends, and discretionary income level. No personally identifiable data were collected. Table 4.2 summarizes the list of collected socio-economic demographics.

The second block of the questionnaire consisted of a single-item financial satisfaction measure and an 11-item financial anxiety measure. For the self-reported financial satisfaction measure, we utilized a single question that asks the following question: “*How satisfied are you with your overall current financial situation?*”. This single-item method for the measurement of overall financial satisfaction is a previously used item in the literature (Archuleta et al., 2011, 2013). The respondents gave scores on a 10-point Likert-type scale from 1 to 10 where 1 corresponds to “very dissatisfied”, and 10 corresponds to “very satisfied”.

Table 4.2: Socio-economic demographics collected from the survey participants

#	Demographics	Answer Options
1	Gender	[Male] [Female]
2	Age	[18-20] [21-23] [24-26] [27-29] [30+]
3	Enrolled Program	[Associate Degree Student] [Bachelor's Student] [Master's Student] [Ph.D. Student]
4	Grade Point Average	[4.00-3.51] [3.50-3.01] [3.00-2.51] [2.50-2.01] [2.00-1.51] [1.50-1.01] [1.00-0.51] [0.50-0.00] [Not Available]
5	Taken a Finance Related Course	[Yes] [Currently Taking] [No]
6	Years Enrolled in Current Program	[1] [2] [3] [4] [5] [6+]
7	Average Monthly Income	[0 TL - 500 TL] [501 TL - 1000 TL] [1001 TL - 1500 TL] [1501 TL - 2000 TL] [2001 TL - 2500 TL] [More than 2500TL]
8	Employment Status	[Full-time] [Part-time] [Unemployed]
9	Receiving Scholarship	[Yes] [No]
10	Receiving Student Loan Stipend	[Yes] [No]
11	Receiving Allowance from Friends & Family	[Yes] [No]
12	Discretionary Income	[0 TL - 250 TL] [251 TL - 500 TL] [501 TL - 750 TL] [751 TL - 1000 TL] [1001 TL - 1250 TL] [1251 TL - 1500 TL] [More than 1500 TL]

For the measurement of financial anxiety levels, an 11-item financial anxiety measure was developed by adapting items from financial anxiety scales developed by Shapiro and Burchell (2012), and Archuleta et al. (2013). Overall, 7 items from Archuleta et al. (2013) and 4 items from Shapiro and Burchell (2012) were used. Respondents gave scores on a 5-point Likert-type scale from 1 to 5 where 1 corresponds to “Strongly Disagree”, and 5 corresponds to “Strongly Agree”. Table 4.3 shows the items in the financial satisfaction and financial anxiety measure used in our study.

Table 4.3: Items of financial anxiety measures and the corresponding studies

Financial Satisfaction Measure			
Study	#	Statement	Scale
(Archuleta et al., 2013, 2011)	1	How satisfied are you with your overall current financial situation?	<u>10-point Likert-type</u> 1: [Very dissatisfied] 10: [Very satisfied]
Financial Anxiety Measure			
(Archuleta et al., 2013)	1	I feel anxious about my financial situation	<u>5-point Likert-type</u> 1: [Strongly disagree] 5: [Strongly agree]
	2	I have difficulty sleeping because of my financial situation	
	3	I have difficulty concentrating on my school/or work because of my financial situation	
	4	I am irritable because of my financial situation.	
	5	I have difficulty controlling/worrying about my financial situation.	
	6	My muscles feel tense because of worries about my financial situation.	
	7	I feel fatigued because I worry about my financial situation.	
(Shapiro & Burchell, 2012)	8	I am worried about the debt I will have when I complete my university education	
	9	Thinking about my personal finances can make me feel anxious	
	10	Discussing my finances can make my heart race or make me feel stressed	
	11	I do not think I am doing as well as I could academically because I worry about money	

The third block of the questionnaire was designed to understand individual levels of subjective and objective financial literacy. For measuring the individual subjective financial literacy levels, we used the same methodology as Lind et al. (2020) where a question that asked participants about how confident they feel regarding their knowledge of financial matters was used on a 7-point scale. In our study, we utilized a 10-point Likert scale where participants were asked to give scores from 1 to 10 where 1 corresponds to “Very unconfident”, and a score of 10 corresponds to “Very confident”. Table 4.4 outlines the subjective financial literacy component of the questionnaire.

Table 4.4: Subjective financial literacy measure used in the study

Study	Statement	Scale
(Lind et al., 2020)	In general, how confident do you feel regarding your knowledge of financial matters?	10-point Likert-type 1: [Very unconfident] 10: [Very confident]

To measure the objective financial literacy levels, a 5-item financial literacy measure was utilized. These 5-items were adapted from the 2009 National Financial Capability Study (NFCS) which was also used by Lusardi and Mitchell (2011), and Hastings et al. (2013). Hastings et al. (2013) explained that NFCS is a large national survey of the individual financial capabilities among the adult population in the United States where the selected five items from their study are known as the Big Five.

These five items were used to objectively evaluate people's understanding of the following concepts: compounding interest, inflation, risk diversification, mortgages, and bond pricing. When structuring the answers, in addition to the regular options, we also included the "Do not know" and the "Refuse to answer" options in the questionnaire. Lusardi and Mitchell (2011) explained that these two answer options aid the participants who do not know the answer or the ones refusing the answer by not forcing them to choose a random answer option which allows better differentiation across different levels of financial literacy. The outline of the objective financial literacy measure was shown in Table 4.5.

Table 4.5: Items of objective financial literacy measure

#	Concept	Statement	Answer Options
1	Interest Rates and Compounding	Suppose you had 100 TL in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?	<u>[More than 102 TL]</u> [Exactly 102 TL] [Less than 102 TL] [Do not know] [Refused to answer]
2	Inflation	The money in your savings account has received interest with an annual net interest rate of 1% for the period of 01/01/2020-01/01/2021. In the same period, the annual inflation rate was announced as 2%. In this case, which of the following can be said about the purchasing power of the money in your savings account at the end of the period compared to the beginning of the period?	[Increase] [Stays the same] <u>[Decrease]</u> [Do not know] [Refused to answer]
3	Risk Diversification	Do you think that the following statement is true or false: Buying a single company stock usually provides a safer return than a stock mutual fund?	[True] <u>[False]</u> [Do not know] [Refused to answer]
4	Mortgages	Do you think that the following statement is true or false: A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less?	<u>[True]</u> [False] [Do not know] [Refused to answer]
5	Bond Pricing	If interest rates rise, what will typically happen to bond prices?	[They will rise] <u>[They will fall]</u> [They will stay the same] [There is no relationship] [Do not know] [Refused to answer]

Source: Adapted from the 2009 NFCS State-by-State Survey Questionnaire (pp. 30-31)

The answer evaluated as correct is shown in bold and underlined in the last column.

The fourth and final block of the questionnaire was designed under three subsections for measuring individual differences in the three main components of mental accounting which are framing of gains and losses, budgeting, and choice bracketing.

We have adopted the four original hedonic framing cases that were developed and tested by Thaler (1985). Regarding the hedonic framing hypothesis, Thaler (1985) identifies four unique cases of how people frame multiple outcomes together which are segregation of gains, integration of losses, integration of smaller losses with larger gains, and segregation of smaller gains from larger losses (i.e. silver-lining). All four items from Thaler's (1985) study were translated into Turkish language and dollar values of the outcomes were coded in Turkish lira approximations. In addition, we added the phrase "On the same day" to all item statements to prevent the potential effects of temporal separation. Table 4.6 depicts the measure used for the framing of gains and losses assessment.

To test the budgeting component of mental accounting, we adopted the open-ended "*Saving Questionnaire*" used in Shefrin and Thaler's (1988) "*The Behavioral Life-Cycle Hypothesis*" article. The questionnaire consisted of 3 cases where each case measured the tendency of discretionary savings on different mental wealth accounts. The questionnaire was translated into the Turkish language and dollar values were approximated to the Turkish Lira equivalents. Participants responded with numerical values of their intended discretionary savings greater than or equal to zero. The questionnaire items were listed in Table 4.7.

Table 4.6: Questionnaire items of the framing of gains and losses during mental accounting

Mental Accounting – Framing of Gains and Losses

#	Concept	Statement	Answer Options
1	Multiple Gains	Zeynep has taken part in two lotteries. On the same day, she received 500 TL from the first draw and 250 TL from the second draw. Elif played in a single lottery and earned 750 TL as a result. Who do you believe was the happiest?	<u>[Zeynep]</u> [Elif] [No difference]
2	Multiple Losses	Alper received a notification from the tax office where he was registered, and as a result of an accounting error, he learned that he had a tax debt of 1000 TL in addition to the tax debt he had already paid. On the same day, he received another notification from the tax office and learned that he owed 500 TL more in taxes apart from all payments. Berkay, on the other hand, received a notification from the tax office where he was registered, and as a result of an accounting error, he learned that he had a tax debt of 1500 TL in addition to the tax debt he had already paid. Who do you think was more unhappy?	<u>[Alper]</u> [Berkay] [No difference]
3	Mixed Gain	Burcu learned that the lottery ticket she bought for the first time in her life won 500 TL. On the same day, as a result of an accident, Burcu's phone was broken and she learned that 400 TL was needed for repair. Defne learned that the lottery ticket she bought for the first time in her life won 100 TL. Who do you think was happier?	[Burcu] <u>[Defne]</u> [No difference]
4	Mixed Loss	Selim's car was hit by another car while it was parked in the parking lot and a cost of 2000 TL was incurred. On the same day, Selim learned that he had won 400 TL from a lottery he participated in. Deniz's car was hit by another car while it was parked in the parking lot and a cost of 1600 TL was incurred. Who do you think was more unhappy?	[Selim] <u>[Deniz]</u> [No difference]

Source: Adapted from Thaler (1985, pp. 203-204)

The answer coded as “hedonic framing exists” is written in bold and underlined.

Table 4.7: Questionnaire items of budgeting during mental accounting
Mental Accounting - Budgeting

Please answer the questions below by considering how you would act. There is no right or wrong answer to the questions. Answer the following questions assuming you have a full-time job and assuming they will happen this week.

#	Mental Account	Statement	Answer Options
1	Current Income	You are entitled to premium payment as a reward at your workplace. Your premium will be paid by adding 1000 TL to your net salary every month for 1 year. In this case, from the month you earned the bonus, how much would you expect to see an increase in your average monthly expenditure for 1 year?	I expect _____ TL increase in my monthly expenditure
2-1	Current Assets	You are entitled to premium payment as a reward at the workplace you work for. Your premium will be paid at once by adding 12000 TL to your net salary in the month you are eligible for the premium. In this case, how much would you expect to see an increase in your spending in the month you earned the premium?	I expect _____ TL increase in my expenditure for the month I received the premium
2-2		(Cont.) How much of an increase do you expect to see in your average monthly spending in a year after the month you qualify for the premium?	I expect _____ TL increase in my monthly expenditure
3	Future Income	As a result of the death of a distant relative, you learned that you are entitled to an inheritance of 12000 TL net. For various reasons, you will not be able to spend this inheritance for 5 years and during this period, annual interest will be applied to the inheritance. After 5 years, 12000 TL net plus interest income will be deposited into your account. In this case, how much would you expect your average monthly expenditure to increase in the first year you learn that you are entitled to an inheritance?	I expect _____ TL increase in my monthly expenditure

Source: Adapted from Shefrin & Thaler (1988, p. 619)

Participants responded with numerical expenditure values ≥ 0

In the final subsection of the mental accounting block, we administered a 3-item test for measuring the myopic loss aversion propensity. Originally known as Samuelson's Bet which was developed by Paul Samuelson (1963) to investigate a decision-making anomaly regarding the fallacy of large numbers; Benartzi and Thaler (1999) utilized the same test under three different conditions to measure the tendency of myopic loss aversion.

Firstly, Benartzi and Thaler (1999) asked students and coffee shop workers whether they were willing to accept a single play of Samuelson's bet where a coin is

flipped and the participant has a 50%-50% chance of winning \$20 or losing \$10. They also offered the same coin-flip bet to MBA students with higher stakes with the chances of winning \$100 or losing \$50. Secondly, the participants were asked whether they were willing to accept the same bet 100 times instead of just once which implies a much higher expected value. Finally, to see whether participants would change their minds after seeing the approximate distribution of net wins/losses; they repeated the second item but this time they showed the net wins/losses distribution of 100,000 people playing the same bet 100 times over. In our questionnaire, we translated all three bets into the Turkish language and used approximate Turkish Lira equivalents of 200 TL wins and 100 TL losses. A simulation script was written in Python (ver. 3.9.5) and a distribution graph of net wins/losses for 30,000 participants accepting Samuelson's Bet 100 times was generated (see Figure 4.2 and Appendix 2A). The winner of the highest number of bets won 11300 TL and the person with the highest loss was -1000 TL with a median of 5000 TL winnings. The details of the simulation script were given in Appendix 2A. Table 4.8 outlines the administered myopic loss aversion questionnaire.

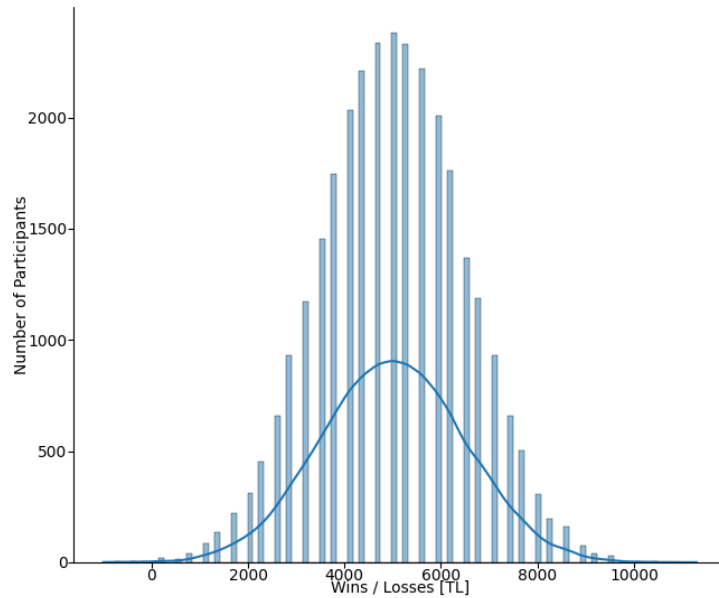


Figure 4.2: Calculated results of net wins/losses of 30000 people accepting Samuelson's bet.

Table 4.8: Questionnaire items of myopic loss aversion during mental accounting
Mental Accounting – Choice Bracketing

Please answer the questions below by considering how you would act. There is no right or wrong answer to the questions.

#	Concept	Statement	Answer Options
1	Single Bet	A friend of yours asked for a bet with you and offered to flip a coin. If the coin turns tails, your friend will give you 200 TL; If it comes up heads, you will give your friend 100 TL. You fully trust your friend and you can ideally consider coin flip to be 50%-50%. Would you agree to this bet?	[Yes] <u>[No]</u>
2	Multiple Bets	Regardless of your answer to the previous question; Your friend offers you to play the same bet 100 times in a row. The coin will be flipped 100 times. Your friend will give you 200 TL each time coin flips tails; you will give your friend 100 TL each time coin flips heads. You fully trust your friend and you can ideally consider coin flip to be 50%-50%. Would you agree to this bet?	[Yes] <u>[No]</u>
3	Multiple Bets with Results	Net wins/losses of 30,000 people who accepted the bet in the previous question are given in the image (shown in Figure 4.2). Considering this information, would you agree to this bet?	[Yes] <u>[No]</u>

Source: Adapted from Benartzi & Thaler (1999, pp. 367-369)

The answer coded as “myopic loss aversion exists” is written in bold and underlined.

Turkish translated questionnaire including all the item statements, answer options, and the given graph is provided in Appendix 1.

4.3.3 Variables of the Study

This study uses several sets of variables for statistical testing of our hypotheses. The data collection method for these variables and the related studies are explained in Section 4.3.2. Table 4.9 and Table 4.10 summarizes the dependent, independent, and control variables of the study. The details and the related literature on the definition and calculation of the variables are provided below.

Table 4.9: The dependent and independent variables of the study

Variable	Definition	Calculation
Dependent Variables		
hed_{1-4}	Responses to hedonic framing cases	The variables are coded as 1 if the framing response fits the hedonic framing hypothesis; otherwise coded as 0 (Thaler, 1985)
$discSav$	The total amount of discretionary savings made in three budgeting cases	$discSav_{CI} + discSav_{CA} + discSav_{FI}$
$myoExist$	Existence of myopic loss aversion	$\begin{cases} \text{if } myoPattern = 1; \text{ then } myoExist = 0 \\ \text{if } myoPattern \neq 1; \text{ then } myoExist = 1 \end{cases}$
$finAnx^*$	The total score on the financial anxiety measure	$\sum_{i=1}^{11} anx_i$
Independent Variables		
$subjLit$	Subjective financial literacy	10-point Likert-type Scale
$objLit$	The total score on the objective financial literacy measure	$\sum_{i=1}^5 lit_i$
$income$	Average monthly income	Coded on an ordinal scale from 1 to 6 in the following order: [0 TL - 500 TL], [501 TL - 1000 TL], [1001 TL - 1500 TL], [1501 TL - 2000 TL], [2001 TL - 2500 TL], [More than 2500TL]
$incomeSource$	Total number of monthly income sources	$employment + scholarship + credit + stipend$
$discInc$	Monthly discretionary income	Coded on an ordinal scale from 1 to 7 in the following order: [0 TL - 250 TL], [251 TL - 500 TL], [501 TL - 750 TL], [751 TL - 1000 TL], [1001 TL - 1250 TL], [1251 TL - 1500 TL], [More than 1500 TL]
$finSat$	Financial satisfaction	10-point Likert-type Scale

* $finAnx$ is used as a dependent variable only for testing H7 and H8.

For testing H1, H2, and H3, $finAnx$ is utilized as an independent variable.

Table 4.10: The control variables of the study

Control Variables		
Variable	Definition	Calculation
<i>gender</i>	Gender	Nominal variable Male (0) or Female (1)
<i>age</i>	Age group	Coded on an ordinal scale from 1 to 5 in the following order: [18-20], [21-23], [24-26], [27-29], [30+]
<i>educ</i>	Enrolled degree program	Coded on an ordinal scale from 1 to 4 in the following order: [Associate Degree Student], [Bachelor's Student], [Master's Student], [Ph.D. Student]
<i>educDur</i>	Years enrolled in the program	Coded on an ordinal scale from 1 to 6 in the following order: [1], [2], [3], [4], [5], [6+]
<i>finEdu</i>	Financial education history	A dichotomous variable is coded as 1 for those who took or currently taking a finance-related course; and, 0 for those who did not.

Participants' financial anxiety is measured by an 11-item questionnaire on a 5-point Likert-type scale. In Likert-type scales, the score for each individual can be calculated by finding the average or sum of the numerical values of the options chosen (Likert, 1932). Using the survey data, a variable namely *finAnx* is defined which refers to the financial anxiety level of the participant. This variable is calculated as the sum of individual responses (anx_1-anx_{11}) to all 11 items on the financial anxiety scale.

$$finAnx = \sum_{i=1}^{11} anx_i$$

Participants' subjective literacy is measured by a single, 10-point Likert-type scale question where higher scores indicate that the respondent is confident in their financial literacy. The variable *subjLit* is defined which refers to the subjective financial literacy score of the participant.

Participants' objective financial literacy is measured by a 5-item knowledge-based questionnaire. These questions are referred to as the Big Five questions of financial literacy which is an extension of previously used the Big Three (Hastings et al., 2013). The variable *objLit* is defined which refers to the objective financial literacy quiz score of the participant. This variable is computed as the sum of scores

(true answer:1 / false answer:0) of each correctly answered financial literacy question, lit_{1-5} . Also, the responses of “Do not know” and “Refused to answer” are coded as 0.

$$objLit = \sum_{i=1}^5 lit_i$$

In H1 and H4, we investigate the relationship between hedonic framing behavior, objective/subjective financial literacy, and financial anxiety. Hence, the dependent variables for these two hypotheses are four dichotomous variables that represent the existence of hedonic framing behavior for each one of the four concepts being multiple gains (hed_1), multiple losses (hed_2), mixed gain (hed_3), and mixed loss (hed_4). These dichotomous variables are binary coded where the value 1 is assigned for cases when the respondents displayed hedonic framing behavior as described by Thaler (1985). The respondents who chose other options are coded as 0.

In H2 and H5, we examine the association between the amount of discretionary savings during mental accounting, financial anxiety, and objective/subjective financial literacy. Therefore, the dependent variable for these two hypotheses is the amount of discretionary savings, $discSav$, which is calculated as the sum of discretionary savings made by respondents after being awarded a bonus payment of 12000TL on three mental accounts which are current income, current assets, and future income. This study was adapted from Shefrin and Thaler (1988) in which they reported annual total consumption (TC) amounts. Shefrin and Thaler (1988) defined the term “discretionary saving” as when a person engages in saving more than the maximum pension deduction rate offered to him where one should use some willpower effort to generate the associated saving and avoid depleting those savings and refrain from borrowing against future earnings.

Therefore;

$$\begin{aligned}
 discSav &= discSav_{CI} + discSav_{CA} + discSav_{FI} \\
 discSav_{CI} &= 12000TL - TC_{CI} = 12000TL - (12)(bud_1) \\
 discSav_{CA} &= 12000TL - TC_{CA} = 12000TL - (bud_{21} + (11)(bud_{22})) \\
 discSav_{FI} &= 12000TL - TC_{FI} = 12000TL - (12)(bud_3)
 \end{aligned}$$

Where $discSav_{CI}$, $discSav_{CA}$, $discSav_{FI}$, TC_{CI} , TC_{CA} , and TC_{FI} correspond to discretionary savings generated and annual total consumption amounts on current income, current assets, and future income mental accounts respectively. The discretionary savings for each mental account are calculated by subtracting the annual total consumption amount from the total bonus payment of 12000TL. The annual total consumption amounts are calculated by using questionnaire variables bud_1 , bud_{21} , bud_{22} , and bud_3 . That is, bud_1 is defined as the average monthly increase in consumption after being awarded a total bonus payment of 12000TL which will be paid by 1000TL per month for twelve months. bud_{21} is defined as the increase in consumption after receiving a 12000TL bonus paid as a lump sum in the same month; whereas, bud_{22} is defined as the increase in average monthly consumption for the rest of the year (11 months) after receiving the lump sum payment. Lastly, bud_3 refers to the increase in average monthly consumption in the same year after the participant learns that he/she will receive a 12000TL inheritance money which will be paid after five years with interest.

In H3 and H6, we explore the relationship between myopic loss aversion behavior, financial anxiety, and subjective/objective financial literacy. Thus, the dependent variable for these two hypotheses is the existence of myopic loss aversion behavior, *myoExist*, which is a dichotomous variable that is coded as 0 for the participants who did not demonstrate myopic loss aversion and accepted all three of the bets offered in the questionnaire; otherwise, it is coded as 1. To estimate the *myoExist*, we used a similar methodology as Benartzi and Thaler (1999) where they classified the participants into 8 patterns with respect to their willingness to accept each bet (i.e. single bet, multiple bets, and multiples bets by showing the explicit

distribution of winnings). Thus, the variable *myoPattern* is defined according to the patterns shown in Table 4.11.

Table 4.11: Patterns for willingness to accept the "Samuelson's Bet"

Pattern	One bet	Multiple Bets	Multiple Bets with Explicit Distribution
1	Accept	Accept	Accept
2	Accept	Accept	Reject
3	Accept	Reject	Accept
4	Accept	Reject	Reject
5	Reject	Accept	Accept
6	Reject	Accept	Reject
7	Reject	Reject	Accept
8	Reject	Reject	Reject

Source: Patterns are adapted from Benartzi & Thaler (1999)

After the pattern classification, we estimate the *myoExist* as the following:

$$myoExist = \begin{cases} \text{if } myoPattern = 1; & \text{then } myoExist = 0 \\ \text{if } myoPattern \neq 1; & \text{then } myoExist = 1 \end{cases}$$

In H7, we investigate how subjective financial literacy and objective financial literacy influence individual financial anxiety levels where the dependent variable is the *finAnx* and the independent variables are the subjective financial literacy (*subjLit*), and objective financial literacy (*objLit*).

Finally, in H8, we explore the effects of monthly discretionary income, average monthly income, number of income sources, and financial satisfaction on individuals' financial anxiety levels. Considering the H8, the dependent variable is the individuals' financial anxiety levels (*finAnx*); whereas, the independent variables are monthly discretionary income (*discInc*), monthly average income (*income*), number of income sources (*incomeSource*), and financial satisfaction (*finSat*).

In the survey, participants are presented with options indicating their monthly discretionary income, and monthly average income ranges in which they chose the options corresponding to their levels. The income ranges provided in the variables *discInc* and *income* are evenly distributed (250TL intervals for *discInc*, 500TL intervals for *income*). Four dichotomous variables are utilized for assessing

participants' income sources which are employment (*employment*), scholarship (*scholarship*), student loan stipend (*credit*) (such as credits issued by the Turkish government to be paid after graduation), and stipend payments from family and friends (*stipend*). If the participant declares that he/she regularly receives income from these sources, the corresponding variables are coded as 1; if not, 0. Although the question regarding employment provided options for “full-time” and “part-time” employment individually; both of these options are coded as 1 indicating that the participant has an income source via employment. Then, the number of income sources (*incomeSource*) is estimated as follows:

$$incomeNo = employment + scholarship + credit + stipend$$

Participants' financial satisfaction is measured by a single question on a 10-point Likert-type scale. Higher scores on the financial satisfaction scale indicate that the respondent is satisfied with his/her financial status. The variable *finSat* is defined that refers to the participants' financial satisfaction score.

To account for the confounding effects of gender (*gender*), age (*age*), enrolled degree program (*educ*), years enrolled in the degree program (*educDur*), and financial education history (*finEdu*); demographics regarding these factors are also collected in our survey. These variables are added to our regression models as control variables.

4.4 Results

This section discusses the details of the data analysis methodology, and the statistical results obtained from the survey study. Section 4.4.1 provides information on the statistical analysis methods utilized and the software packages used in our study. Section 4.4.2 gives descriptive statistics on the demographics of the survey participants. In Section 4.4.3, we provide the details of the descriptive statistics on the mental accounting case studies where we tabulate our findings on students' hedonic framing, budgeting, and myopic loss aversion behavior. In Section 4.4.4 and Section 4.4.5, we show the details of the reliability and validity analyses conducted

on our measures respectively, and interpret the results. Finally, in Section 0, we show the results of logistic and multiple linear regression analyses performed and discuss our findings.

4.4.1 Data Analysis Method

The collected survey forms are analyzed using IBM SPSS Statistics 26 software. The data were collected between the period of November 2021-December 2022. We organized the presentation of the empirical results of this study under four steps. Firstly, we present the frequency tables and descriptive statistics on the results of demographics, mental accounting case studies, and financial anxiety and financial literacy questionnaires. Secondly, we demonstrate the results of reliability analyses to provide evidence for the internal consistency of the measures used in this study. Thirdly, we introduce the details of the exploratory factor analyses conducted on the measures used in the study for data validation. Lastly, we show the results of regression analyses and discuss our findings.

4.4.2 Demographics of the Survey Participants

In this section, descriptive survey statistics regarding the demographics of the participants are discussed. Table 4.12 tabulates the participants' general demographic information.

182 male and 168 female students participated in our survey. The data represents both male (52.0%) and female (48.0%) participants sufficiently.

The majority of the participants are currently enrolled in bachelor's degree programs (85.4%) followed by master's (9.1%), doctorate (3.4%), and associate degree (2.0%) programs. This also explains that a large portion of the students who participated in our survey reported their age group as 18-20 (53.4%) followed by 21-23 (29.7%), 24-26 (8.3%), 27-29 (5.1%), and only 12 students reported that they are older than 30 (3.4%). 162 students reported that they are in their first year of enrollment (46.3%) followed by 67 second-year (19.1%), 54 third-year (15.4%), and 36 fourth-year (10.3%) students.

Considering the grade point averages, we observe that 133 students (38.0%) reported that their grade point averages are not yet available either because these students are in their first semester, or they are currently enrolled in their universities' preparatory language schools. Among those who reported their grade point averages, the largest group is [3.50-3.01] (18.6%) followed by [3.00-2.51] (14.6%), and [4.00-3.51] (13%). Only 7 students (2.1%) reported that they have grade point averages lower than 1.50. Since 38.0% of the students reported that their grade point averages are not available, we discarded the *gpa* variable and did not include it as a control variable in our analyses. Otherwise, including the *gpa* variable would require the list-wise deletion of 38% portion of our sample.

When students were asked whether they have ever taken a finance-related course 78 students (22.3%) reported that they have and 25 students (7.1%) reported that they are currently taking one; on the other hand, 247 (70.6%) students reported that they have never taken a finance-related course during higher education.

Table 4.12: Descriptive statistics of general demographics

Factor	Options	Frequency	Percentage
Gender	Male	182	52.0%
	Female	168	48.0%
	Total	350	100%
Age	[18-20]	187	53.4%
	[21-23]	104	29.7%
	[24-26]	29	8.3%
	[27-29]	18	5.1%
	[30+]	12	3.4%
	Total	350	100%
Enrolled Program	Associate Degree Student	7	2.0%
	Bachelor Student	299	85.4%
	Master's Student	32	9.1%
	PhD Student	12	3.4%
	Total	350	100%
Grade Point Average	[4.00 – 3.51]	48	13.7%
	[3.50 – 3.01]	65	18.6%
	[3.00 – 2.51]	51	14.6%
	[2.50 – 2.01]	33	9.4%
	[2.00 – 1.51]	13	3.7%
	[1.50 – 1.01]	3	0.9%
	[1.00 – 0.51]	3	0.9%
	[0.50 – 0.00]	1	0.3%
	Not Available	133	38.0%
	Total	350	100%

Taken a Finance Related Course	Yes	78	22.3%
	Currently Taking	25	7.1%
	No	247	70.6%
	<i>Total</i>	350	100%
Years Enrolled in Current Program	1	162	46.3%
	2	67	19.1%
	3	54	15.4%
	4	36	10.3%
	5	17	4.9%
	6+	14	4.0%
	<i>Total</i>	350	100%

Table 4.13: Descriptive statistics of financial demographics

Factor	Options	Frequency	Percentage
Average Monthly Income	[0 – 500 TL]	62	17.7%
	[501 – 1000 TL]	51	14.6%
	[1001 – 1500 TL]	58	16.6%
	[1501 – 2000 TL]	25	7.1%
	[2001 – 2500 TL]	74	21.1%
	[2500+ TL]	80	22.9%
	<i>Total</i>	350	100%
Employment Status	Full-time	34	9.7%
	Part-time	42	12.0%
	Unemployed	274	78.3%
	<i>Total</i>	350	100%
Receiving Scholarship	Yes	118	33.7%
	No	232	66.3%
	<i>Total</i>	350	100%
Receiving Student Loan Stipend	Yes	101	28.9%
	No	249	71.1%
	<i>Total</i>	350	100%
Receiving Allowance from Friends & Family	Yes	255	72.9%
	No	95	27.1%
	<i>Total</i>	350	100%
Discretionary Income	[0 – 250 TL]	114	32.6%
	[251 – 500 TL]	14	4.0%
	[501 – 750 TL]	9	2.6%
	[751 – 1000 TL]	42	12.0%
	[1001 – 1250 TL]	77	22.0%
	[1251 – 1500 TL]	46	13.1%
	More than 1500 TL	48	13.7%
	<i>Total</i>	350	100%

Table 4.13 presents the participants' financial demographics. Considering the monthly average income statistics, we observe a skewed distribution where 154 students (44.0%) reported that their monthly income is above 2000TL and 80 students (22.9%) reported their monthly income is more than 2500TL. On the other hand, 171 students (48.9%) stated that their monthly income is less than 1500TL.

Among this group, 62 students (17.7%) declared that their monthly income is even lesser than 500 TL.

Regarding their income sources, 76 students (21.7%) reported that they are employed. 34 (9.7%) students are employed full-time; and, 42 students (12.0%) are employed part-time. 118 students (33.7%) reported receiving a scholarship. Also, 101 students (28.9%) reported that they are receiving monthly stipends from their student loans which they are obligated to pay after graduation. 255 students (72.9%) reported that they regularly receive allowances from their families and friends.

In terms of discretionary income, the demographics indicate that 114 students (32.6%) have a monthly discretionary income of less than 250 TL which implies that students have almost no financial resources left after they pay mandatory bills like rent, utilities, and food. On the other hand, 161 students (48.8%) reported having discretionary incomes of more than 1000 TL.

4.4.3 Descriptive Statistics of Mental Accounting Survey Cases

Table 4.14 shows the frequencies of the students' hedonic framing preferences. The results demonstrate that most students prefer segregation when dealing with multiple gains and integration for multiple losses during the mental accounting of the multiple outcomes of the same type. On the other hand, when students face mixed outcomes, they prefer the integration of large gains with smaller losses and the segregation of large losses from smaller gains during mental accounting. In each case, our findings provide supporting evidence for the hedonic framing hypothesis where the majority of students' responses match Thaler's (1985) predictions.

Table 4.14: Frequency tables of students' hedonic framing preferences

Case	Framing Preference	Frequency	Percentage
Multiple Gains	Segregation	242	69.1%
	Integration	57	16.3%
	No difference	51	14.6%
	<i>Total</i>	<i>350</i>	<i>100%</i>
Multiple Losses	Segregation	57	16.3%
	Integration	220	62.9%
	No difference	73	20.9%
	<i>Total</i>	<i>350</i>	<i>100%</i>
Mixed Gain	Segregation	75	21.4%
	Integration	244	69.7%
	No difference	31	8.9%
	<i>Total</i>	<i>350</i>	<i>100%</i>
Mixed Loss	Segregation	250	71.4%
	Integration	50	14.3%
	No difference	50	14.3%
	<i>Total</i>	<i>350</i>	<i>100%</i>

Table 4.15 shows the discretionary savings allocated by the students in the budgeting study. Considering the Behavioral Life-cycle Hypothesis, we expected to see the lowest discretionary savings on the current income mental account followed by current assets and future income mental accounts (Shefrin & Thaler, 1988). However, our findings show that students' marginal propensity to consume is highest when the bonus is paid as a lump sum. These results contradict the predictions of the Behavioral Life-cycle Hypothesis. One possible explanation is that Shefrin and Thaler (1988) conducted this same study among MBA students who possibly have higher levels of financial literacy; wherein our study most of the participants are undergraduate students (85.4%) and the majority reported that they have never taken a finance related course in their lives (70.6%). Considering the beneficial effects of financial literacy on proper savings behaviors; we suspect that our results could be an indication of lower financial literacy among our sample. In another study, Antonides et al. (2011) found that financial knowledge positively affects budgeting behavior during mental accounting. However, this phenomenon is currently beyond our research scope and will be considered for future research.

Table 4.15: Descriptive statistics of discretionary savings made in budgeting
Discretionary Savings [TL]

Mental Account	Mean	Std. Deviation	Skewness		Kurtosis	
			Statistic	Std. Error	Statistic	Std. Error
Current Income	5318.54	4096.63	0.067	0.130	-1.151	0.260
Current Assets	4469.66	4473.29	0.451	0.130	-1.320	0.260
Future Income	9366.34	4574.55	-1.425	0.130	0.230	0.260
Total	18977.54	9942.30	-0.210	0.130	-0.543	0.260

Finally, as explained in Section 4.3.3, we adapted the willingness to bet patterns from Benartzi and Thaler (1999) to classify the responses of our subjects. Table 4.16 shows the frequency table of students' decision patterns for the offered gambles. The frequency table shows that the largest group is Pattern 8 where 101 students (28.9%) rejected all three bets even in the case where we showed the explicit probability distributions of winnings and losses. The next largest group is Pattern 1 in which 74 students (21.1%) students accepted all three bets showing no myopic loss aversion. We also observe that 71 students (20.3%) belong to Pattern 5 (Samuelson's case) where they rejected a single bet but accepted multiple bets showing clear symptoms of myopic loss aversion. In Pattern 7 (8.0%) and Pattern 3 (6.6%), students rejected multiple bets but when the probability distribution chart is shown, they changed their opinions and accepted to play the bet 100 times.

Table 4.16: Student's decision patterns for Samuelson's Bet

Pattern	One Bet	Repeated Plays	Explicit Dist.	Frequency	Percent
1	Accept	Accept	Accept	74	21.1%
2	Accept	Accept	Reject	7	2.0%
3	Accept	Reject	Accept	23	6.6%
4	Accept	Reject	Reject	39	11.1%
5	Reject	Accept	Accept	71	20.3%
6	Reject	Accept	Reject	7	2.0%
7	Reject	Reject	Accept	28	8.0%
8	Reject	Reject	Reject	101	28.9%
<i>Total</i>				350	100.0%

Source: Patterns are adapted from Benartzi & Thaler (1999)

4.4.4 Reliability Analyses

In survey studies, one must consider the accuracy or reliability of measurements. According to Cronbach (1951), “*a reliability coefficient demonstrates whether the test designer was correct in expecting a certain collection of items to yield interpretable statements about individual differences*”.

Cronbach’s alpha (α) is one of the most commonly used reliability coefficients used for internal consistency which varies between 0 to 1. A value of 0 indicates that the true score is not measured at all, and only an error component exists; whereas, Cronbach’s alpha equals 1 shows that all items measure the true score, and there is no error component. Conventionally, the interpretation of Cronbach’s alpha is as follows: the acceptable threshold is 0.6 which is often used by exploratory studies; while, an alpha of 0.7 is considered adequate, and alpha values above 0.8 are considered good for confirmatory research (Garson, 2013, p. 38).

4.4.4.1 Reliability Analysis of the Financial Anxiety Measure

We adopted 7 items from Archuleta et al. (2013) and 4 items from Shapiro and Burchell (2012) to design our financial anxiety measure where the participants scored on a 5-point Likert-type scale. Descriptive statistics regarding the mean, standard deviation, and valid sample size of the financial anxiety measure are presented in Table 4.17.

Table 4.18 shows the calculated reliability statistics for the financial anxiety measure used in our study. Cronbach’s alpha coefficient of the financial anxiety measure is computed as 0.933 which indicates high reliability.

Table 4.17: Descriptive statistics of financial anxiety measure

Item	Statement	Mean	Standard Deviation
<i>anx1</i>	I feel anxious about my financial situation	3.91	1.145
<i>anx2</i>	I have difficulty sleeping because of my financial situation	2.32	1.269
<i>anx3</i>	I have difficulty concentrating on my school/or work because of my financial situation	2.52	1.326
<i>anx4</i>	I am irritable because of my financial situation.	2.67	1.407
<i>anx5</i>	I have difficulty controlling/worrying about my financial situation.	2.35	1.392
<i>anx6</i>	My muscles feel tense because of worries about my financial situation.	2.17	1.319
<i>anx7</i>	I feel fatigued because I worry about my financial situation.	2.73	1.393
<i>anx8</i>	I am worried about the debt I will have when I complete my university education	2.64	1.505
<i>anx9</i>	Thinking about my personal finances can make me feel anxious	3.49	1.339
<i>anx10</i>	Discussing my finances can make my heart race or make me feel stressed	2.54	1.421
<i>anx11</i>	I do not think I am doing as well as I could academically because I worry about money	2.85	1.491
Overall		30.53	11.635

Sample size (N=350)

Table 4.18: Reliability statistics for the financial anxiety measure

Reliability Statistics					
Cronbach's Alpha		Cronbach's Alpha Based on Standardized Items		Number of Items	
0.933		0.934		11	
Item-Total Statistics					
Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
<i>anx1</i>	26.61	119.430	.585	.420	.932
<i>anx2</i>	28.21	112.762	.779	.674	.924
<i>anx3</i>	28.00	111.602	.786	.692	.924
<i>anx4</i>	27.85	110.675	.767	.652	.924
<i>anx5</i>	27.84	110.087	.799	.671	.923
<i>anx6</i>	28.36	112.626	.750	.640	.925
<i>anx7</i>	27.79	109.906	.806	.692	.923
<i>anx8</i>	27.89	114.692	.571	.368	.934
<i>anx9</i>	27.03	112.569	.739	.618	.926
<i>anx10</i>	27.99	110.963	.748	.618	.925
<i>anx11</i>	27.68	113.571	.616	.417	.932

4.4.4.2 Reliability Analysis of the Objective Financial Literacy

Measure

To measure objective financial literacy, we adapted 5 knowledge-based items from the 2009 State-by-State NFCS survey which are identified as the Big Five questions for measuring financial literacy (Hastings et al., 2013). Each one of the items in the questionnaire measures specific financial concepts which are interest rates and compounding, inflation, risk diversification, mortgages, and bond pricing. Descriptive statistics regarding the mean, standard deviation, and valid sample size of the objective financial literacy measure are presented in Table 4.19.

Table 4.19: Descriptive statistics of objective financial literacy measure

Item	Concept	Statement	Mean	Standard Deviation
<i>lit1</i>	Interest rates and compounding	Suppose you had 100 TL in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?	.83	.380
<i>lit2</i>	Inflation	The money in your savings account has received interest with an annual net interest rate of 1% for the period of 01/01/2020-01/01/2021. In the same period, the annual inflation rate was announced as 2%. In this case, which of the following can be said about the purchasing power of the money in your savings account at the end of the period compared to the beginning of the period?	.76	.428
<i>lit3</i>	Risk diversification	Do you think that the following statement is true or false: Buying a single company stock usually provides a safer return than a stock mutual fund?	.17	.372
<i>lit4</i>	Mortgages	Do you think that the following statement is true or false: A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less?	.65	.477
<i>lit5</i>	Bond pricing	If interest rates rise, what will typically happen to bond prices?	.15	.362
Overall			2.56	1.314
Sample size (N=350)				

The descriptive statistics indicate that students' average scores on risk diversification and bond pricing concepts are relatively lower. Table 4.20 shows the calculated reliability statistics for the objective financial literacy measure used in our

study. Cronbach's alpha coefficient of the objective financial literacy measure is computed as 0.653; however, it is evident that significant improvements to internal consistency are attainable by deleting items that significantly lower Cronbach's alpha. Thus, we updated the objective financial literacy measure where the questionnaire items regarding risk diversification (*lit3*) and bond pricing (*lit5*) are discarded.

Table 4.20: Reliability analysis of original objective financial literacy measure

Reliability Statistics					
Cronbach's Alpha		Cronbach's Alpha Based on Standardized Items		Number of Items	
0.653		0.640		5	
Item-Total Statistics					
Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
<i>lit1</i>	1.73	1.165	.507	.449	.555
<i>lit2</i>	1.80	1.010	.620	.522	.487
<i>lit3</i>	2.39	1.391	.224	.081	.676
<i>lit4</i>	1.91	1.008	.511	.304	.544
<i>lit5</i>	2.40	1.427	.194	.046	.685

The results of the reliability analysis for the updated objective financial literacy measure are presented in Table 4.21. A Cronbach's alpha coefficient of 0.769 is calculated which indicates adequate and acceptable reliability.

Table 4.21: Reliability analysis of the updated objective financial literacy measure

Cronbach's Alpha		Cronbach's Alpha Based on Standardized Items		Number of Items	
0.769		0.777		3	
Item-Total Statistics					
Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
<i>lit1</i>	1.41	.627	.611	.442	.690
<i>lit2</i>	1.48	.525	.694	.511	.583
<i>lit4</i>	1.59	.541	.526	.290	.791

4.4.4.3 Reliability Analysis of the Hedonic Framing Cases

Table 4.22 shows the descriptive statistics of the students' responses to hedonic framing cases.

Table 4.22: Descriptive statistics for hedonic framing cases

Variable	Outcome	Hedonic Framing Condition	Mean	Standard Deviation
<i>hed1</i>	Multiple Gains	Segregation	.69	.463
<i>hed2</i>	Multiple Losses	Integration	.63	.484
<i>hed3</i>	Mixed Gain	Integration	.70	.480
<i>hed4</i>	Mixed Loss	Segregation	.71	.452

Sample size (N=350)

The calculated reliability statistics for the hedonic framing cases are shown in Table 4.23. Cronbach's alpha coefficient of 0.408 is computed which indicates that the responses to the hedonic framing items are not internally consistent. Therefore, it is not a statistically viable option to define a single hedonic framing variable to describe a person's tendency to exhibit hedonic framing for all four alternatives. We also observe that discarding a questionnaire item does not improve Cronbach's alpha.

Table 4.23: Reliability analysis of the hedonic framing cases

Reliability Statistics					
Cronbach's Alpha		Cronbach's Alpha Based on Standardized Items		Number of Items	
0.408		0.404		4	
Item-Total Statistics					
Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
<i>hed1</i>	2.04	.835	.233	.089	.331
<i>hed2</i>	2.10	.729	.342	.128	.202
<i>hed3</i>	2.03	.893	.162	.038	.403
<i>hed4</i>	2.02	.899	.165	.030	.400

As a result, to process and reflect all the available information on the students' hedonic framing, we decided to utilize multiple sub-hypothesis and investigate the effects of financial anxiety and financial literacy separately for each one of the hedonic framing cases.

H1 is updated as follows:

- H1A:** Financial anxiety positively predicts the segregation of gains in mental accounting
- H1B:** Financial anxiety has a positive association with the integration of losses in mental accounting
- H1C:** Financial anxiety has a positive relationship with the integration of large gains with smaller losses in mental accounting
- H1D:** Financial anxiety increases the likelihood of the segregation of larger losses from smaller gains in mental accounting

H4A and H4B are replaced as follows:

- H4A:** Objective financial literacy negatively predicts the segregation of gains in mental accounting
- H4B:** Objective financial literacy has a negative association with the integration of losses in mental accounting
- H4C:** Objective financial literacy has a negative relationship with the integration of large gains with smaller losses in mental accounting
- H4D:** Objective financial literacy decreases the likelihood of the segregation of larger losses from smaller gains in mental accounting
- H4E:** Subjective financial literacy negatively predicts the segregation of gains in mental accounting
- H4F:** Subjective financial literacy has a negative association with the integration of losses in mental accounting
- H4G:** Subjective financial literacy has a negative relationship with the integration of large gains with smaller losses in mental accounting
- H4H:** Subjective financial literacy decreases the likelihood of the segregation of larger losses from smaller gains in mental accounting

4.4.5 Validity Analyses

Validity is described as the capacity to which a concept is accurately measured in a quantitative study (Heale & Twycross, 2015). Essentially, our interest in terms of validity is whether the utilized items in our questionnaires could measure the variables they were intended for. In this section, we provide the details of our methodology for checking the validity of financial anxiety and objective financial literacy measures used in our survey.

In general terms, factor analysis offers tools for the analysis of the structure of correlations among a large number of variables such as test scores or questionnaire items by assigning these highly correlated variables into sets known as factors or components (Hair et al., 2019, p. 125). Therefore, we will utilize an exploratory factor analysis to check whether there are any redundant variables and whether all items cluster around the same dimensions.

Before we perform the exploratory factor analyses, we check its applicability by measuring the sampling adequacy and applying Bartlett's test of sphericity. In this study, the sampling adequacy is measured by using the Kaiser-Meyer-Olkin (KMO) sampling adequacy test where sampling adequacy measures with values greater than 0.5 are deemed acceptable (Kaiser & Rice, 1974). Also, we apply Bartlett's test of sphericity where statistically significant ($p < 0.05$) results imply the existence of correlations among the questionnaire items which is needed for factory analysis (Hair et al., 2019, p. 136). After confirming these prerequisites, we continue to calculate the initial eigenvalues and check the number of factors and the total variance explained where a solution that could explain 60% variance is considered satisfactory (Hair et al., 2019, p. 142). Lastly, we inspect the factor loadings of the questionnaire items where loadings above 0.5 are assumed to be practically significant and loadings above 0.7 indicate a well-defined structure (Hair et al., 2019, p. 151).

4.4.5.1 Factor Analysis of the Financial Anxiety Measure

We conducted an exploratory factor analysis on the 11 items of the financial anxiety measure. The KMO coefficient verified our sampling adequacy with a KMO value of 0.935 which was well above the threshold of 0.5. Also, all KMO values for individual items were greater than 0.9 which is similarly well beyond the acceptable limit of 0.5. The result of Bartlett's Test of Sphericity was significant ($p < 0.05$) indicating that there is a sufficient correlation between the items of the measure to continue factor analysis. Thus, the results of the KMO and Bartlett's Test of Sphericity showed that the factory analysis is applicable. Table 4.24 shows the results of KMO and Bartlett's Test of the financial anxiety measure.

Table 4.24: KMO and Bartlett's Test results of the financial anxiety measure

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.935
Bartlett's Test of Sphericity	Appx. Chi-Square	2584.747
	df	55
	Sig.	0.00000

As shown in Table 4.25, An initial analysis was conducted to obtain eigenvalues for each factor in the data. The results revealed a single factor that explained 60.71% of the variance. Table 4.26 shows the factor loadings of the items belonging to the financial anxiety measure where the minimum factor loading of 0.630 was observed which is above the acceptable threshold of 0.5 for factor loadings. No items were removed from the financial anxiety measure. In short, the results of the exploratory factor analysis showed that the financial anxiety measure consists of a single factor where each one of the 11 items clusters on the same factor which represents the individual financial anxiety levels.

Table 4.25: Total variance explained by the components of the financial anxiety measure

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.678	60.708	60.708	6.678	60.708	60.708
2	.742	6.748	67.456			
3	.735	6.685	74.141			
4	.612	5.567	79.708			
5	.448	4.072	83.780			
6	.417	3.791	87.571			
7	.363	3.300	90.871			
8	.327	2.975	93.847			
9	.264	2.401	96.248			
10	.227	2.066	98.314			
11	.185	1.686	100.000			

Extraction Method: Principal Component Analysis

Table 4.26: Factor loadings of each item in the financial anxiety measure

Item	Factor loadings
<i>anx1</i>	.648
<i>anx2</i>	.829
<i>anx3</i>	.832
<i>anx4</i>	.820
<i>anx5</i>	.847
<i>anx6</i>	.804
<i>anx7</i>	.853
<i>anx8</i>	.630
<i>anx9</i>	.790
<i>anx10</i>	.798
<i>anx11</i>	.675

Extraction Method: Principal Component Analysis

4.4.5.2 Factor Analysis of the Objective Financial Literacy Measure

An exploratory factor analysis was conducted on the 3 items of the objective financial literacy measure. We calculated the KMO coefficient as 0.656 which indicates acceptable sampling adequacy as it is greater than 0.5. Furthermore, the KMO values for each item were also found to be greater than 0.6. Correlations between the items were also tested where Bartlett's Test of Sphericity is found to be significant ($p < 0.05$) implying there is a sufficient correlation between measure items. The results of the KMO sampling adequacy and Bartlett's Test of Sphericity prove that factor analysis applies to our dataset. Table 4.27 outlines the results of KMO and Bartlett's Test of Sphericity.

Table 4.27: KMO and Bartlett's Test results of the objective financial literacy measure

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.654
Bartlett's Test of Sphericity	Appx. Chi-Square	316.552
	df	3
	Sig.	0.000

We conducted an initial analysis to obtain the eigenvalues for each factor in the objective financial literacy measure. The results showed that items clustered around a single factor explained 69.329% of the variance which is presented in Table 4.28. Then, the factor loadings of each item in the objective financial literacy measure were calculated in which all items' loadings were found to be greater than 0.5 with a minimum loading of 0.764. Therefore, no additional items were removed from the objective financial literacy measure. Table 4.29 outlines the factor loadings of each item in the objective financial literacy measure. In summary, exploratory factor analysis on the objective financial literacy measure indicated that these 3 items measure a single factor that corresponds to the participants' objective financial literacy levels.

Table 4.28: Total variance explained by the components of the objective financial literacy measure

Total Variance Explained						
Initial Eigenvalues				Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.080	69.329	69.329	2.080	69.329	69.329
2	.596	19.866	89.195			
3	.324	10.805	100.000			

Extraction Method: Principal Component Analysis

Table 4.29: Factor loadings of each item in the objective financial literacy measure

Item	Factor loadings
<i>lit1</i>	0.841
<i>lit2</i>	0.888
<i>lit4</i>	0.764

Extraction Method: Principal Component Analysis

4.4.6 Regression Analyses

In this section, we present the results of the binary logistic regression and multiple linear regression models and discuss the evidence found for our hypotheses.

4.4.6.1 Analysis of the Relationship Between Financial Anxiety and Framing of Gains and Losses

This section focuses on investigating the statistical relationship between financial anxiety and hedonic framing behavior which we investigate under four unique cases: multiple gains, multiple losses, mixed gain, and mixed loss. We hypothesized that individual financial anxiety levels would have a statistically significant positive relationship with the prevalence of hedonic framing behavior. We developed two binary logistic regression models for each one of the hedonic framing cases where the primary models test the direct effects of financial anxiety over hedonic framing; and, the secondary model tests whether these effects change when control variables are taken into regression models.

Table 4.30 presents the coefficients of binary logistic regression to explain the relationship between financial anxiety and hedonic framing of multiple gains which is coded as a dichotomous variable (hed_1). Model 1A ($\chi^2(1)=1.312$) could explain 0.5% of the variance and could correctly identify 69.1% of the cases of segregation of gains. Model 1B ($\chi^2(10)=7.874$) could explain the 3.1% of the variance and could predict 68.0% of the segregation of gains cases. Both models could not identify a statistically significant effect of financial anxiety on the segregation of gains behavior. Therefore, **H1A is not supported.**

Table 4.30: Binary logistic regression model for the relationship between financial anxiety and segregation of gains (N=350)

Multiple Gains	Model 1A					Model 1B				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Financial Anxiety	-.011	.010	1.313	.989	.252	-.015	.012	1.577	.985	.209
Gender						.042	.247	.029	1.043	.865
Age						-.009	.212	.002	.991	.966
Education						-.112	.398	.079	.894	.779
Finance Education						-.416	.275	2.295	.660	.130
Years Enrolled						.007	.097	.005	1.007	.946
Income						.042	.089	.224	1.043	.636
Number of Income Sources						-.072	.173	.175	.930	.676
Discretionary Income						-.087	.079	1.214	.916	.271
Financial Satisfaction						-.016	.063	.066	.984	.797
Constant	1.157	.330	12.309	3.182	.000	1.928	.946	4.149	6.875	.042
Nagelkerke χ^2	.005					.031				

Dependent Variable: Segregation of gains is coded as 1

Table 4.31 shows the results of binary logistic regression models to explore the effects of financial anxiety on the hedonic framing of multiple losses where a dichotomous variable (hed_2) is defined to describe whether participants integrate multiple losses during mental accounting. Model 1C ($\chi^2(1)=1.946$) could explain the 0.8% of the variance and could correctly classify 62.9% of the cases of integration of losses. Model 1D ($\chi^2(10)=8.277$) could explain the 3.2% variance and could correctly identify 63.1% of the cases in which respondents preferred to integrate multiple losses. Both models could not detect a statistically significant effect of financial anxiety on the hedonic framing of multiple losses. Hence, **H1_B** is **not supported**.

Table 4.31: Binary logistic regression model for the relationship between financial anxiety and integration of losses (N=350)

Multiple Losses	Model 1C					Model 1D				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Financial Anxiety	-.013	.010	1.942	.987	.163	-.016	.012	1.875	.984	.171
Gender						-.239	.237	1.015	.788	.314
Age						.119	.204	.342	1.127	.559
Education						-.119	.380	.098	.888	.755
Finance Education						-.309	.265	1.359	.734	.244
Years Enrolled						-.130	.093	1.949	.878	.163
Income						-.056	.084	.444	.946	.505
Number of Income Sources						-.008	.166	.002	.992	.960
Discretionary Income						-.018	.077	.053	.983	.819
Financial Satisfaction						.006	.060	.011	1.006	.917
Constant	.934	.315	8.789	2.545	.003	1.792	.908	3.897	5.999	.048
Nagelkerke χ^2	.008					.032				

Dependent Variable: Integration of losses is coded as 1

Table 4.32 outlines the results of binary logistic regression models to identify the statistical relationship between financial anxiety and hedonic framing of mixed gains where a dichotomous variable (hed_3) is defined to describe whether participants integrate large gains with smaller losses. Model 1E ($\chi^2(1)=0.306$) could explain the 0.1% of the variance in 69.7% of the correctly classified cases of integration of large gains with smaller losses. Model 1F ($\chi^2(10)=6.861$) could explain the 2.7% variance in 69.4% of the correctly classified cases of integration of large gains with smaller losses. No statistically significant effects of financial anxiety on participants' tendency to integrate large gains with smaller losses are detected in both models. Thus, **H1c** is **not supported**.

Table 4.32: Binary logistic regression model for the relationship between financial anxiety and integration of large gains with smaller losses (N=350)

Mixed Gain	Model 1E					Model 1F				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Financial Anxiety	-.006	0.10	.306	.994	.580	-.001	.012	.003	.999	.954
Gender						.215	.247	.756	1.240	.385
Age						.106	.216	.239	1.111	.625
Education						.180	.410	.194	1.198	.660
Finance Education						-.302	.281	1.152	.739	.283
Years Enrolled						.052	.101	.270	1.054	.603
Income						-.077	.089	.745	.926	.388
Number of Income Sources						-.208	.173	1.454	.812	.228
Discretionary Income						-.044	.081	.297	.957	.586
Financial Satisfaction						.038	.063	.359	1.038	.549
Constant	1.003	.329	9.298	2.727	.002	.706	.962	.539	2.026	.463
Nagelkerke χ^2	.001					.027				

Dependent Variable: Integration of large gains with smaller losses is coded as 1

Table 4.33 presents the results of binary logistic regression models to test the statistical relationship between financial anxiety and hedonic framing of mixed losses in which a dichotomous variable (*hed₄*) is assigned to characterize whether large losses are segregated from smaller gains. Model 1G ($\chi^2(1)=3.248$) could explain the 1.3% of the variance where the model could correctly identify 71.4% of the cases. Model 1H ($\chi^2(10)=11.281$) could explain the 4.5% variance and could correctly classify 71.4% of the cases. Both models could not identify a statistically significant relationship between financial anxiety and segregation preference for mental accounting of mixed losses. For this reason, **H1_D** is **not supported**.

Table 4.33: Binary logistic regression model for the relationship between financial anxiety and segregation of large losses from smaller gains (N=350)

Mixed Loss	Model 1G					Model 1H				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Financial Anxiety	-.018	.010	3.239	.982	0.072	-.021	.012	2.836	.979	.092
Gender						-.015	.254	.003	.986	.954
Age						.124	.218	.324	1.132	.569
Education						-.298	.406	.538	.742	.463
Finance Education						-.247	.285	.756	.781	.385
Years Enrolled in Prog.						-.010	.099	.011	.990	.918
Income						-.051	.091	.317	.950	.574
Number of Income Sources						.058	.178	.105	1.059	.746
Discretionary Income						-.115	.081	2.015	.891	.156
Financial Satisfaction						.038	.064	.345	1.039	.557
Constant	1.484	.342	18.824	4.412	.000	2.352	.971	5.868	10.509	.015
Nagelkerke χ^2	.013					.045				

Dependent Variable: Segregation of large losses from smaller gains is coded as 1

Considering the results of the logistic regression models, we find no evidence for financial anxiety being a statistically significant predictor of hedonic framing behavior among university students. These results may imply that hedonic framing is a cognitive mechanism that is not affected by the individuals' psychological condition. To our knowledge, this is the first study to investigate the influence of financial anxiety on the prevalence of hedonic framing behavior. Thus, our finding is a unique contribution to financial anxiety literature.

4.4.6.2 Analysis of the Relationship Between Financial Anxiety and

Budgeting

In this section, we investigate the effect of financial anxiety on budgeting behavior during mental accounting. We hypothesized that financial anxiety would have a statistically significant negative relationship with the tendency to make discretionary savings during mental accounting. To test our hypothesis, we utilize a multiple linear regression model (Model 2) between financial anxiety and the total amount of discretionary savings while controlling the effects of gender, age,

education level, finance education, years enrolled in the program, monthly income, number of income sources, discretionary income, and financial satisfaction. Table 4.34 shows the overall summary of the proposed model where adjusted R^2 indicates that financial anxiety and the control variables account for 2.3% of the variance in the total discretionary savings.

Table 4.34: Summary of the multiple linear regression model calculated for the relationship between financial anxiety and total discretionary savings during mental accounting (N=350)

Model 2 Summary			
R	R²	Adjusted R²	Std. Error of the Estimate
.226	.051	.023	9826.708

Correlations between financial anxiety and the control variables showed no indication of multicollinearity. Table 4.35 presents the coefficients of the multiple linear regression model. Our model showed that financial anxiety has a statistically significant negative relationship with total discretionary savings during mental accounting ($p=0.040$). The results imply that 1 point increase in participants' total financial anxiety scores that ranges from 10 to 55, resulted in an average of 111.54 TL decrease in discretionary savings made. Considering the adverse effect of financial anxiety on discretionary savings in a statistically significant manner; **H2 is supported.**

Table 4.35: Coefficients of the multiple linear regression model for the relationship between financial anxiety and total discretionary savings during mental accounting (N=350)

	Unstandardized Coefficients		Standardized Coefficients	Sig.
	B	Std. Error	Beta	
Financial Anxiety	-111.539	53.973	-.131	.040
Constant	22993.711	4016.687		.000

Dependent Variable: Total discretionary savings (*discSav*)

Control Variables: Gender (1:female), age, education, years enrolled, finance education, income, number of income sources, discretionary income, financial satisfaction

Our results showed that financial anxiety can negatively predict discretionary savings behavior during mental accounting. Previous studies also support this finding where financial anxiety is found to have adverse effects on individuals' debt (Ahn et al., 2018), savings (Hasler et al., 2021), and financial planning (Grable et al., 2015).

4.4.6.3 Analysis of the Relationship Between Financial Anxiety and Choice Bracketing

This section presents our findings on the effect of financial anxiety on myopic loss aversion behavior. In H3, we hypothesized that people with higher levels of financial anxiety would be more prone to myopic loss aversion behavior. To test this claim, we present the results of two binary logistic regression models. In the first model, we examine how financial anxiety affects myopic loss aversion while the second model takes account of the control variables to check whether demographics have a confounding influence.

Table 4.36 outlines the results of binary logistic regression models. Model 3A ($\chi^2(1)=0.625$) could explain 0.3% of the variance and could correctly identify 78.9% of the myopic loss aversion cases. Model 3B ($\chi^2(10)=24.721$) could explain 10.6% of the variance and could predict 78.6% of the myopic loss aversion cases. Both models could not identify a statistically significant effect of financial anxiety on myopic loss aversion. However, Model 3B showed that gender is a statistically significant strong predictor of myopic loss aversion in which females are associated with more frequent myopic loss aversion. Given these results, **H3 is not supported**.

Table 4.36: Binary logistic regression model for the relationship between financial anxiety and myopic loss aversion (N=350)

Model 3A						Model 3B				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Financial Anxiety	.009	.011	.619	1.009	.431	-.001	.014	.008	.999	.928
Gender						.987	.301	10.770	.373	.001
Age						-.034	.245	.019	.967	.890
Education						.682	.502	1.845	1.977	.174
Finance Education						-.049	.333	.022	.952	.883
Years Enrolled						.088	.123	.519	1.092	.471
Income						-.118	.102	1.343	.889	.247
Number of Income Sources						-.271	.197	1.906	.762	.167
Discretionary Income						-.108	.093	1.368	.897	.242
Financial Satisfaction						.020	.072	.081	1.021	.776
Constant	1.046	.364	8.230	2.845	.004	1.468	1.152	1.625	4.341	.202
Nagelkerke χ^2	.003					.106				

Dependent Variable: The existence of myopic loss aversion is coded as 1

Our results indicate that financial anxiety does not affect the likelihood of myopic loss aversion behavior. Our models find that gender has a strong statistically significant effect on individuals' myopic loss aversion where males are more likely to accept all three cases of Samuelson's Bet. When gender effects are controlled; the effect of financial anxiety completely diminishes.

4.4.6.4 Analysis of the Relationship Between Financial Literacy and Framing of Gains and Losses

In this section, we test our hypotheses on the effects of objective and subjective financial literacy on hedonic framing behavior. We hypothesized that objective and subjective financial literacy would have statistically significant negative associations with hedonic framing. We test these claims by presenting the results of two binary logistic regression models for each one of the hedonic framing cases where the primary models test the direct effects of financial literacy on hedonic framing; and, the secondary models test whether these effects carry on when confounding effects of control variables are taken into regression models.

Table 4.37 presents the binary logistic regression models to explain the effects of objective and subjective financial literacy on the hedonic framing of multiple gains. The dependent variable is a dichotomous variable (*hed₁*) that indicates whether the participant prefers segregation when faced with a multiple gains outcome. Model 4A ($\chi^2(2)=1.665$) could explain the 0.7% of the variance and could correctly identify 69.1% of the cases of segregation of gains. Model 4B ($\chi^2(11)=8.745$) could explain 3.5% of the variance and could predict 69.1% of the segregation of gains cases. No statistically significant effects of objective and subjective financial literacy are observed on the hedonic framing of multiple gains. Therefore, hypotheses **H4A** and **H4E** are **not supported**.

Table 4.37: Binary logistic regression model for the relationship between financial literacy and segregation of gains (N=350)

Multiple Gains	Model 4A					Model 4B				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Objective Financial Literacy	.145	.112	1.677	1.156	.195	.185	.118	2.439	1.203	.118
Subjective Financial Literacy	-.018	.056	.103	.982	.748	-.009	.060	.021	.991	.885
Gender						.013	.261	.002	1.013	.960
Age						-.003	.212	.000	.997	.987
Education						-.178	.398	.199	.837	.655
Finance Education						-.478	.277	2.987	.620	.084
Years Enrolled						.008	.097	.008	1.009	.930
Income						.024	.089	.074	1.024	.785
Number of Income Sources						-.087	.173	.251	.917	.617
Discretionary Income						-.073	.079	.869	.929	.351
Financial Satisfaction						.009	.056	.028	1.009	.868
Constant	.585	.345	2.871	1.795	.090	1.189	.827	2.068	3.285	.150
Nagelkerke χ^2	.007					.035				

Dependent Variable: Segregation of gains is coded as 1

Table 4.38 shows the coefficients of binary logistic regression analyses to test the implications of objective and subjective financial literacy on the hedonic framing of multiple losses. The dependent variable is a dichotomous variable (*hed₂*) which describes whether the participant prefers integration during the mental accounting of multiple losses. Model 4C ($\chi^2(2)=3.842$) could explain the 1.5% of the variance and could correctly identify 62.0% of the cases of integration of losses. Model 4D ($\chi^2(11)=11.988$) could explain 4.6% of the variance and could predict 69.1% of the integration of losses cases. Model 4C showed that objective financial literacy is a statistically significant predictor of integration of losses behavior during mental accounting of multiple losses ($B=.211$, $p=.050$). When control variables are taken into the regression model, we see that the predictive power of objective financial literacy increases ($B=0.269$, $p=.019$). The odds ratio of objective financial literacy in Model 4D indicates that each level increase in objective financial literacy translates into a 30.8% increase in the likelihood of integration preference during the mental accounting of multiple losses. Although statistically significant; H4_B states that objective financial literacy is negatively associated with the integration preference during hedonic framing of multiple losses. Hence, **H4_B is not supported.**

Furthermore, no statistically significant effect of subjective financial literacy over hedonic framing of multiple losses is found. Therefore, **H4_F** is **not supported**.

Table 4.38: Binary logistic regression model for the relationship between financial literacy and integration of losses (N=350)

Multiple Losses	Model 4C					Model 4D				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Objective Financial Literacy	.211	.108	3.839	1.235	.050	.269	.115	5.472	1.308	.019
Subjective Financial Literacy	-.037	.054	.464	.964	.496	-.011	.058	.036	.989	.849
Gender						-.312	.252	1.528	.732	.216
Age						.127	.206	.382	1.136	.536
Education						-.221	.385	.331	.802	.565
Finance Education						-.386	.268	2.068	.680	.150
Years Enrolled						-.129	.094	1.884	.879	.170
Income						-.079	.084	.867	.924	.352
Number of Income Sources						-.025	.167	.022	.975	.881
Discretionary Income						-.002	.076	.000	.998	.983
Financial Satisfaction						.029	.054	.284	1.029	.594
Constant	.258	.332	.601	1.294	.438	.990	.802	1.524	2.692	.217
Nagelkerke χ^2	.015					.046				

Dependent Variable: Integration of losses is coded as 1

The results of the binary logistic regression models to examine the statistical relationship between objective and subjective financial literacy and hedonic framing of mixed gains are presented in Table 4.39. We defined a dichotomous hedonic framing variable (*hed₃*) which is coded as 1 when the participant prefers the integration of large gains with smaller losses during hedonic framing. Model 4E ($\chi^2(2)=4.775$) could explain the 1.9% of the variance in 69.7% of the correctly classified cases of integration of large gains with smaller losses. Model 4F ($\chi^2(11)=11.235$) could explain the 4.5% variance in 68.3% of the correctly classified cases of integration of large gains with smaller losses while controlling for demographic variables. In Model 4E, objective financial literacy has a statistically significant positive association with the integration of large gains with smaller losses during mental accounting ($B=.233, p=.038$). However, when we control demographic variables in Model 4F, the effect of objective financial literacy becomes insignificant ($B=.228, p=.055$). As a result, **H4_C** is **not supported**. Also, both models show that

the interaction between subjective financial literacy and the integration of large gains with smaller losses during mental accounting is insignificant. Thus, **H4G** is **not supported**.

Table 4.39: Binary logistic regression model for the relationship between financial literacy and integration of large gains with smaller losses (N=350)

Mixed Gain	Model 4E					Model 4F				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Objective Financial Literacy	.233	.112	4.301	1.263	.038	.228	.119	3.670	1.256	.055
Subjective Financial Literacy	-.075	.057	1.732	.928	.188	-.076	.061	1.541	.927	.215
Gender						.196	.264	.553	1.217	.457
Age						.073	.219	.112	1.076	.738
Education						.138	.416	.110	1.148	.740
Finance Education						-.289	.284	1.035	.749	.309
Years Enrolled						.054	.102	.282	1.056	.595
Income						-.081	.090	.818	.922	.366
Number of Income Sources						-.227	.174	1.710	.797	.191
Discretionary Income						-.035	.080	.190	.966	.663
Financial Satisfaction						.030	.057	.270	1.030	.603
Constant	.732	.348	4.414	2.079	.036	.802	.858	.875	2.231	.349
Nagelkerke χ^2	.019					.045				

Dependent Variable: Integration of large gains with smaller losses is coded as 1

Lastly, we investigated the effects of objective and subjective financial literacy on the segregation of large losses from smaller gains during mental accounting. A dichotomous variable (*hed₄*) is defined to describe whether the survey participants prefer segregation during mental accounting of a mixed loss outcome. Table 4.40 shows the results of two binary logistic regression models. Model 4G ($\chi^2(2)=24.939$) could explain the 9.9% of the variance where the model could correctly identify 73.4% of the cases. Model 4H ($\chi^2(11)=36.497$) could explain the 14.2% variance and could correctly classify 75.4% of the cases. In Model 4G, objective financial literacy ($B=.541$, $p=0.000$) and subjective financial literacy ($B=-.198$, $p=.001$) are found to be significant predictors of the segregation of large losses from smaller gains during mental accounting. Moreover, when we controlled the demographic variables, we observe that the statistical significance of both objective financial literacy ($B=0.618$, $p=.000$) and subjective financial literacy ($B=-.196$, $p=.003$) persists. Considering the

odds ratios, these results imply that a level increase in objective financial literacy translates to an 85.6% increase in the odds of segregation of large losses from smaller gains behavior; whereas, a level increase in subjective financial literacy leads to a 17.8% decrease in these odds.

Although objective financial literacy is a statistically significant effect, H4_D posited that the relationship would be negative. Hence, hypothesis **H4_D** is **not supported**. On the other hand, our results show that subjective financial literacy has a statistically significant negative association with the segregation of large losses from smaller gains. As a result, hypothesis **H4_H** is **supported**.

Table 4.40: Binary logistic regression model for the relationship between financial literacy and segregation of large losses from smaller gains (N=350)

Mixed Loss	Model 4G					Model 4H				
Variable	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Objective Financial Literacy	.541	.119	20.683	1.718	.000	.618	.129	23.093	1.856	.000
Subjective Financial Literacy	-.198	.062	10.223	.821	.001	-.196	.067	8.651	.822	.003
Gender						-.026	.283	.008	.975	.928
Age						.064	.227	.079	1.066	.779
Education						-.462	.421	1.206	.630	.272
Finance Education						-.278	.295	.888	.757	.346
Years Enrolled						-.014	.104	.017	.986	.896
Income						-.075	.095	.631	.927	.427
Number of Income Sources						.005	.183	.001	1.005	.977
Discretionary Income						-.089	.083	1.146	.915	.284
Financial Satisfaction						.068	.060	1.319	1.071	.251
Constant	.853	.359	4.637	2.346	.018	1.908	.874	4.765	6.738	.029
Nagelkerke χ^2	.099					.142				

Dependent Variable: Segregation of large losses from smaller gains is coded as 1

The results showed that people with higher objective financial literacy prefer hedonic framing when dealing with financial outcomes involving losses. These results oppose our hypotheses where we expected objective financial literacy would reduce the prevalence of hedonic framing. Previously, Muehlbacher and Kirchler (2019) reported that people with higher financial knowledge are more likely to engage in mental accounting. One explanation is that people with higher objective

financial literacy might be better suited to manage difficult financial situations. Bucher-Koenen and Ziegelmeyer (2014) explain that financially literate people are better prepared to react to a financial shock. Another finding of our study is that people who are confident in their financial literacy do not prefer segregating their large losses from smaller gains; in other words, they don't prefer a silver lining as explained by Thaler (1985).

4.4.6.5 Analysis of the Relationship Between Financial Literacy and Budgeting

Next, we examine the effects of objective and subjective financial literacy on budgeting behavior during mental accounting. Our hypotheses (H5_A, H5_B) claim that objective and subjective financial literacy would have a statistically significant positive relationship with discretionary savings during mental accounting. In order to test our hypotheses, we developed a multiple linear regression model (Model 5) between objective and subjective financial literacy, and total discretionary savings while controlling the effects of gender, age, education, finance education, years enrolled in the program, monthly income, number of income sources, discretionary income, and financial satisfaction. Table 4.41 presents the summary of the model where adjusted R^2 estimates that objective and subjective financial literacy levels and control variables could explain 4.0% of the variance in the total discretionary savings.

Table 4.41: Summary of the multiple linear regression model calculated for the relationship between financial literacy and total discretionary savings during mental accounting (N=350)

Model 5 Summary			
R	R²	Adjusted R²	Std. Error of the Estimate
.264	.070	.040	9743.514

A correlation coefficient of 0.303 is found between objective financial literacy and subjective financial literacy. Correlations between objective and subjective financial literacy levels and control variables showed no sign of multicollinearity. Table 4.42 shows the coefficients of the multiple linear regression model. A

statistically significant positive relationship between objective financial literacy and total discretionary savings during mental accounting is found ($B=1311.496$, $p=0.015$). The beta coefficients show that a level increase in objective financial literacy translates to an average increase of 1311.496 TL increase in total discretionary savings. On the other hand, although the beta coefficient of the subjective financial literacy implies an average of 303.332 TL increase in total discretionary savings, the effect was not statistically significant ($p=0.259$). Considering the statistically significant positive relationship between objective financial literacy and total discretionary savings; **H5A is supported**. Since no statistically significant relationship between subjective financial literacy and total discretionary savings is found; **H5B is not supported**.

Table 4.42: Coefficients of the multiple linear regression model for the relationship between financial literacy and total discretionary savings during mental accounting (N=350)

	Unstandardized Coefficients		Standardized Coefficients	Sig.
	B	Std. Error	Beta	
Objective Financial Literacy	1311.496	537.167	.141	.015
Subjective Financial Literacy	303.332	268.122	.067	.259
Constant	15462.423	3770.067		.000

Dependent Variable: Total discretionary savings (*discSav*)

Control Variables: Gender, age, education, years enrolled, finance education, income, number of income sources, discretionary income, financial satisfaction

Our results showed that objective financial literacy positively affects individual discretionary savings behavior during mental accounting as predicted by our hypothesis. Previously, Sabri and MacDonald (2010) reported that students with higher objective financial literacy are more likely to report having savings and fewer financial problems. Therefore, our results confirm previous literature. On the other hand, we detected no statistically significant effect of subjective financial literacy on discretionary savings behavior. This finding might imply that subjective financial literacy does not always translate to higher financial knowledge and better savings behavior. Another explanation would be that given the financial demographics of the

students where 32.6% of students reported having monthly discretionary incomes less than 250 TL; one could interpret that students in Turkey face significant financial difficulties which lead them to increase their monthly consumption. Thus, we theorize that future studies with different sample populations may find a stronger correlation between subjective financial literacy and discretionary savings.

4.4.6.6 Analysis of the Relationship Between Financial Literacy and Choice Bracketing

This section presents our findings on the effects of objective and subjective financial literacy on myopic loss aversion. In H6_A and H6_B, we posited that objective and subjective financial literacy levels would have statistically significant negative associations with myopic loss aversion behavior. To test our hypotheses, two binary logistic regression models are developed wherein the first model focuses on the direct effects of objective and subjective financial literacy over myopic loss aversion; and, the second model is used to check whether these results persist when control variables are taken into regression models.

We present the results of our binary logistic regression models (Model 6A and Model 6B) in Table 4.43. Model 6A ($\chi^2(1)=6.419$) could explain the 2.8% of the variance and could correctly identify 78.9% of the myopic loss aversion cases. Model 6B ($\chi^2(10)=27.571$) could explain 11.8% of the variance and could predict 78.6% of the myopic loss aversion cases. Initially, Model 6A identified a statistically significant negative relationship between subjective financial literacy and myopic loss aversion; however, when control variables are taken into regression models, we observe that the effect of subjective financial literacy diminishes due to gender effects where females are more prone to myopic loss aversion. In both models, no statistically significant effect of objective financial literacy on myopic loss aversion is found. Considering these findings, hypotheses **H6_A** and **H6_B** are **not supported**.

Table 4.43: Binary logistic regression model for the relationship between financial anxiety and myopic loss aversion (N=350)

Variable	Model 6A					Model 6B				
	B	S.E.	Wald	OR	Sig.	B	S.E.	Wald	OR	Sig.
Objective Financial Literacy	.080	.131	.372	1.083	.542	.174	.143	1.487	1.190	.223
Subjective Financial Literacy	-.162	.065	6.183	.850	.013	-.098	.069	2.002	.906	.157
Gender						.952	.318	8.946	.386	.003
Age						-.079	.249	.100	.924	.752
Education						.687	.511	1.808	1.988	.179
Finance Education						-.017	.336	.003	.983	.959
Years Enrolled						.097	.125	.604	1.102	.437
Income						-.119	.103	1.344	.888	.246
Number of Income Sources						-.296	.196	2.272	.744	.132
Discretionary Income						-.098	.092	1.137	.906	.286
Financial Satisfaction						.018	.066	.076	1.018	.782
Constant	2.052	.423	23.575	7.786	.000	1.638	1.059	2.389	5.143	.122
Nagelkerke χ^2	.028					.118				

Dependent Variable: The existence of myopic loss aversion is coded as 1

Our models revealed that objective and subjective financial literacy are not statistically significant predictors of exhibiting myopic loss aversion. Similar to financial anxiety models, we observe that gender is a strong predictor of myopic loss aversion behavior. Previous research suggests that women are more risk-averse than men (Borghans et al., 2009; Croson & Gneezy, 2009). To better understand why such gender effect exists, we believe that a neurofinance approach to this problem may help in understanding the gender differences in risk-taking behavior.

4.4.6.7 Analysis of the Relationship Between Financial Literacy and Financial Anxiety

We hypothesized that objective and subjective financial literacy would have statistically significant negative effects on individuals' financial anxiety levels. Thus, to explore this relationship and test our hypotheses, we computed a multiple linear regression model (Model 7). Table 4.44 presents the summary of our model where the adjusted R^2 indicates that the model could explain 2.1% of the variance in the respondents' financial anxiety levels.

Table 4.44: Summary of the multiple linear regression model calculated for the relationship between financial literacy and financial anxiety (N=350)

Model 7 Summary			
R	R²	Adjusted R²	Std. Error of the Estimate
.163	.027	.021	11.512

No multicollinearity issues are found between the variables. Table 4.45 shows the beta coefficients and statistical significance of objective and subjective financial literacy on financial anxiety. The results show that objective financial literacy is a statistically significant predictor of financial anxiety ($p=0.011$). The beta coefficient of objective financial literacy implies that a level increase in objective financial literacy results in an average of 1.378 lower scores on the financial anxiety scale; thus, **H7A is supported**. No statistically significant relationship between subjective financial literacy and financial anxiety could be found; therefore, **H7B is not supported**.

Table 4.45: Coefficients of the multiple linear regression model for the relationship between financial literacy and financial anxiety (N=350)

	Unstandardized Coefficients		Standardized Coefficients	Sig.
	B	Std. Error	Beta	
Objective Financial Literacy	-1.378	.509	-.156	.011
Subjective Financial Literacy	-.162	.306	-.030	.384
Constant	34.930	1.775		.000

Dependent Variable: Financial anxiety (*finAnx*)

Our findings indicate that individuals with higher objective financial literacy exhibit lower levels of financial anxiety as predicted by our hypothesis. Previously, Lind et al. (2020) reported similar results where people who have low objective financial literacy felt more financial anxiety compared to those who have higher objective financial literacy. Although Lind et al. (2020) observed a negative relationship between subjective financial literacy and financial anxiety too; we could not detect a statistically significant relationship between subjective financial literacy and financial anxiety.

4.4.6.8 Analysis of the Relationship Between Financial Demographics and Financial Anxiety

As our final hypotheses, we posited that certain financial demographics which are average monthly income (H8_A), number of monthly income sources (H8_B), monthly discretionary income (H8_C), and financial satisfaction (H8_D) are statistically significant negative predictors of individuals' financial anxiety. To test these hypotheses, we computed a multiple linear regression model (Model 8) to observe the interactions between the aforementioned financial demographics and financial anxiety levels while controlling the effects of gender, age, education, finance education, and years enrolled in the higher education program. Table 4.46 shows the summary of Model 8 where the adjusted R^2 value implies that the model could explain the 28.1% variance in the financial anxiety levels.

Table 4.46: Summary of the multiple linear regression model calculated for the relationship between financial demographics and financial anxiety (N=350)

Model 8 Summary			
R	R ²	Adjusted R ²	Std. Error of the Estimate
.546	.296	.281	9.864

No multicollinearity issues are detected between the predictor variables. Table 4.47 presents the beta coefficients of financial demographics and the statistical significance of their effects on financial anxiety. No statistically significant effects of monthly income and number of income sources are observed; therefore, **H8_A** and **H8_B** are **not supported**. Yet, the linear regression model indicates that discretionary income ($B=-.862$, $p=.014$) and financial satisfaction ($B=-2.224$, $p=.000$) have statistically significant negative associations with financial anxiety. Thus, hypotheses **H8_C** and **H8_D** are **supported**.

Table 4.47: Coefficients of the multiple linear regression model for the relationship between financial demographics and financial anxiety (N=350)

	Unstandardized Coefficients		Standardized Coefficients	Sig.
	B	Std. Error	Beta	
Income	.567	.376	.087	.133
Number of Income Sources	.986	.773	.059	.203
Discretionary Income	-.862	.348	-.148	.014
Financial Satisfaction	-2.224	.244	-.452	.000
Constant	36.741	3.510		.000

Dependent Variable: Financial anxiety (*finAnx*)

Control Variables: Gender, years enrolled, finance education

Our regression models could not identify a statistically significant influence of monthly income and the number of income sources over financial anxiety; however, we found that monthly discretionary income and financial satisfaction are statistically significant negative predictors of one's financial anxiety. These results imply that monthly income and the number of income sources alone could not explain students' financial anxiety. On the other hand, students with higher discretionary income reported lower levels of financial anxiety. One explanation would be that higher discretionary income implies lower levels of household debt by definition. Our literature survey showed that financial anxiety has an association with higher debt levels (see Section 3.1). Furthermore, we also found that those who have higher financial satisfaction reported lower financial anxiety levels. Previously, Archuleta et al. (2013) reported similar results where students with higher financial satisfaction are associated with lesser financial anxiety which complies with our findings.

5 CONCLUSIONS & SUGGESTIONS FOR FURTHER RESEARCH

In this study, we investigated the effects of financial anxiety and financial literacy on the mental accounting processes. A survey study among 350 university students in Turkey was conducted in which an online questionnaire was administered to the participants. The reliability and validity analyses conducted on financial anxiety and objective financial literacy measures showed that they can successfully assess the variables they were designed for. The descriptives of mental accounting case studies were also discussed. Although the trends in the hedonic framing behavior were similar to Thaler's (1985) study, the reliability analyses revealed that people hedonically frame multiple outcomes independent of each other. Thus, we updated our theoretical model and utilized sub-hypotheses for each one of the hedonic framing cases. Then, we performed logistic regression analysis for testing our hypotheses on hedonic framing and myopic loss aversion behavior. Moreover, multiple linear regression models were formed to test our hypotheses on discretionary savings behavior and predictors of financial anxiety. Table 5.1 shows the summarized results of this thesis study.

In H1, we examined whether and how financial anxiety affects the hedonic framing of multiple outcomes in mental accounting. To capture the effect of financial anxiety on each one of the four hedonic framing cases, this hypothesis is divided into four sub-hypothesis (H1_A, H1_B, H1_C, H1_D). The results of binary logistic regression analyses showed that financial anxiety is not a statistically significant predictor of hedonic framing.

In H2, we investigated the impact of financial anxiety on discretionary savings which is measured under three hypothetical mental budgeting scenarios. A multiple regression model is developed. The results confirmed our hypothesis that financial anxiety has a statistically significant negative effect on the discretionary savings allocated by people during mental accounting. This finding also supports the previous literature regarding the adverse effects of financial anxiety on debt (Ahn et al., 2018), savings (Hasler et al., 2021), and financial planning (Grable et al., 2015).

Table 5.1: Summary of the results

#	Hypothesis	Findings of the study
H1 _A	Financial anxiety positively predicts the segregation of gains in mental accounting	NOT SUPPORTED
H1 _B	Financial anxiety has a positive association with the integration of losses in mental accounting	NOT SUPPORTED
H1 _C	Financial anxiety has a positive relationship with the integration of large gains with smaller losses in mental accounting	NOT SUPPORTED
H1 _D	Financial anxiety increases the likelihood of the segregation of larger losses from smaller gains in mental accounting	NOT SUPPORTED
H2	As individuals' financial anxiety levels increase; their inclination towards discretionary savings decreases during mental accounting	SUPPORTED
H3	People with higher levels of financial anxiety tend to exhibit myopic loss aversion more frequently during financial decision-making	NOT SUPPORTED
H4 _A	Objective financial literacy negatively predicts the segregation of gains in mental accounting	NOT SUPPORTED
H4 _B	Objective financial literacy has a negative association with the integration of losses in mental accounting	NOT SUPPORTED INVERSE RELATIONSHIP
H4 _C	Objective financial literacy has a negative relationship with the integration of large gains with smaller losses in mental accounting	NOT SUPPORTED INVERSE RELATIONSHIP
H4 _D	Objective financial literacy decreases the likelihood of the segregation of larger losses from smaller gains in mental accounting	NOT SUPPORTED INVERSE RELATIONSHIP
H4 _E	Subjective financial literacy negatively predicts the segregation of gains in mental accounting	NOT SUPPORTED
H4 _F	Subjective financial literacy has a negative association with the integration of losses in mental accounting	NOT SUPPORTED
H4 _G	Subjective financial literacy has a negative relationship with the integration of large gains with smaller losses in mental accounting	NOT SUPPORTED
H4 _H	Subjective financial literacy decreases the likelihood of the segregation of larger losses from smaller gains in mental accounting	SUPPORTED
H5 _A	Objective financial literacy levels have a statistically significant positive relationship with the discretionary savings tendency during mental accounting process	SUPPORTED
H5 _B	Subjective financial literacy levels have a statistically significant positive relationship with the discretionary savings tendency during mental accounting process	NOT SUPPORTED
H6 _A	Objective financial literacy levels have a statistically significant negative relationship with the tendency of myopic loss aversion during financial decision-making	NOT SUPPORTED
H6 _B	Subjective financial literacy levels have a statistically significant negative relationship with the tendency of myopic loss aversion during financial decision-making	NOT SUPPORTED
H7 _A	Objective financial literacy levels have a statistically significant negative relationship with individuals' financial anxiety levels	SUPPORTED
H7 _B	Subjective financial literacy levels have a statistically significant negative relationship with individuals' financial anxiety levels	NOT SUPPORTED

H8 _A	As the individuals' monthly income increases, they demonstrate lower levels of financial anxiety	NOT SUPPORTED
H8 _B	People who have multiple sources of income exhibit lower levels of financial anxiety	NOT SUPPORTED
H8 _C	The amount of discretionary income has a negative relationship with an individual's financial anxiety levels	SUPPORTED
H8 _D	People who have higher levels of financial satisfaction demonstrate lower levels of financial anxiety	SUPPORTED

In H3, we postulated that financial anxiety would induce the likelihood of myopic loss aversion during financial decision-making. We performed binary logistic regression analyses where we measure myopic loss aversion tendency by the responses given to three hypothetical bets. Our models showed that financial anxiety is not a statistically significant parameter of myopic loss aversion behavior. Interestingly, our results revealed that gender is a strong predictor of myopic loss aversion where female students are approximately three times more likely to reject these bets due to myopic loss aversion. This finding suggests that among Turkish university students, gender is a stronger predictor of myopic loss aversion than financial anxiety. In a previous study, Croson and Gneezy (2009) conducted a similar study on gender differences in responses to probability bets and found that women are generally more risk-averse than men possibly due to emotions, overconfidence, and framing differences.

Similar to our approach in H1, we generated four sub-hypotheses for the effects of objective financial literacy (H4_A, H4_B, H4_C, H4_D) and subjective financial literacy (H4_E, H4_F, H4_G, H4_H) on hedonic framing preferences when dealing with multiple outcomes. The results of our logistic regression analyses provided supporting evidence only for the H4_H where students' subjective financial literacy is negatively associated with the segregation of large losses from smaller gains. Thaler (1999) describes that smaller gains act like “silver linings” to help people cope with their large losses when these outcomes are framed separately since the gain function is steepest at the origin of the value function. Interestingly, our findings imply that objective financial literacy is also a positive predictor of integration of multiple losses, integration of larger gains with smaller losses, and segregation of large losses from smaller gains behavior. These findings led us to question that hedonic framing

may not always yield adverse effects on financial decision-making. For example, we could interpret that those who are more knowledgeable on financial matters might be more suited to manage financial situations where there are loss outcomes.

In H5, we hypothesized that objective financial literacy (H5_A) and subjective financial literacy levels (H5_B) have a positive relationship with the discretionary savings made during mental accounting. Similar to H2, we run a multiple linear regression analysis where the total amount of discretionary savings is the dependent variable while objective financial literacy and subjective financial literacy are the independent variables. We found no statistically significant interaction between subjective financial literacy and discretionary savings. However, our results indicate that objective financial literacy is positively correlated with the amount of discretionary savings. This result complies with another study where Sabri and MacDonald (2010) reported that students with higher objective financial literacy are more likely to report savings and fewer financial problems.

In H6, we examined the implications of financial literacy on myopic loss aversion behavior. As our hypotheses, we posited that objective financial literacy (H6_A) and subjective financial literacy (H6_B) are negative predictors of the prevalence of myopic loss aversion. Similar to our methodology in H3, we performed logistic regression analyses to identify the statistical effects of objective and subjective financial literacy levels on the likelihood of exhibiting myopic loss aversion. Logistic regression models could not find a statistically significant interaction between objective financial literacy and myopic loss aversion behavior. However, the initial model indicated a statistically significant negative effect of subjective financial literacy on myopic loss aversion behavior as hypothesized. Nonetheless, this effect became statistically insignificant when we control for the demographic variables. Specifically, taking gender as a variable in the logistic regression model causes this effect which leads us to the conclusion that gender has a confounding effect on the interaction between subjective financial literacy and demonstrating myopic loss aversion.

In addition to the effects of financial anxiety and financial literacy on mental accounting processes, we investigated the predictor factors that regulate individuals' financial anxiety. In H7, we postulated that objective financial literacy (H7_A) and subjective financial literacy (H7_B) have negative correlations with financial anxiety levels. To test these hypotheses, we developed a multiple linear regression model where financial anxiety is the dependent variable while objective and financial literacy levels are the independent variables. The linear regression model showed that objective financial literacy has a statistically significant negative effect on people's financial anxiety levels which confirms our hypothesis. Given that lower debt levels, better savings habits, and proper financial planning are associated with higher objective financial literacy and lower financial anxiety, we believe this finding complies with previous literature. The regression model also showed a negative correlation between subjective financial literacy and financial anxiety; however, this effect was statistically insignificant.

Lastly, in H8, we investigated the effects of demographic variables on financial anxiety. This hypothesis is divided into four sub-hypotheses in which we presuppose that average monthly income (H8_A), number of income sources (H8_B), monthly discretionary income (H8_C), and financial satisfaction (H8_D) are in a statistically significant negative relationship with financial anxiety levels. We tested these hypotheses by performing a multiple linear regression analysis. The results of the regression analysis showed that monthly discretionary income and financial satisfaction are statistically significant negative predictors of financial anxiety which supports hypotheses H8_C and H8_D. Previously, Archuleta et al. (2013) reported similar results on the negative interaction between financial satisfaction and financial anxiety. They also found that student debt is a positive predictor of financial anxiety. Therefore, we theorize that higher student debt levels and mandatory living expenses translate into lower discretionary income; and, thus, higher financial anxiety. Lastly, we observed no statistically significant effects of average monthly income and the number of income sources on participants' financial anxiety levels. As a result hypotheses H8_A and H8_B are not supported.

This thesis study contributes to mental accounting, financial anxiety, and financial literacy literature in several ways. To our knowledge, this thesis study is unique in terms of its approach to modeling individual differences in mental accounting where three main components of mental accounting are assessed separately. A key finding of this study is that financial anxiety does not influence the individual framing of gains and losses; whereas, the effects of objective/subjective financial literacy are limited. On the other hand, we found that mental budgeting, specifically the tendency to make discretionary savings is affected by one's financial anxiety in a negative manner; while, objective financial literacy has a positive influence as predicted by our literature survey. Lastly, we attempted to predict one's likelihood of demonstrating myopic loss aversion by using financial anxiety and financial literacy. Our regression analysis showed that financial anxiety is not a predictor of myopic loss aversion. Also, initial models implied that myopic loss aversion has a positive correlation with one's subjective financial literacy; however, when control variables are included in the model, we found that gender is a powerful predictor of myopic loss aversion among university students and suppresses the effect of subjective financial literacy.

In conclusion, this thesis study shows that the psychological and cognitive origins of mental accounting processes extend beyond the scope of financial anxiety and financial literacy. Although, our findings support the association between proper discretionary savings and one's financial anxiety/financial literacy levels; we could not find supporting evidence for our hypotheses regarding the effects of financial anxiety and financial literacy on hedonic framing and myopic loss aversion. On the contrary, we find that objective financial literacy is a predictor of hedonic framing when dealing with outcomes with losses. Also, we observed a strong gender effect on the likelihood of myopic loss aversion. A limitation of our study is that the population from whom the research data are collected is mostly undergraduate students (85.4%). We suppose that the findings of this study regarding the mental accounting differences are in exploratory nature and future studies may consider replicating these results for different populations such as finance professionals, investors, and households could yield new findings. Another suggestion for future

research would be to investigate the effects of personality traits and mathematical skills on the individual components of mental accounting. This study shows that individual differences in mental accounting do exist; however, exploring the predictive factors of these differences and comprehending the underlying cognitive mechanisms requires further investigation.

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7 APPENDIX

Appendix 1: The questionnaire used in the survey study (Turkish)

Demografik Bilgiler

No	İfade	Seenekler
dem1	Cinsiyetiniz nedir?	[Kadın] [Erkek]
dem2	Yaşınız kaçtır?	[18-20] [21-23] [24-26][27-29] [30+]
dem3	Eğitim durumunuz nedir?	[Önlisans öğrencisi] [Lisans öğrencisi] [Yüksek lisans öğrencisi] [Doktora öğrencisi]
dem4	Akademik not ortalamanız 4'lük sisteme göre kaçtır?	[4.00-3.51] [3.50-3.01] [3.00-2.51] [2.50-2.01] [2.00-1.51] [1.50-1.01] [1.00-0.51] [0.50-0.00] [Mevcut Değil (Hz öğrencisi ya da 1.sınıf ilk dönem)]
dem5	Öğrenim hayatınızda finans konuları ile ilgili bir ders aldınız mı?	[Aldım] [Almadım] [Şu anda alıyorum]
dem6	Öğrenim gördüğünüz programda kaçınıcı yılınız?	[1] [2] [3] [4] [5] [6+]
dem7	Aylık ortalama geliriniz ne kadardır?	[0 TL - 500 TL] [501 TL – 1000 TL] [1001TL – 1500 TL] [1501 TL – 2000 TL] [2001 TL – 2500 TL] [2500 TL ve üstü]
dem8	Çalışma durumunuz nedir?	[Tam zamanlı çalışıyorum] [Yarı zamanlı çalışıyorum] [Çalışmıyorum]
dem9	Burs alıyor musunuz?	[Evet] [Hayır]
dem10	Öğrenci kredisi alıyor musunuz? (örn: KYK öğrenim kredisi vb.)	[Evet] [Hayır]
dem11	Aile ve/veya arkadaşlarınızdan düzenli finansal destek alıyor musunuz?	[Evet] [Hayır]
dem12	Kişinin, kira, vergiler, borçlar, sigorta, ev alışverişi (gıda, giyim, sağlık vb.) ve ulaşım gibi zorunlu harcamalarının ardından geriye kalan gelire "isteğe bağlı gelir" denilmektedir. İsteğe bağlı gelir genellikle eğlence, yatırım ve turizm faaliyetleri sırasında harcanan para olarak da düşünülebilir. Bu bağlamda aylık "isteğe bağlı gelir" seviyeniz ne kadardır?	[0 TL – 250 TL] [251 TL – 500 TL] [501 TL – 750 TL] [751 TL – 1000 TL] [1001 TL – 1250 TL] [1251 TL – 1500 TL] [1501 TL ve üstü]

Appendix 1 Cont.

Finansal Memnuniyet

Genelde finansal konularla ilgili hislerinize ilişkin olarak aşağıdaki ifadeler hakkındaki görüşlerinizi belirtiniz.		
finSat	Genel olarak şu anki finansal durumunuzdan ne kadar memnunsunuz?	<u>10 Puanlık Likert Ölçeği</u> 1: [Kesinlikle memnun değilim] 10: [Kesinlikle memnunum]

Finansal Anksiyete

Genelde finansal konularla ilgili hislerinize ilişkin olarak aşağıdaki ifadeler hakkındaki görüşlerinizi belirtiniz.		
anx1	Finansal durumum hakkında kaygılı hissederim.	<u>5 Puanlık Likert Ölçeği</u> 1: [Kesinlikle katılmıyorum] 5: [Kesinlikle katılıyorum]
anx2	Finansal durumum nedeniyle geceleri uyumakta güçlük çekerim.	
anx3	Finansal durumum nedeniyle okulda derslerime / işte yapmam gerekenlere odaklanmakta güçlük çekerim.	
anx4	Finansal durumum nedeniyle normalde olduğundan daha çabuk sinirlenip rahatsız olabilirim.	
anx5	Finansal durumum hakkındaki endişelerimi kontrol etmekte zorlanırım.	
anx6	Finansal durumum hakkındaki endişelerim nedeniyle kaslarımın gerildiğini hissederim.	
anx7	Finansal durumum hakkındaki endişelerimden dolayı kendimi yorgun hissederim.	
anx8	Üniversite eğitimim sırasında doğan borçlarımdan dolayı, mezun olduktan sonra sıkıntı yaşayabileceğimi düşünerek endişelenirim.	
anx9	Finansal durumum hakkında düşünmek beni endişeye sevk edebilir.	
anx10	Finansal durumum hakkında konuşmak, kalbimin daha hızlı çarpmasına ve stresli hissetmeme sebep olur.	
anx11	Akademik olarak elimden gelenin en iyisini yaptığımı düşünmüyorum çünkü para konusunda endişeleniyorum.	

Appendix 1 Cont.

Öznel Finansal Okuryazarlık

subjLit	Genel olarak finansal konulardaki bilginize güveniyor musunuz?	<u>10 Puanlık Likert Ölçeği</u> 1: [Kesinlikle kendime güvenmem] 10: [Kesinlikle kendime güvenirim]
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Nesnel Finansal Okuryazarlık

lit1	Bankadaki tasarruf hesabınızda 100 TL bulunmaktadır ve faiz oranı yıllık net %2 olarak belirlenmiştir. 5 yıl boyunca anaparaya ve faizlerine dokunmadığınız takdirde 5 yıl sonra hesabınızda ne kadar para olacaktır?	[102 TL'den fazla] [Tam olarak 102 TL] [102 TL'den az] [Bilmiyorum] [Cevaplamak istemiyorum]
lit2	Tasarruf hesabınızda bulunan para 01/01/2020-01/01/2021 döneminde yıllık net %1 faiz oranı ile değerlendirilmiştir. Aynı dönemde yıllık enflasyon oranı %2 olarak açıklanmıştır. Bu durumda tasarruf hesabınızda bulunan paranın dönem başına göre, dönem sonundaki alım gücü hakkında aşağıdakilerden hangisi söylenebilir?	[Artar] [Aynı kalır] [Azalır] [Bilmiyorum] [Cevaplamak istemiyorum]
lit3	Verilen ifade hakkındaki düşünceniz nedir? "Bir firmanın pay senedi, borsa yatırım fonuna göre daha güvenli getiri sağlar".	[Doğru] [Yanlış] [Bilmiyorum] [Cevaplamak istemiyorum]
lit4	Verilen ifade hakkındaki düşünceniz nedir? "15 yıl vadeli bir ev kredisinin aylık geri ödemesi 30 yıl vadeli bir ev kredisinin aylık geri ödemesinden daha yüksektir; fakat, 15 yıl vadeli ev kredisi için vade boyunca ödenmesi gereken toplam faiz tutarı, 30 yıl vadeli krediye göre daha düşüktür."	[Doğru] [Yanlış] [Bilmiyorum] [Cevaplamak istemiyorum]
lit5	Piyasa faiz oranları yükselirse, tahvil fiyatları nasıl etkilenir?	[Yükselir] [Düşer] [Aynı kalır] [İlişkili değildir] [Bilmiyorum] [Cevaplamak istemiyorum]

Doğru olarak kodlanacak olan yanıt kalın font ve altıçizili şekilde verilmiştir.

Kaynak: 2009 NFCS State-by-State Survey Questionnaire (sf.31-32) çalışmasından uyarlanmıştır

Appendix 1 Cont.

Zihinsel Muhasebe - Kazanç ve Kayıpların Çerçevenmesi

hed1	Zeynep iki adet çekilişe katılmıştır. İlk çekilişten 500 TL aynı gün içinde gerçekleşen ikinci çekilişten ise 250 TL kazanmıştır. Elif ise tek bir çekilişe katılmış ve bu çekilişten 750 TL kazanmıştır. Sizce kim daha mutlu olmuştur?	[Zeynep] [Elif] [Fark yoktur]
hed2	Alper kayıtlı olduğu vergi dairesinden bir bilgilendirme almış ve yapılan bir hesap hatası sonucu, önceden ödemiş olduğu vergi borcunun yanı sıra 1000 TL vergi borcu daha olduğunu öğrenmiştir. Aynı gün vergi dairesinden bir bilgilendirme daha almış ve tüm ödemelerin dışında 500 TL daha vergi borcu olduğunu öğrenmiştir. Berkay ise kayıtlı olduğu vergi dairesinden bir bildirim almış ve yapılan bir hesap hatası sonucu önceden ödemiş olduğu vergi borcunun yanı sıra 1500 TL vergi borcu daha olduğunu öğrenmiştir. Sizce kim daha mutsuz olmuştur?	[Alper] [Berkay] [Fark yoktur]
hed3	Burcu hayatında ilk defa almış olduğu piyango biletine 500 TL çıktığını öğrenmiştir. Aynı gün bir kaza sonucu Burcu'nun telefonu bozulmuş ve tamir için 400 TL masraf çıktığını öğrenmiştir. Defne hayatında ilk defa almış olduğu piyango biletine 100 TL çıktığını öğrenmiştir. Sizce kim daha mutlu olmuştur?	[Burcu] [Defne] [Fark yoktur]
hed4	Selim'in arabasına otoparkta park halindeyken başka bir araba çarpmış ve 2000 TL'lik masraf çıkmıştır. Aynı gün Selim katılmış olduğu bir çekilişten 400 TL kazandığını öğrenmiştir. Deniz'in arabasına otoparkta park halindeyken başka bir araba çarpmış ve 1600 TL masraf çıkmıştır. Sizce kim daha mutsuz olmuştur?	[Selim] [Deniz] [Fark yoktur]

Hedonik çerçeveleme var şeklinde kodlanacak yanıt kalın font ve altı çizili verilmiştir

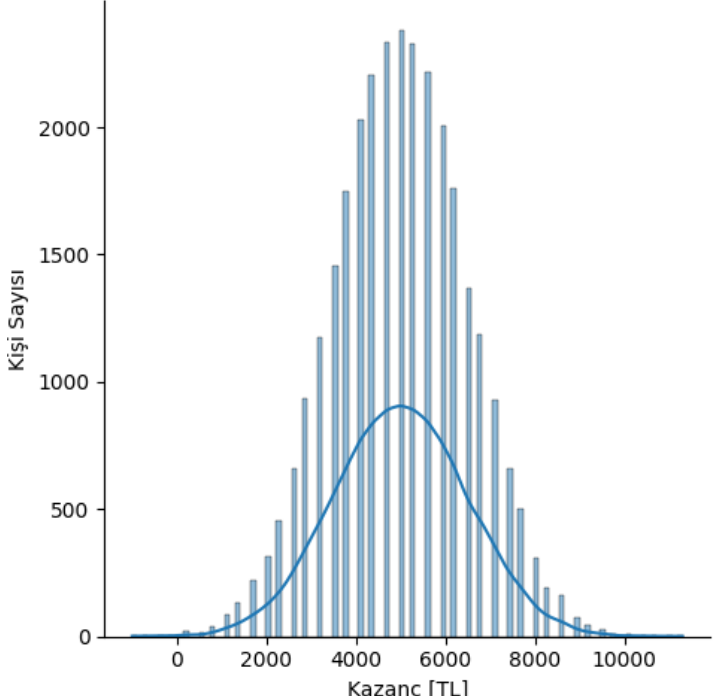
Appendix 1 Cont.

Zihinsel Muhasebe - Bütçeleme

Lütfen aşağıdaki soruları siz olsanız nasıl davranacağınızı düşünerek cevaplayınız. Her 3 soru için de doğru ya da yanlış cevap bulunmamaktadır. Aşağıdaki soruları tam zamanlı bir işte çalıştığınızı varsayarak ve bu hafta gerçekleşeceklerini kabul ederek cevaplayınız.		
bud1	Çalıştığınız işyerinde ödül olarak prim ödemesine hak kazandınız. Priminiz, 1 yıl boyunca her ay net maaşınıza 1000 TL eklenerek ödenecektir. Bu durumda primi kazandığınız aydan itibaren, 1 yıl boyunca ortalama aylık harcamanızda ne kadarlık bir artış olmasını beklersiniz?	Ortalama aylık harcamamda _____ TL artış beklerim
bud21	Çalıştığınız işyerinde ödül olarak prim ödemesine hak kazandınız. Priminiz, prime hak kazandığınız aydaki net maaşınıza 12000 TL eklenerek tek seferde ödenecektir. Bu durumda primi kazandığınız ayda harcamanızda ne kadarlık bir artış olmasını beklersiniz?	Prime hak kazandığım ayda oluşacak harcamamda _____ TL artış beklerim
bud22	(Üstteki sorunun devamı) Prime hak kazandığınız aydan itibaren bir yıl içindeki ortalama aylık harcamanızda ne kadarlık bir artış olmasını beklersiniz?	Ortalama aylık harcamamda _____ TL artış beklerim
bud3	Uzak bir akrabanızın vefatı sonucunda, elinize net 12000 TL geçecek bir mirasa hak kazandığınızı öğrendiniz. Çeşitli sebeplerden dolayı bu mirası 5 yıl boyunca harcayamayacaksınız ve bu süre içerisinde mirasa yıllık faiz işletilecek. 5 yılın ardından net 12000 TL ve artı faiz geliri hesabınıza yatırılacaktır. Bu durumda mirasa hak kazandığınızı öğrendiğiniz ilk yıl ortalama aylık harcamanızda ne kadar artış olmasını beklersiniz?	Ortalama aylık harcamamda _____ TL artış beklerim

Appendix 1 Cont.

Zihinsel Muhasebe - Seçim Basamaklama

Lütfen bu soruları gerçek bir durumda nasıl davranacağınızı düşünerek yanıtlayınız. Her 3 soru için de doğru ya da yanlış cevap bulunmamaktadır.		
myo1	Bir arkadaşınız sizinle bahse girmek istemiş ve yazı-tura atmayı teklif etmiştir. Yazı gelirse, arkadaşınız size 200 TL verecek; tura gelirse, siz arkadaşınıza 100 TL vereceksiniz. Arkadaşınıza tamamen güveniyorsunuz ve yazı-tura gelme olasılığını ideal olarak %50-%50 olarak düşünebilirsiniz. Bu bahse girmeyi kabul eder misiniz?	[Evet] <u>[Hayır]</u>
myo2	Önceki soruya verdiğiniz yanıttan bağımsız olarak; arkadaşınız size aynı bahsi arka arkaya 100 defa oynamayı teklif etmektedir. 100 kere yazı-tura atılacaktır. Her yazı geldiğinde arkadaşınız size 200 TL verecek; her tura geldiğinde ise siz arkadaşınıza 100 TL vereceksiniz. Arkadaşınıza tamamen güveniyorsunuz ve yazı-tura gelme olasılığını %50-%50 olarak düşünebilirsiniz. Bu bahse girmeyi kabul eder misiniz?	[Evet] <u>[Hayır]</u>
myo3	Önceki soruda bahsi kabul eden 30,000 kişinin Kazanç/Kayıp durumları aşağıdaki görselde verilmiştir.  Bu bilginin ışığı altında önceki soruda yer alan bahsi kabul eder misiniz?	[Evet] <u>[Hayır]</u>

Miyopik kayıptan kaçınma davranışı var şeklinde kodlanan yanıt kalın fontla ve altı çizili olarak yazılmıştır.

Appendix 2A: Python script for simulating Samuelson's Bet

```
# A simulation script written for Samuelson's Bet with
# varying bet parameters, number of trials, and participants.
#
# (C) 2023 Ayberk Sadıç, Istanbul, Turkey
# Released under GNU General Public License v3 (GPLv3)
# GitHub: aysadic
# email ayberksadic@gmail.com

import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np

np.random.seed(1923)
coin = np.array([0,1])
sums = []

trial = 100
noPeople = 30000
people = np.zeros(noPeople)
profit = 200
loss = 100

for i in range(noPeople):
    for j in range(trial):
        roll = np.random.choice(coin)
        if roll == 1:
            people[i] += profit
        elif roll == 0:
            people[i] -= loss

print(people)
print(len(people))
print(min(people))
print(max(people))

ax = sns.displot(people, kde=True)
ax.set(xlabel='Kazanç [TL]', ylabel='Kişi Sayısı')
plt.show()
```

Appendix 2B: Python Script for simulating St. Petersburg Paradox

```
# A simulation script written for St. Petersburg Paradox
#
# (C) 2023 Ayberk Sadıç, Istanbul, Turkey
# Released under GNU General Public License v3 (GPLv3)
# GitHub: aysadic
# email ayberksadic@gmail.com

import matplotlib.pyplot as plt
import numpy as np

noHeadToss=8
pot=np.zeros(noHeadToss)
wealth=np.zeros(noHeadToss)
wins=np.zeros(noHeadToss)
pWin=np.zeros(noHeadToss)
for k in range(0,noHeadToss):
    pot[k]=2**(k+1)
    wealth[k]=np.sum(wealth[0:k])+pot[k]
    wins[k]= np.array([2**(t+1) for t in range (0,k+1)]).sum()
    pWin[k]=1/(2**(k+1))

print(pot)
print(wealth)
print(wins)
print(pWin)

w=np.arange(1000)
u=np.log(w)

fig, ax1 = plt.subplots()
ax1.set_title('St.Petersburg Game Winnings and Probabilities')
ax1.set_xlabel('Number of Winning Coin Tosses')
ax1.set_ylabel('Winnings [$]')
ax1.plot(range(1,noHeadToss+1),wins,color='blue',label='Winnings')
ax1.scatter(range(1,noHeadToss+1),wins,color='blue')
ax1.grid()
ax2 = ax1.twinx()
ax2.set_ylabel('Probability of Win [%]')
ax2.plot(range(1,noHeadToss+1),100*pWin,
        color='green',label='Probability')
ax2.scatter(range(1,noHeadToss+1),100*pWin,color='green')
fig.tight_layout()

lines_1, labels_1 = ax1.get_legend_handles_labels()
lines_2, labels_2 = ax2.get_legend_handles_labels()
lines = lines_1 + lines_2
labels = labels_1 + labels_2
ax1.legend(lines, labels, loc=9)
plt.show()
```

Tez Onay Sayfası

Üniversite : T.C. GALATASARAY ÜNİVERSİTESİ
Enstitü : SOSYAL BİLİMLER ENSTİTÜSÜ
Hazırlayanın Adı Soyadı : Ayberk SADIÇ
Tez Başlığı : The Effects of Financial Anxiety And Financial Literacy on Mental Accounting Processes: A Survey of University Students in Turkey
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