A STUDY OF STRESS AS A PREDICTOR OF IRRATIONAL DECISION MAKING FOR WORKERS IN THE FINANCIAL SERVICES SECTOR

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ABSTRACT

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MARTIN CONNOLLY

The purpose of this paper is to investigate the relationship between stress and decision making in the financial services industry. To this end, this paper examines whether individuals who record a high score on the Perceived Stress Scale are more prone to irrational decision making. According to rational choice theory, the preference between options should not change or reverse due to changes in how the option is framed.

This paper adopts a cross-sectional research design and takes a quantitative approach, with a questionnaire administered to 264 people, of which 168 are employed in financial services, with the latter group forming the sample population. A snowball and convenience approach was taken to distribute the survey. Data analysis is performed, with hypotheses supported that a higher stressed group are more likely to make irrational decisions on framing effect experiments replicated from studies by Tversky and Kahneman (1981) and Rubinstein (2003).

The results show that higher stress levels can be a predictor of irrational decision making. A logistic regression model is built to test the data, but does not account for a high degree of variance. As the findings point towards a positive relationship between stress and cognitive bias in decision making, this paper adds to existing research on how employee performance and decision-making capabilities are being impacted by stress, and supports the validity of the existing framing experiments.

Keywords: stress, rationality, decision making, framing, financial services, behavioural economics.

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This dissertation is dedicated to my parents.

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CHAPTER ONE

1.1 INTRODUCTION

Decision making is of enormous theoretical interest and practical importance, with significant interdisciplinary interest in fields such as economics, business and psychology (Evans, 2007). Evidence shows that a key factor impacting decision making is stress, with most of the evidence focusing on its negative impacts (Gok and Atsan, 2016, Keinan, 1987). Given the importance of decision making and the potential impacts of stress, this study aims to analyse if highly stressed workers in the financial services sector are more prone to cognitive biases.

In Ireland alone, over 35,000 people are employed in the Irish financial services sector which accounts for over 7% of total employment, underscoring its importance to the wider Irish economy (O'Connell *et al.,* 2010). Previous studies have examined the impact of job stress in finance (Grabble and Britt, 2012). However, a dearth of research exists on whether stress is impacting the decision-making abilities of people in this sector.

Making coherent and consistent choices is a basic requirement of rational decision making (Mandel, 2014). This study employs framing experiments by Tversky and Kahneman (1981) and Rubinstein (2003) to see if choices will vary due to how questions are framed. Demonstrations of framing effects have been regarded as compelling evidence that choices can be incoherent and irrational (Mandel, 2014, citing Dawes, 1988, and Stanovich and West, 2000).

Tversky and Kahneman's (1981) seminal study on framing and the psychology of choice notes the definition of rationality is much debated, but general agreement exists that rational choice requires consistency and coherence. Gok and Atsan (2016) highlight that evidence shows decisions under stressful conditions tend to be more unsystematic and irrational. Individuals under

stressful conditions often make decisions that fail to adhere to rational choice models that assume decisions are based on the weighing of probabilities and utilities associated with the available courses of action.

In addition to the framing experiments of Tversky and Kahneman (1981) and Rubinstein (2003), this study utilises the ten-item Perceived Stress Scale (PSS-10) (Cohen, 1983) which has been validated on diverse samples and employed in various fields (Taylor, 2015). Cohen and Williamson (1988) highlight the convergent validity of the PSS-10 and recommend it for use in research. This scale is chosen due to the evidence presented by numerous studies which have reported similar reliability and validity findings across cultures (Taylor, 2015).

The key methodological tools deployed in this study are theoretical analysis and a survey experiment, and unique insights are gained by using the PSS-10 scale along with framing experiments. The results, it is hoped, can add to the existing literature and research on decision making and stress, recognising the growing importance of behavioural economics – an experimental science that uses the scientific approach to test economic theories. The hypothesis that higher stress levels engender cognitive biases for people employed in the financial services industry is tested by the collection of data using quantitative methods – an online survey – in line with trends in behavioural economics (Camerer, Loewenstein and Rabin, 2004).

According to Gravetter and Forzano (2012), surveys are used extensively in the behavioural sciences as efficient ways to gather large amounts of information, negating the need to observe directly how people behave in real world scenarios. Thaler (2015) also notes the appropriateness of surveys for experiments in behavioural economics, and the use of hypothetical questions as the simplest procedure for investigating theoretical questions.

The review of the extant literature on decision making and stress exposes a research gap for insights on people employed in financial services. For

example, Griffiths, Baxter and Townley-Jones (2011) argue that the valuable social and economic contribution of financial advisors receives little public attention, and their extensive review of literature did not reveal published studies of financial advisors' own work-related wellbeing. The authors note that the degree of job stress has been used to predict job-related psychological wellbeing among health care workers, while studies have found correlations between job stress and job satisfaction.

The present study will also have implications for management. Previous studies have found correlations between job stress and job satisfaction (Griffiths, Baxter and Townley-Jones, 2011, citing Carpenter *et al*., 2003), and highlighted that factors that increased stress had a negative impact on job satisfaction.

1.2 DISSERTATION STRUCTURE

Chapter One of this dissertation presents the motivations underlying the decision to research stress and decision making, particularly in the context of people working in financial services.

Chapter Two presents the literature in the area of both stress and decision making in the context of behavioural economics, with a focus on the framing effect and its application for revealing cognitive bias. The concept of rationality, as understood by the present study, is defined.

Chapter Three outlines the dissertation purpose and aim. The current research gap is outlined to underscore the need for current research. The hypotheses developed for this study are outlined.

Chapter Four discusses the research methodology chosen by the researcher, including an overview of the research instrument – an online survey – and both justifications for its selection and its limitations.

Chapter Five presents the statistical results and findings of the research. Descriptions of the sample of respondents are provided, and the hypotheses are outlined, and either accepted or rejected. Binary logistic regressions are also analysed.

Chapter Six discusses the findings of the study, including theoretical implications and management implications.

In Chapter Seven, the conclusion to the study is presented, with limitations and recommendations for future research.

CHAPTER TWO – LITERATURE REVIEW

2.1 INTRODUCTION

This literature review will outline the key concepts used to measure stress, with a focus on the Perceived Stress Scale, and the research into decision making that has been done in the field of behavioural economics. This chapter aims to analyse the relevant literature pertaining to the Perceived Stress Scale and decision making in behavioural economics. For this purpose, articles have been reviewed and key concepts are presented which will set a foundation for the objective of this study – to analyse the effects of stress on the decision making of people working in the financial services industry.

2.2 STRESS

Stress refers to a person's emotional response to a stressor – an external environmental stimulus that results in mental worry (Grable and Britt, 2012). According to Kowalski-Trakofler *et al*. (2003), stress is a process by which certain demands evoke an appraisal process in which perceived demands exceed resources, resulting in undesirable physiological, emotional, and cognitive changes.

The authors note the significance of this definition's emphasis on perception – as the ability to cope with stress depends upon the individual's perception or interpretation of an event. This study aims to analyse if stress can be a predictor of irrational decision making, and Kowalski-Trakofler *et al.* (2003) note that the stressful situations do not automatically impact judgement, but rather, it is the perceived experience of stress that leads to problems.

The evidence of the effects of stress on decision making and the scanning of alternatives is inconclusive. The attribution of poor decision making to stress is largely inferential – one cannot with certainty assume that from a poor

decision outcome that the decision-making process was defective and that not all alternatives were appropriately considered (Kowalski-Trakofler, 2003). For example, a decision maker may weigh all options carefully and still make a poor decision. Further, Keinan (1987) argues that the effects of stress on decision making need to be evaluated by direct observation.

Studies have shown that employees in a service industry are prone to a high degree of job stress which is linked to decreased job satisfaction, commitment and productivity, and increased absenteeism and burnout (Oh, Rutherford and Park, 2014, citing Montgomery *et al.,* 1996, Singh *et al.,* 1994). In addition, employees in financial services deal with intangible services that are deemed to be riskier than those in other sectors, and have been found to be more stressful and difficult to sell (Oh, Rutherford and Park, 2014, citing Zeithaml *et al.,* 1985).

The financial services sector is an important part of the Irish economy, employing over 35,000 people and accounting for over 7.7% of total employment. The majority of those employed in financial services in Ireland work in the banking sector, with roles ranging from highly skilled to middle level and routine administration roles (O'Connell *et al*., 2010). O'Connell *et al*. (2010) notes that employees in the Irish financial services sector typically have high job autonomy, but notes that frequent exposure to demanding clients can lead to stress at work. The authors note that recent economic crisis has led to salary reductions, fewer training availabilities and higher workloads.

2.3 THE PERCEIVED STRESS SCALE

The Perceived Stress Scale (PSS) is the most popular measure of perceived stress (Smith, Rosenberg, and Haight, 2014). The PSS was developed as a self-report measure to measure the degree to which individuals perceive situations in their life to be excessively stressful relative to their ability to cope (Cohen, Kamarck, and Mermelstein, 1983). Taylor (2014) notes that the PSS

scale has been used across a broad range of fields for empirical research and clinical practice, has been translated into 25 languages, and has been validated on diverse samples.

The PSS was developed by Cohen *et al*. (1983) to serve as a global, subjective measure of perceived stress. The PSS has become widely used in clinical settings, and has been adopted to identify individuals at risk for worsening conditions, to aid clinicians in planning for treatment, and as a means of tracking a patient's response to an intervention (Roberti *et al*., 2006).

Cohen *et al*. (1983) outline how the PSS has been used in three standard versions: the original 14-item scale (PSS-14), the PSS-10, and a four-item scale (PSS-4). According to the authors, scores on the PSS-14 exhibited good consistency, with Cronbach's alpha of .86 when tested, and moderate predictive and concurrent validity. Cohen and Williamson (1988) further researched the PSS-14 and identified four poorly performing items on the scale, which were removed to form the PSS-10. The authors also shortened the scale to the four-item PSS-4 for situations where measurements were needed quickly.

The present study uses the PSS-10, as per the recommendations of Cohen and Williamson (1998) who argued that the PSS-10 is the best form. According to Cohen and Williamson (1988) scores from the PSS-4 showed less reliability (with a Cronbach's alpha of .60) compared to the scores produced by the PSS-10 (with a Cronbach's alpha of .78). As a result, Cohen and Williamson advocated researchers use the PSS-10. Taylor (2014) reports that subsequent studies using the PSS-10 have exhibited good measurement properties, consistent with the original findings of Cohen and Williamson (1988).

Further, this scale's measurement of and focus on perceptions of stress make it ideal under the definition of stress according to Kowalski-Trakofler *et al*. (2003) and noted above.

2.4 LIMITATIONS OF THE PSS-10

Grable and Britt (2012) note that the subjective nature of an instrument where respondents self-report their stress levels has limitations compared with objective measurements which use the subject's physiological response as a direct stress measurement. While the PSS-10 remains a quick and convenient method of measuring stress, it is possible for a respondent to falsify their experiences of stress. Grable and Britt (2012) note that little is known about the accuracy of stress evaluation within the financial services domain.

Previous studies have suggested that gender differences may be evident in the results of the PSS-10. According to Smith, Rosenberg, and Haight (2014) women have reported consistently higher overall PSS scores than men on negatively worded items, but no consistent gender differences have been found on the positively worded items, meaning that the construct of the PSS-10 may be in question.

2.5 STRESS AND BEHAVIOURAL BIASES

Decisions are affected by skills and personalities, and moods and emotions (Baddeley, 2012). According to Gok and Atsan (2016), experimental research studies have suggested that stress increases behavioural biases in decision making by inducing more conservative choices for those who are normally risk averse and riskier choices for risk takers. In addition, recent evidence suggests when making decisions under stress, people tend to pay more attention to positive information and discount negative information (Gok and Atsan, 2016, citing Mather and Lighthall, 2012).

Previous studies have looked at the impact of stress on persons in the workplace. According to Oh, Rutherford and Park (2014), job stress is a feeling of personal dysfunction as a result of perceived conditions or happenings in the workplace, and one's psychological and physiological responses to these

conditions. The authors cite Jamal (1990) in noting that in response to job stress, individuals often deviate from their normal behaviour patterns, affecting work outcomes.

2.6 BEHAVIOURAL ECONOMICS

Behavioural economics tries to model human behaviours as they actually are - contrasting the traditional Neoclassical assumption that people always behave rationally. It starts with the presumption that human decision making is more emotional than rational (Galetic and Labas, 2015).

Behavioural economics focuses on cognitive skills and functioning, particularly as cognition links clearly into standard economics' focus on assumptions of rationality (Baddeley, 2013). Cognitive functioning can be linked with assumptions about cognition in economics, for example, in analyses of heuristics and biases (Baddeley, 2013).

Brzezicka and Wisniewski (2014) note that it is an experimental science, combining economic deduction with psychological induction, and economic logic of choice with psychological analysis of behaviour. It also combines formal and normative models of economic behaviour determined by principles of rationality with a psychological approach to financial decisions.

One of the standard assumptions of neoclassical economics is that people are rational, forward looking in a systematic way, discounting the future using exponential discount functions in which preferences are consistent over time (Baddeley, 2013). Muradoglu and Harvey (2012) note that modern economics assumes that individuals choose between alternatives in a rational manner (citing von Neumann and Morgenstern, 1944) and that they are aware of the probability distribution of future states of the world (citing Arrow and DeBreu, 1954).

2.7 DEFINING RATIONALITY

Kahneman (2012) states “the only test of rationality is not whether a person’s beliefs and preferences are reasonable, but whether they are internally consistent” (Kahneman, 2012, pp. 411). As a result, according to Kahneman (2012), rationality is logical coherence whether reasonable or not. Rational agents are assumed to make important decisions carefully, and to use all information available (Kahneman, 2012).

A rational person is resourceful, evaluating and maximising, and the rationality of decisions is concerned with balancing the gains and losses which may result from a given action (Wajzer, 2015). Experiments in behavioural economics show that people are prone to cognitive errors that lead them to act in a manner that is not logically coherent. The definition of rationality provided by Kahneman (2012) does not infer that people are irrational – as the definition is impossibly restrictive, people cannot always be logically coherent.

Paternoster and Pogarsky (2009) note that the dominant view in the literature surrounding decision making is that while people compile and weigh options before making decisions, it does not follow that decisions are always reasoned, thoughtful or utility maximising, nor that everyone is adept at decision making.

Brzezicka and Wisniewski (2014) cite Blaug (1995) in noting that rationality, for the economist, is defined as choosing in accordance with a preference ordering that is complete and transitive, but this simplified assumption continues to attract criticisms (Brzezicka and Wisniewski, 2014, citing Fetchenhauer *et al*., 2012). Thaler (2000) criticises the view of economic man as being hyper-rational, arguing that the concept of economic man is only theoretical and unrelated to real world behaviour.

2.8 BOUNDED RATIONALITY

One of the first concepts to challenge the dominant theory of the rationality of the economic man was that of bounded rationality (Simon, 1955). This holds that people can, at best, act in a broadly reasonable manner rather than a strictly rational manner (Simon, 1955). According to Baddeley (2013), bounded rationality focuses on decision making when there are constraints on cognitive capacity and information. Rationality may be bounded when situations are complex and it is hard to identify the best course of action.

According to Baddeley (2013), most people make common mistakes in their probability judgments, and this reflects Simon's (1955) concept of bounded rationality – information is mishandled, reflecting limits on the cognitive processing ability of the human mind.

Kahneman (2011) develops the concept, postulating that two systems are involved in decision making: thinking via intuition (which he denotes as "System 1" – fast, effortless) and thinking via reasoning ("System 2" – slow, effortful). The theories put forward by Kahneman on heuristics and biases are consistent with limits to reasoning and more consistent with Simon's (1955) concept of bounded rationality than the standard rationality assumptions that dominate in economics.

In the study of decision making, developments in psychology also were significant, as psychologists collected data that suggested people make decisions in a manner that was sub-optimal, contradicting the work of economists (Muradoglu and Harvey, 2012, citing Edwards, 1954).

According to Muradoglu and Harvey (2012), Bell *et al.* (1988) argued that economists should not assume normative models of decision making are descriptive. Instead, they argued for a conceptual distinction to be made between normative models which identified the optimal ways of decision making, descriptive models that showed how decisions were actually made under varying conditions, and prescriptive models that suggest ways to improve decision making.

2.9 HEURISTICS AND BIASES

According to Tversky and Kahneman (1984), people use heuristics (mental "rules of thumb") as they do not have the cognitive resources to make normative decisions, leading to cognitive biases. Extensive research has highlighted that heuristics often produce good outcomes (Muradoglu and Harvey, 2012, citing Gigerenzer *et al*., 1999). Muradoglu and Harvey (2012) note, for example, that studies in finance have shown that simpler strategies for picking stocks are often superior to complex ones, citing De Miguel *et al*., (2007).

The difference between biases and heuristics is unclear. Baddeley (2013) notes that heuristics can be justified as procedurally rational, and biases involve misjudgements of information and events. Heuristics are generally reasonable decision-making tools given uncertainty, but may generate systematic behavioural biases if misapplied. The author notes that a bias is a deviation in judgement, by definition, and may be the outcome of bounded rationality (Baddeley, 2013).

Some critics of the study of heuristics and biases argue that heuristics have no theoretical substance – they do not relate to, follow from, or lead to any other major concepts in cognitive science (Beach, 1997), and have no unifying concepts other than the methods used to discover them (Baron, 2008). Despite this, extensive research has been devoted to the framing effect, a violation of normative utility which is central to behavioural economics (Mishra *et al*., 2011).

2.10 FRAMING

Central to framing is the suggestion that the same decision situation can be framed from different reference points, leading to different representations,

which in turn lead to inconsistencies (Maule and Villejoubert, 2007). Within psychology and behavioural economics, the most prominent research on framing has focused on how people frame problems that are stated in terms of gains or losses.

For example, Kahneman and Tversky (1981) presented 150 participants with the following problems and asked them to choose their preferred option. This study has highlighted how the wording of the problem can influence how it is framed by respondents, and as a result, how they will respond. Druckman (2001) and Jullien (2016) note this experiment has been replicated and confirmed by several studies.

A1: A sure gain of $240

A2: A 25% chance to gain $1,000 and a 75% chance to gain nothing

Or

B1: A sure loss of $750

B2: A 75% chance to lose $1,000 and a 25% chance to lose nothing

This example concerns the framing of acts – that is, it is the objects of choice that are framed (Jullien, 2016). 84% of the participants choose A1 rather than A2, even though $240 is less than the expected value of $250 for A2, supporting the theory that people tend to avoid taking risks when outcomes are framed as gains. Similarly, when choosing between B1 and B2, 87% chose B2, even though the expected loss for B2 is equal to the loss of $750 for B1, showing that people are willing to engage in risky behaviour when the outcome is framed as a loss. Kahneman and Tversky (1981) explain this behaviour with reference to Prospect Theory.

2.11 PROSPECT THEORY

According to Prospect Theory, people display framing effects because the rate of increase in utility resulting from gains is sharply diminishing: for example, gaining €100 is more valuable if one starts with €1 than if one starts with €10,000 (Mishra *et al*., 2011). Regarding losses, the rate of decrease in utility diminishes more rapidly. Therefore, risky behaviour may be displayed to prevent further losses. Kahneman and Tversky (1979) argued reference points exist, forming the basis of losses or gains depending on whether the outcome falls below or above the reference point.

Prospect theory, according to Thaler (2015), sought to break from the traditional idea that a single theory of human behaviour can be both normative and descriptive, and developed the theory of decision making under uncertainty, building on the work of Bernoulli (1738). Bernoulli had posited that happiness, or utility, increases with wealth but at a decreasing rate – known as diminishing sensitivity (Thaler, 2015).

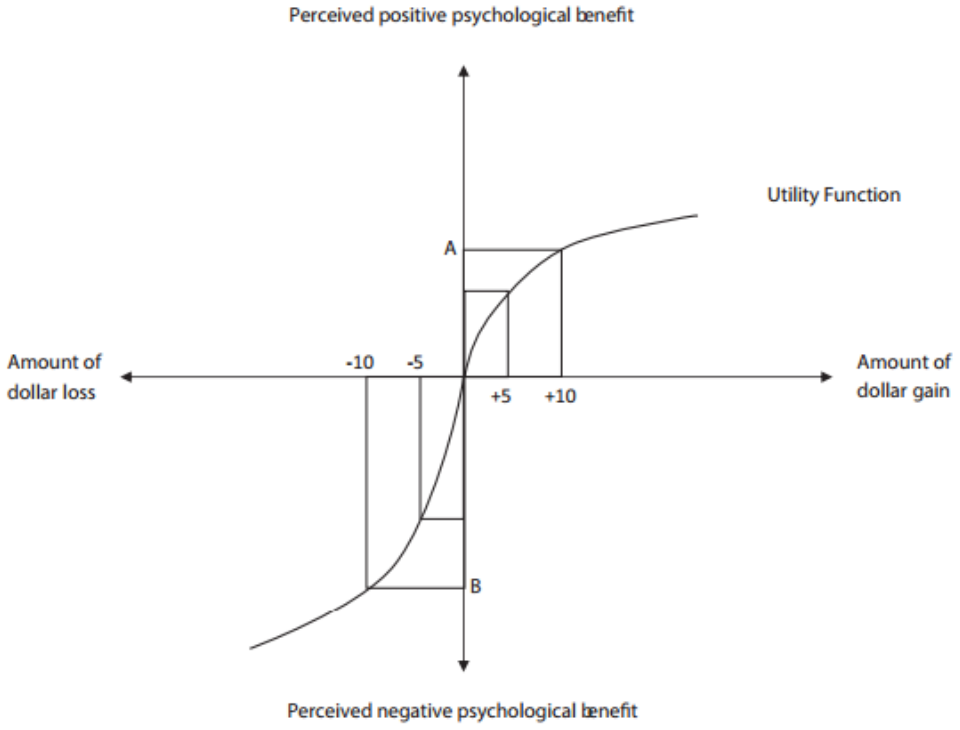

Figure 1. The principles of Prospect Theory. Source: Kahneman and Tversky (1979).

A key part of behavioural economics is its ability to produce replicable tests that confirm the predictions of theories such as Prospect Theory (Mishra *et al*., 2011). Several studies have validated the framing effects found within Prospect Theory involving risky choices, with participants exhibiting higher risk acceptance in negatively framed decision scenarios compared to positively framed decision scenarios (Mishra *et al*., 2011, Benjamin and Robins, 2007).

A widely used decision scenario within behavioural economics to test framing and risk acceptance is the 'Asian disease problem' (Tversky and Kahneman, 1981). This gives a hypothetical choice regarding actions that lead to variable numbers of lives saved in the face of a pandemic, which represents a framing of outcomes, distinguishing it from the previous example on the framing of acts (Jullien, 2016).

However, Mishra *et al*. (2011) note that this a novel scenario for participants, less relevant to their day to day lives than hypothetical investment scenarios. Therefore, results from this problem may not be generalisable to other decision scenarios.

Along with other experiments, Tversky and Kahneman's (1981) study highlighted how individuals' choice behaviour is affected by reference points (the way the decision is presented) rather than the fundamental beliefs or values of the decision maker. According to Maule and Villejoubert (2007), Tversky and Kahneman's (1981) study highlights how individuals violate one of the fundamental axioms of rational decision theory – the invariance axiom.

2.12 DESCRIPTION INVARIANCE

Making coherent choices is a fundamental requirement of rational decision making, and is captured well by the principle of description invariance, a central coherence axiom of rational-choice theories (Tversky and Kahneman,

1986). According to Mandel (2014), this refers to the principle that a choice from a set of possibilities should not vary simply because they are described or framed differently, provided that the alternative frames describe an equal and identical set of options.

Mandel (2014) notes that framing effects are regarded as compelling evidence of incoherent and irrational choices, and have been used as negative indicators to measure decision competence and critical thinking. Read *et al* (2013) note that description invariance is a fundamental requirement for rationality, citing Arrow (1982) and Wakker (2010), and that it is also assumed in models of intertemporal choice and time inconsistency.

The verdict of irrationality drawn in the framing literature rests on the extensional-equivalence assumption (Mandel, 2013). According to Levin *et al*. (1998), the "Asian disease problem" highlights a pure framing effect as the certain option in the positive frame is identical to the certain option in the negative frame, and likewise for the uncertain options across frames. Most of the literature supports this assertion of extensional-equivalence (eg. Kahneman and Tversky, 1986; Kuhberger and Tanner, 2010; Mandel, 2001, Gold and List, 2004).

Druckman (2001) notes that attempts to replicate this experiment have had mixed success, with the framing effect found to be generally highly reliable but the magnitude of the effect tending to the smaller than the original (Druckman, 2001, citing Levin *et al*., 2001).

However, Mandel (2014) has argued against this assumption that the framing effect as noted above is "pure", noting that the question of how to verify if the reframed options are identical is neglected in the literature. An opportunity for future research is highlighted here, whereby one could examine the participants' interpretations of numeric quantifiers in framing studies of decision making. The current study adopts the widespread view in the literature of "extensional equivalence" – that the reframed options are identical.

2.13 MENTAL ACCOUNTING

Framing effects have been used to highlight the concept of mental accounting which individuals use to evaluate financial activities – sorting expenditure into different psychological accounts which provide a frame for coding, categorising and evaluating events (Thaler, 1999). Allocating expenditure to different mental accounts has a significant impact on decision making. Household spending violates the standard assumption of fungibility: expenditure in one mental account is not a perfect substitute for expenditure in another, and money cannot be easily reallocated between mental accounts.

According to Beach (1997), it is assumed by most economic theories that payoffs can be described by their objective market value, which is stated in terms of money. Money is held to be fungible – its source is unimportant and one's present asset value is the sum of all one's different sources of wealth. Recent theories have challenged this view of the fungibility of money. Beach (1997) notes how von Winterfeldt and Edwards (1986) described four different categories in personal finance: quick cash, capital assets, income and fixed expenditure, and play money. Thaler (1992, 2015) refers to these as mental accounts.

The mental accounting approach emphasises the context in which decisions are made, which raises the issue of framing. Framing effects are a key source of cognitive bias and capture how people respond in a way that is determined by the context in which the question is framed, and can be seen in mental accounting experiments (Thaler, 2015). One such experiment concerns the framing of outcomes under certainty – Tversky and Kahneman's (1981) 'theatre' problem, which includes a sunk cost in both frames, and is replicated also in the present study.

According to Read, Frederick and Scholten (2013), description invariance is assumed in psychological models of intertemporal choice, as well as rational

choice models, including Ainslie's (1975) model of hyperbolic discounting. Therefore, the present study will apply the framing effect to also to experiments in time inconsistency.

2.14 TIME INCONSISTENCY

Framing effects have been shown to extend to choices involving trade-offs between time and amount with participants choosing between smaller sooner rewards and larger later rewards (Weber *et al*., 2007). According to Read, Frederick and Scholten (2013) the choice between smaller sooner rewards and larger later rewards is the dominant method in the literature for examining intertemporal choice. Killeen (2009) and Scholten and Read (2006) agree that most psychological models of discounting are based on experiments that adopt this approach.

Baddeley (2013) notes that a fundamental assumption of standard economic models is that people are systematically forward looking, with exponential discount functions stable throughout their lifetime. Behavioural models of time inconsistency can capture anomalies. The present study contends that individuals who are highly stressed will exhibit unstable time preferences.

According to Crompton (2016), economists assume people have consistent time preferences, discounting future benefits and costs at a constant interest or discount rate. For example, if a discount rate of 5% is used, €100 today would be worth €105 in one year, and this would mean that if offered €100 today or €150 next year, people should select €150. Evidence suggests people are more likely to choose to receive €100 now (Frederick, Loewenstein and O'Donoghue, 2002). However, when the two amounts are offered in five and six years' time, respectively, respondents tend to prefer the higher option in year six (Frederick, Loewenstein and O'Donoghue, 2002).

This is an example of hyperbolic discounting - a form of time inconsistency where the rate of substitution between today and tomorrow is smaller than that

of between any other pair of successive periods. That is, people do not have stationary fixed discount rates, as evidenced by empirical research in cognitive psychology (Frederick, Loewenstein and O'Donoghue, 2002, Rubinstein, 2003). This has received significant attention in the literature as it complicates the modelling of the decision maker since assumptions must be added that specify the decision maker's analysis of his future behaviour (Rubinstein, 2003).

According to Harris and Laibson (1999), studies of time preferences find that discount rates are much greater in the short term than in the long term, leading to a shift in the literature away from the traditional exponential functions towards the hyperbolic model. Crompton (2016) suggests that people's preference may switch when the time period changes to two future dates for three reasons: immediate gratification, procrastination, and delusional optimism.

Immediate gratification recognises that people have an intrinsic immediate bias, wanting the benefits now, attaching too much weight to salient or vivid events rather than future, non-salient events (Crompton, 2016, citing Akerlof, 1991). The reverse is procrastination – present costs are given too much saliency when compared with future costs. Delusional optimism, meanwhile, is the tendency to be overconfident, rather than weighing gains, losses and probabilities rationally (Crompton, 2016, citing, Kahneman, 2011). Crompton (2016) argues that all three explanations for hyperbolic discounting highlight a failure of self-regulation.

2.15 CRITICISMS OF BEHAVIOURAL ECONOMICS

While the ability of behavioural economics to achieve replication of key findings is considered a notable achievement for a social science (Etzioni, 2011, Baddeley 2015), the reliance on experiments under lab conditions have

led some critics to suggest that the findings apply much more in the lab rather than in the field, and it therefore lacks external validity (Etzioni, 2011).

Mell and Walker (2014) note that hypothetical questions can be seen as contrived and unrepresentative of real world decisions – adding that it may be a case that instead of making cognitive errors, respondents may simply be liable to mistakes in unfamiliar environments. The authors argue that a respondent who erred in the framing question would not persist in their irrationality once they realised the questions were the same but reworded.

A related criticism is that the experiments in behavioural economics typically offer hypothetical choices or real gambles with low payoffs. As a result, an individual may be prone to experience lab pressures such as being observed, being unfamiliar with the situation, and desiring to give the experimenter the result they want (Baddeley, 2014).

Chang (2014) argues that the focus on individuals rather than the collective is both a strength and a weakness. While offering unique insights into an individual's behavioural approaches, it does not provide sufficient insight on a macro level, and its findings may not always be generalisable. According to Etzioni (2011), some economists have argued that even if many individuals act in ways that appear to contradict the standard, rational, and utility-maximising assumptions of the traditional neoclassical model (that is, that they act irrationally), this is not the case when assessed in aggregate.

Numerous studies have replicated the framing effects found by Kahneman and Tversky (1981), but some have failed to produce the predicted effect, challenging the notion that framing effects are ubiquitous. Maule and Villejoubert (2007) cite Levin *et al*. (1999) who argued that the risky or safe option in a decision pair can be unclear. Druckman (2001) argued that the studies that failed to find the framing effect demonstrate that the framing effect theory should be rejected. However, most of the evidence within the literature supports the framing effect (Thaler, 2015).

2.16 CHAPTER SUMMARY

This chapter has noted how the ability to cope with stressful situations depends on the individual's perception or interpretation of the stressful event. To this end, the Perceived Stress Scale (Cohen, 1983), in the ten-item format, has been chosen by the researcher as a suitable measure for stress, supported by extensive evidence in the literature that confirms the scale's reliability. The literature has shown that stress increases behavioural biases in decision making (Gok and Atsan, 2014).

Behavioural economics focuses on rationality and human behaviour, applying a scientific approach to test assumptions such as the neoclassical theory that people are rational and systematic in their decision making. The framing effect challenges traditional models of decision making that assume people make rational decisions when faced with choices. Several studies have validated the framing effect, with participants consistently exhibiting higher risk acceptance in negatively framed scenarios compared to positive ones (Mishra *et al*., 2011).

The literature review has highlighted how demonstrations of framing effects have been regarded as compelling evidence that people's choices are irrational and inconsistent (Mandel, 2014). Adopting the PSS-10, the present study builds on this evidence by investigating if subjects with high stress levels will be more likely to exhibit violations of the principle of description invariance.

CHAPTER THREE - DISSERTATION PURPOSE AND AIM

3.1 INTRODUCTION

The present study aims to bridge a research gap in the literature regarding the impact of stress on the decision making of people in financial services. According to Baron (2009), a hypothesis is a proposition that is evaluated and tested by gathering evidence regarding its truth or probability. Several hypotheses are developed in the present study to investigate if higher stress levels will engender a bias away from “rational” decision making.

Psychologists have tended to focus on cognitive and social psychological accounts of people engaged in decision processes (Evans, 2007, citing Hastie, 2001, and Koehler and Harvey, 2004). Evans (2007) notes that psychological experiments in this area typically consist of presenting people with hypothetical scenarios in which they are requested to make choices between proposed alternatives, often imagining themselves to be in the role or situation described to them. This study is in keeping with that trend in the research.

The present study contends that experiments on the framing effects give key insights into decision making abilities and cognitive limitations. Further, this study proposes that the impact of stress is worthy of investigation to determine if they lead to cognitive limitations. This is in keeping with Kahneman’s (2003) assertion that paradigms of choice that do not consider all factors will lead to prescriptions that fail to maximise the utility of outcomes as they are actually experienced.

3.2 RESEARCH AIM

The research aim in this study is to examine if higher stress levels can engender a bias towards irrational decision making. A significant body of

evidence has shown that stress impacts the decision-making process (Gok and Atsan, 2016, Keinan, 1987). The majority of the literature surrounding stress highlights its negative impacts (Gok and Atsan, 2016, citing Staal, 2004). In their review of the existing literature on the topic, Gok and Atsan (2016) highlight that most evidence indicates decisions under stressful conditions tend to be more unsystematic, irrational, and lacking a consideration of all the options.

It is hypothesised that the decision making of people who perceive themselves to be stressed will show performance deficits. This study employs an online survey, with a series of question couplets, taken from experiments by Tversky and Kahneman (1981) and Rubinstein (2003). To achieve the research aim, the PSS-10 is also incorporated into the online survey, with respondents assigned an aggregate score and classified as stressed or non-stressed, allowing the differential effects of framing to be analysed between groups.

3.3 RESEARCH GAP

Decision making is a process, comprised of interrelated steps, including recognition of the problem, search of information, assessment of alternatives, selection of alternative and implementation (Gok and Atsan, 2016). The association between stress and decision-making behaviour has not been explored extensively in the literature, according to Gok and Atsan (2016), and the present study aims to add to the existing literature by investigating if stress can engender cognitive biases.

In reviewing the extant literature, a research gap is evident. It has been seen that the relationship between stress and decision making is complex, inconclusive, and inadequately explored (Kowalski-Trakofler and Vaught, 2003). This is despite the significant practical importance of the effect of stress on decision making and judgments. According to Galetic and Labas (2015),

for a thorough understanding of decision making, a balanced understanding of rational and intuitive behaviour is required.

While work has been conducted before on the effects of stress on decision making, most of it has looked at human factors and how stress impairs decision making by causing anxiety, or the impact of anxiety from secondary tasks, such as exams (Preston *et al*., 2007). O'Connell (2016) notes that workers in financial services are prone to high stress levels. This study is unique in using the PSS-10 as a psychometrically valid measure of perceived stress along with cognitive tests to gain an insight into the decision making of people employed in financial services.

3.4 HYPOTHESES

The present study posits that individuals who report higher levels of stress will tend to make less rational decisions. To give the online test validity, questions used will be replicated from previous studies which have been replicated across diverse samples with consistent results (Druckman, 2001). To achieve the overall research aim, this study examines the following hypotheses:

Hypothesis 1: There will be a positive relationship between higher stress levels and irrationality in the replication of Tverksy and Kahneman's (1981) experiment on the framing of acts.

Hypothesis 2: There will be a positive relationship between higher stress levels and irrationality in the replication of Tversky and Kahneman's (1981) experiment on framing under certainty.

Hypothesis 3: There will be a positive relationship between higher stress levels and irrational decision making in the replication of Kahneman and Tversky's (1981) experiment on the framing of outcomes.

Hypothesis 4: There will be a positive relationship between higher stress levels and time inconsistency.

CHAPTER FOUR - RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter will present the method and approaches adopted for this research. It will include an overview of the research philosophy that underpins the study, the research framework and approach, and the research design for how the data is collected and analysed. The research strategy for analysing the relationship between decision making and stress is outlined, along with details of the research instrument – an online questionnaire. This questionnaire is discussed in depth, with a justification for its selection, along with its limitations. Research limitations are also discussed, as are the ethical considerations of the researcher.

4.2 RESEARCH PHILOSOPHY

According to Quinlan (2011), research projects are underpinned by a philosophical framework which evidences the worldview within which the research is situated and which can be seen at each step of the process.

Blumberg, Cooper and Schindler (2008) note that a research philosophy is a belief about how research should be conducted and how research reasoning (theory) and observations (data or information) are interrelated. According to Saunders, Lewis and Thornhill (2012), research philosophy is related to the development of knowledge and the nature of that knowledge. The two main research philosophies are positivism and interpretivism.

Positivists argue that there is only one objective and external reality, and that a theory of knowledge and human behaviour should be based only on observations that can be made with absolute certainty (Goodwin, 2010). Conversely, interpretivists argue that reality is subjective, with individuals

having their own sense of reality, which is socially constructed (Saunders, Lewis and Thornhill, 2012).

This proposal adopts the philosophy of positivism, which according to Quinlan (2011) holds that there is one objective reality, and that reality is singular and separate from consciousness, and as a result the researcher remains objective throughout.

4.3 RESEARCH FRAMEWORK

The present study adopts the research framework proposed by Saunders, Lewis and Thornhill (2011) known as the “research onion”. This framework depicts the issues underlying the choice of data collection methods, with the outer layers being research philosophies, approaches, methodological choices, strategies, and time horizon. This framework has informed the work of the current research, guiding its progression and assisting in the selection of the most appropriate methodology.

In line with this framework, the researcher adopted the stance of the natural scientist, collecting data about the evident reality of revealed preferences, searching for regularities and causal relationships to make law-like generalisations. Within behavioural economics, this approach is appropriate, as noted by Camerer, Loewenstein and Rabin (2004), making the field of behavioural economics an experimental science.

To investigate the effects of stress on the decision making of people employed in the financial services sector, hypotheses are developed based on the framing effect. While the study aims to take a value-free approach, Saunders, Lewis and Thornhill (2011) note that this is arguably impossible, given that the researcher has chosen the topic to study, the research objectives and the data to collect.

4.4 RESEARCH APPROACH

According to Goodwin (2010), the move from theory to data involves the logical process of deduction, reasoning from a set of general statements toward the prediction of a specific outcome.

Saunders, Lewis and Thornhill (2011) identify six sequential steps that are followed in this approach: after the testable hypothesis is put forward, along with testable propositions, the argument is compared against existing theories in the field of behavioural economics. The premises are tested by the collection of data using quantitative methods, and analysed to see if the results are consistent with the premises. At this point, the theory that highly stressed individuals in the financial sector are more likely to be prone to cognitive biases will be either rejected or corroborated.

4.5 RESEARCH DESIGN

Research design relates to the overall plan for the research study, including tactics on how the data will be gathered and analysed, and how the strategy will be implemented (Saunders *et al.,* 2012). Determining a research design requires deciding whether to study a group or an individual, and the number of variables to be included (Gravetter and Forzano, 2012).

As a group study, this research adopted a quantitative approach, constructing and using a survey, as group studies tend to have higher external validity – that is, the results tend to hold true outside the specific study (Gravetter and Forzano, 2012). Wright (2006) notes that quantitative approaches are less open to bias, are more scientific than qualitative approaches, and can be analysed objectively.

According to Bryman and Bell (2015), quantitative research is a research strategy emphasising quantification in the collection and analysis of data. This

strategy involves a deductive approach between the theory and the research that emphasises testing the theories; employs a natural scientific model associated with positivism, where numbered data can be analysed statistically (Bryman and Bell, 2015).

Quantitative surveys can be closed-ended, multiple choice, levels of satisfaction or semantic differential-type questions that can be codified and then administered to a large stratified or random representative sample (Wright, 2006). Camerer, Loewenstein and Rabin (2004) note the quantitative approach is dominant within behavioural economics, and cite as an example Ariely's (2010) experiments on anchoring and the zero-price effect. However, Wright (2006) notes that an individual study rather than a group study may provide detail that is lost in averaging a large group (Gravetter and Forzano, 2012).

4.6 RESEARCH STRATEGY

A relationship between variables such as stress and decision making would indicate that a change in one variable is consistently and predictably accompanied by changes in the other variable. To establish the existence of a relationship, researchers must make observations – that is, measurements of the two variables (Gravetter and Borzano, 2012).

The quantitative approach is principally linked to two research strategies: experiments, and surveys (Saunders *et al*., 2012). According to Quinlan (2011) surveys are commonly found in quantitative studies, with the methods of data collection usually questionnaires or scales. This approach allows for the collection of data from large samples due to the effectiveness of this method for researching bigger populations (Quinlan, 2011).

A survey is a structured set of questions or statements given to a group of respondents to measure their attitudes, beliefs, values, or preferences (Goodwin, 2010). This use of surveys, as used in this research, is found widely

in behavioural economics (Thaler, 2015) and noted by Saunders, Lewis and Thornhill (2012) as useful for exploratory and descriptive research. Surveys allow for collecting standardised data from a sizable population in an economical way (Saunders, Lewis and Thornhill, 2012). Another reason is practicality, given the budget and time constraints of this research. Muradoglu and Harvey (2012) note that experimenters are increasingly adopting web-based experimentations.

Thaler (2015) notes hypothetical surveys are common for practical reasons as permission would not be obtained to run experiments where subjects may lose money. Furthermore, the author notes that an unwillingness to rely on hypothetical questions would have prevented theorists from learning the nuances of behaviour found in Prospect Theory. Thaler (2015) also notes the method is the simplest procedure by which multiple theoretical questions can be investigated.

However, Baddeley (2013) notes that experiments are fraught with problems for behavioural economics, noting that experimental designs need to be clean, with proper controls, simple instructions and clear, salient incentives. Results can have limited external validity and may not be generalizable to the outside world, and this has been cited as a common criticism of behavioural economics.

Carlsson (2010) also notes the limitations of framing experiments due to their reliance on surveys. The author cites Levitt and List (2007) in noting that the difference in actual behaviour and surveys can be due to context, stakes, selection of subjects, restrictions on time horizons and choice sets. However, Carlsson (2010) notes that there are methods of improving survey accuracy, such as employing the time-to-think protocol advocated by Cook *et al* (2007), where respondents do not need to respond immediately.

This study acknowledges that results may suffer from hypothetical bias – introduced by asking a hypothetical question and not confronting the

respondent with a real-world situation. However, Carlsson (2010) suggests employing the time-to-think protocol and allowing respondents to discuss the study with others before responding to better resemble an actual situation.

4.7 POPULATION AND SAMPLE SIZE

The two main types of sampling techniques are probability and non-probability, with the latter being particularly suited to research constrained by time and cost (Saunders *et al*., 2012). The target population for the proposed study was adults working in the financial services sector, and convenience and snowball sampling were used. According to Quinlan (2011), convenience sampling techniques are used for those participants who are easy to include in the research sample, reflecting their easy and feasible access for the researcher.

Snowball sampling, according to Saunders *et al*., (2012), allows the researcher to identify a group of respondents who can in turn identify additional respondents for the survey. This method is often used when targeted respondents are not registered as a population, and difficulties exist in the identification of the target population members (Saunders *et al*., 2012).

White (2009) notes that while a large sample size decreases the probability of sampling error, there are instances where a large sample size is not necessary – such as when the types of respondents are very similar – and instead emphasises the importance of the accuracy of the information collected. Accuracy can be achieved by the careful design and execution of the questionnaire used in a quantitative study, for example (White, 2009).

Bias, according to Harper (1991), is allowing an influence to have more importance than it really warrants. Given that the topic being examined was framing, it was important to avoid researcher bias which could be caused by giving the respondents too much information that would make them conscious of making inconsistent choices. White (2009) notes that it is impossible to remove bias completely from any form of survey research, whether it is

research bias, sampling frame bias, or non-response bias. Non-response is always an issue, as it cannot be determined how individuals would have responded if they had chosen to participate in the study (White, 2009).

4.8 DATA COLLECTION

According to Quinlan (2011), online surveys are an effective method for surveying the population who have the access and skills necessary to use the technology. Designed to take five to ten minutes to complete, the survey was made using Google Forms, and emailed to industry contacts. One reported limitation from respondents was that the survey could not be taken in some workplaces where access to Google Forms was restricted. The survey was also promoted via social media, with links to the survey shared to potential industry contacts on Facebook, Twitter and LinkedIn.

According to Wright (2006), internet surveys are an economical and efficient method for reaching many potential respondents, allowing a saving of time and cost. However, internet surveys, like mail surveys, are also subject to non-response bias (Wright, 2006). Participants who engage and respond may be different from those who did not through lack of access to the internet, or from those who could not access Google Forms while at the workplace.

4.9 QUESTIONNAIRE DESIGN

Conducting survey research presents issues that must be addressed for the results to be accurate and meaningful and have good external validity. Survey questions must be developed, assembled and organised to produce a well-constructed survey, before a selection process is developed to determine who will be asked to participate in the survey. Finally, researchers must determine how the survey will be administered (Gravetter and Forzano, 2012).

While the extant literature has shown how behavioural economics theories have been criticised for having no unifying concepts other than the methods used to discover them (Beach, 1997, Baron, 2008), this study has combined biases for their unifying theme of the framing effect, and their implications on the understanding of rationality and consistency.

This study evaluates framing effects by measuring the consistency of respondents to question pairs, that is, whether there is a unidirectional effect or a choice shift between objectively identical frames. According to Druckman (2001), this approach provides insight into the maximal power of framing.

According to Druckman (2001), framing effects can be sensitive to slight contextual changes. This has been highlighted by replication studies of Tversky and Kahneman's (1981) experiments, which have often produced significant framing effects but of smaller magnitudes than the original (Druckman, 2001, citing Bless *et al*., 1998). As a result, the questionnaire developed for this study reproduces the experiments with only slight adjustments, such as currency and dates.

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

1. Choose your preferred option.
A. A sure gain of €240
B. 25% chance to gain €1000, and a 75% chance to gain nothing.

2. Choose your preferred option.
A. A sure loss of €750.00
B. 75% chance to lose €1000.00, and 25% chance to lose nothing.

Imagine that you have decided to see a play where admission is €10.00 per ticket. As you enter the theatre you discover you have lost €10.00.

Would you still pay €10 to see the play? A. Yes B. No
Imagine that you have decided to see a play and paid the admission price of €10.00 per ticket. As you enter the theatre you discover that you have lost the ticket. The seat was not marked and the ticket cannot be recovered.
Would you pay €10 for another ticket? A. Yes B. No
Imagine that your country is preparing for the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as outlined in the below options.
Select your preferred option. A. If Program A is adopted, 200 people will be saved. B. If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
Again, imagine that your country is preparing for the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as outlined in the below options.
Select your preferred option. A. If Program A is adopted 400 people will die. B. If Program B is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Table 1: Section A - Replicated from Tversky and Kahneman (1981)

Questions in section B are from Rubinstein's (2003) study on hyperbolic discounting. This section consists of three problem pairs, asking respondents to choose between smaller sooner rewards, or larger later rewards.

Imagine that you have to choose between the following two options. Select your choice.

A. Receiving €467.00 on September 1st, 2017
B. Receiving €607.00 on September 1st, 2018

Imagine that you have to choose between the following two options. Select your choice.

A. Receiving €467.00 on September 1st, 2017
B. Receiving €467.39 on September 2nd, 2017

You can receive the amounts of money indicated according to one of the two following schedules. Select which one you prefer

A. Apr 1: €1000, Jul 1: €1000, Oct 1: €1000, Dec 1: €1000
B. Mar 1: €997, Jun 1: €997, Sep 1: €997, Nov 1: €997

Choose which one of the following options you would prefer.

A. Receive €1000 on December 1st
B. Receive €997 on November 1st

In 60 days you are supposed to receive a new stereo system to replace your current one. Upon receipt of the system, you will have to pay €960. Are you willing to delay the transaction for one day for a discount of €2?

A. Yes
B. No

Tomorrow you are supposed to receive a new stereo system to replace your current one. Upon receipt of the system, you will have to pay €1,080. Are you willing to delay the delivery and the payment by 60 days for a discount of €20?

A. Yes
B. No

Table 2: Section B – Replicated from Rubinstein (2003)

While the questionnaire, which can be found in full in Appendix A, began with problem pairs measuring consistency, the study required a scale to measure stress levels. The scale used is the ten-item version recommended by Cohen and Williamson (1988). Responses range from 1 (never) to 5 (very often), with four items worded in a positive direction which are reverse coded in SPSS to create a psychological stress score.

A potential limitation of rating scale questions, of which the PSS-10 is a type, was that whenever questions in a series have the same choices for responding, participants tend to use the same response to answer most questions (Gravetter and Forzano, 2012). However, the PSS-10 contains four positively-framed questions, minimising the response set problem, as respondents need to move back and forth between opposite sides of the scale so they cannot fall into a single response set for all questions.

In the last month, how often have you been upset because of something that happened unexpectedly?
1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

In the last month, how often have you felt that you were unable to control the important things in your life?
1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

In the last month, how often have you felt nervous and "stressed"?
1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

In the last month, how often have you felt confident about your ability to handle your personal problems?
1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

In the last month, how often have you felt that things were going your way?
1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

In the last month, how often have you found that you could not cope with all the things that you had to do? 1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often In the last month, how often have you been able to control irritations in your life? 1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often In the last month, how often have you felt that you were on top of things? 1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often In the last month, how often have you been angered because of things that were outside of your control? 1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? 1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

Table 3: The PSS-10 (Cohen, 1983)

Gravetter and Forzano (2012) note the primary advantage of rating-scale questions is that they produce numerical values that can be treated as measurements from an interval scale, and participants generally find them easy to understand and easy to answer. In keeping with the authors' recommendations, demographic questions were placed at the end, while the more interesting hypothetical questions were placed at the beginning to obtain the interest of the respondents.

However, Schwarz and Oyserman (2001) highlight how cognitive research indicates that asking respondents about behaviours can be difficult, as respondents need time to recall relevant behaviours from memory. The authors argue that response alternatives presented by the researcher may result in estimation strategies that systematically bias the results.

4.10 PILOT STUDY

Prior to launching the survey and obtaining responses from the general population, a pilot study was conducted. Pilot testing refers to the use of practice studies designed to help researchers refine the measures or manipulations they wish to use in the real study (Pelham and Blanton, 2013). The aim was to obtain feedback from respondents and refine the questions on the survey to make it easier to answer, and to avoid any problems in recording the data.

The pilot study was conducted among members of the researcher's colleagues in the financial sector to test the clarity of the instructions and the questions, the attractiveness of the layout, and the time needed to complete the survey. As a result, minor changes were made to the layout and the instructions.

As participants had to read the survey, the format for each page should be relatively simple and uncluttered. The survey was broken into four distinct sections to avoid an overwhelming appearance that could intimidate participants and deter them from engaging. Questions were grouped together in terms of format, with the multiple-choice questions in sections one and two, and the rating scale of the PSS-10 in section three, before the demographic questions at the end.

Feedback to the survey was positive, with respondents advising they found the PSS-10 easy to answer as it allowed different degrees of responses, without forcing the participants into a binary and absolute yes or no choice. It also allowed for a degree of variety on the survey to maintain interest, after the hypothetical questions presented to respondents in the first two sections.

4.11 DATA ANALYSIS VALIDITY AND RELIABILITY

Data collected from the responses to the questionnaire was input into the statistical tool SPSS (Statistical Packages for Social Sciences) for detailed analysis. The SPSS tool is recommended for quantitative studies due to its ability to analyse large data sets developed through surveys (Quinlan, 2011).

Data analysis began with testing the internal consistency of the PSS-10, that is, the ability of the scale to measure what it is intended to measure, by examining the correlation between responses to questions (Saunders, Lewis and Thornhill, 2012).

The consistency of responses is measured using Cronbach's alpha, which has been shown to be a reliable technique for measuring internal consistency within multi-item questionnaires (Gliem and Gliem, 2003). According to Saunders, Lewis and Thornhill (2012), Cronbach's alpha is one of the most commonly used indicators of internal consistency.

Tests for descriptive analysis of results were then conducted to leverage trends and patterns from the data set, including histogram distributions and tests for normality. For this study, the significance value used will be 5% as standard in the social sciences. This significance level (p-value) of the tests conducted in SPSS will be used to accept or reject the null hypothesis. For values greater than 0.05, the null hypothesis is accepted, and rejected for values under 0.05.

To enhance the external validity of the framing experiments, the frames used are drawn from previous framing experiments by Tversky and Kahneman (1981) and Rubinstein (2003), as recommended in the replication experiments of previous framing experiments by Druckman (2001).

4.12 ETHICAL CONSIDERATIONS

Research ethics concerns the responsibility of researchers to be honest and respectful to all individuals affected by or engaging with their research studies or their reports of the research results (Gravetter and Forzano, 2012). Within the research process, ethical considerations have been included in each stage in line with the principle of not causing harm.

The principle of informed consent requires the researcher to provide all available information about a study to participants so they can make an informed decision about whether to participate (Wright, 2006). Due to the nature of the questions, some information could not be revealed to the respondents regarding the nature of the survey. If participants knew that cognitive biases were being tested, they may adjust their own levels of performance to produce better results or satisfy the researcher. To avoid this problem, the present study introduced the survey by letting the participants know that its focus was on decision making and perceived stress.

Saunders, Lewis, and Thornhill (2012) recommend giving participants full information on the nature of the research, implications for taking part, and how the data will be analysed. The questionnaire was designed with an introduction noting the nature and purpose of the research, a commitment to anonymity and confidentiality, and the contact details of the researcher if further information was required.

Confidentiality ensures that the information obtained in the study from a research participant is private (Gravetter and Forzano, 2012). Confidentiality and anonymity have been maintained with responses, with data only accessible to the researcher and the supervisor. Anonymity is the practice of guaranteeing that a person's name is not directly connected with the information or measurements obtained from that person (Gravetter and Forzano, 2012). The maintenance of objectivity is another ethical concern which was considered throughout the research process to ensure data was analysed accurately and objectively.

Gok and Atsan (2016) note that the process of choosing from alternatives itself can generate some degree of stress. To avoid causing stress to respondents, time pressure was avoided, and individuals were instructed in the introduction to the questionnaire that they could opt out at any stage.

4.13 LIMITATIONS OF THE RESEARCH DESIGN

The present research was purely quantitative and did not include any qualitative analysis such as interviews, which may have allowed for a deeper understanding of the impact of stress on decision making. Narrative data could not be collected from the survey, which would allow people to note their reasoning for choosing particular options in the hypothetical questions.

The study is limited by its sample size. The statistical significance of the relationships found between variables is determined in part by the sample size, with it being hard to obtain a significant test statistic with a small sample. According to Saunders, Lewis and Thornhill (2012), this increases the risk of erroneously rejecting a null hypothesis (a Type I error) or erroneously accepting the null hypothesis (a Type II error).

The use of hypothetical questions can be a limitation as seen in the extant literature. In his study of the psychology of decision making, Beach (1997) notes that the scenario of a decision maker having certain options and choosing between them is not reflective of reality. Instead, Beach (1997) notes that decisions seldom are made at a single point between known alternatives, with decision making being a process that changes with feedback and subsequently leads in directions that were not conceived of originally.

Respondents were not under any time pressure to complete the questionnaire, and could opt out at any time. If under stress, it is possible that the decision maker did not give full attention to the problems presented. Gok and Atsan (2016) cite Janis (1982) and Driskell *et al*. (1999) in noting that decision makers under stress decide hastily, responding to stress with a narrowing attention focus. That is, stress depletes one's available resources (Gok and Atsan, 2016).

Thaler (2015) notes the limitations of research conducted by hypothetical questions in terms of generalisability. However, an unwillingness to rely on

hypothetical questions would keep from learning the nuances of behaviour that are so important to discern (Thaler, 2015). Kahneman (1979) defended the use of hypothetical questions, arguing that the method of hypothetical choices is the simplest procedure by which many theoretical questions can be investigated. The author noted that the method relies on the assumption that people know how they would actually behave, and on the assumption that they have no reason to disguise true preferences.

CHAPTER 5 - RESULTS

5.1 INTRODUCTION

This chapter consists of descriptive and exploratory statistics of the results of the survey. Tests of normality are presented for the variables investigated followed by non-parametric tests, including a 2-sample test of proportions which determine the results of the hypothesis testing. A logistic regression is conducted to validate the findings.

5.2 DESCRIPTIVE STATISTICS

There were 264 respondents to the survey, of which 168 are working in financial services. For the purposes of investigating if stress can be a predictor of irrational decision making of people employed in financial services, the 168 people in the financial services is the sample under analysis. The demographic characteristics of the sample of respondents working in financial services is outlined in Table 4 and Appendix N.

Most respondents were male (60.7%). Furthermore, the largest age group was aged 30-39 (47.6%). Respondents were predominantly single (66.1%) with 27.4% of respondents married.

Characteristics	**Number**	**Valid %**
Demographics		
Gender		
Male	102	60.7
Female	66	39.3
Age		
19-29	51	30.4
30-39	80	47.6
40-49	29	17.3
50-59	4	2.4

60+	4	2.4
Marital Status		
Single	111	66.1
Married	46	27.4
Re-married	3	1.8
Civil partnership	2	1.2
Separated	4	2.4
Divorced	2	1.2

Table 4: Demographics

Socio-economic demographics (in Table 5) show that the majority are in full time employment (93.5%). 26 respondents (15.5%) hold postgraduate qualifications, 91 (54.2%) hold honours degrees or professional qualifications, and 35 (20.8%) hold ordinary degrees or national diplomas. 31% of respondents hold managerial positions, with the majority (46.4%) working in professional positions.

Characteristics	**Number**	**Valid %**
Socio-economic		
Occupational Status		
Not working	2	1.2
Part-time (<15 hours per week)	1	0.6
Part-time (15-34 hours per week)	2	1.2
Full time	157	93.5
On temporary leave	6	3.6
Education		
Lower secondary	4	2.4
Upper secondary	4	2.4
Advanced certificate / apprenticeship	2	1.2
Higher certificate	5	3.0
Ordinary degree / national diploma	35	20.8
Honours degree / professional qualification	91	54.2
Postgraduate diploma / degree	26	15.5
Ph.D. or higher	1	0.6
Sector		

Finance	139	82.7
Business	11	6.5
Creative arts	1	0.6
Hospitality	2	1.2
IT	6	3.6
Law	3	1.8
Public services	1	0.6
HR	2	1.2
Sales	2	1.2
Other	1	0.6
Occupation		
Manager	52	31.0
Professional	78	46.4
Associate professional / technical	15	8.9
Clerical	7	4.2
Sales	11	6.5
Others	5	3.0

Table 5: Socio-economic demographics

5.3 PSS-10 RESULTS

According to DeVellis (2012), the Cronbach alpha coefficient – which measures the internal reliability of a scale – should be above 0.7. Cohen and Williamson (1988) reported a Cronbach's Alpha of 0.76 for the PSS-10, showing good internal consistency. This study, which reverse coded four negatively worded items when compiling aggregate scores on the scale to avoid calculating an inaccurate Cronbach alpha score, found a Cronbach alpha coefficient of 0.927, confirming very good internal consistency for the PSS-10. The detailed results of the scale reliability test are available in Appendix B.

The scale had a minimum score of 10 and a maximum score of 50. 50% of respondents scored above 29.5 on the scale, and the standard deviation was 9.4. Negative skewness (-0.042) suggests a clustering of scores at the high

end of the scale. The lowest score achieved was 10, and the highest was 47. Table 6 gives descriptions of the results of the PSS-10.

Perceived Stress Scale		**Statistic**	**Std. Error**
	Mean	29.2083	0.72669
	95% Confidence Interval for Mean Lower bound	27.7737	
	Upper bound	30.643	
	5% Trimmed Mean	29.2315	
	Median	29.5	
	Variance	88.717	
	Std. Deviation	9.41896	
	Minimum	10	
	Maximum	47	
	Range	37	
	Interquartile Range	16	
	Skewness	-0.042	0.187
	Kurtosis	-1.23	0.373

Table 6: The PSS-10 descriptive results

A test of Normality was conducted on the results of the PSS-10 which indicated the data was not normally distributed. The Shapiro-Wilk statistic indicates a sig. value of .000, suggesting violation of the assumption of normality. The null hypothesis that the sampling distribution is normal is therefore rejected. As a result, non-parametric statistical tests would then be used. Detailed test results can be found in Appendix C.

Test of Normality			
	Shapiro-Wilk		
	Statistic	df	Sig.
Perceived Stress Scale	0.954	168	0

Table 7: Test of Normality for the PSS-10

Cohen (1983) aggregated scores on the scale into three groups: high stress, moderate stress, and low stress. This approach allows for the high stressed group (with score of 34-50) to be analysed as one cohort, while the moderate and low stress group can be classified as non-stressed for the purposes of the present study. A variable was created in SPSS to categorise respondents as stressed and non-stressed. Results are shown in Table 8.

Characteristic	Number	Valid %
PSS-10 Results		
Stressed	69	41.1
Non-stressed	99	58.9

Table 8: Groupings from the results of the PSS-10

In addition, a test was conducted to analyse if females are likely to score higher on the PSS-10 with an independent samples Mann-Whitney U Test, and found no significant differences at the 5 per cent confidence level (p=0.663), with males having a mean rank of 83 and females having a mean rank of 84. Therefore, the null hypothesis that the distribution of scores across categories of gender on the PSS scale was the same was retained. Results of the Mann-Whitney U Test are presented in Appendix D.

5.4 NORMALITY TESTS

For a respondent to be classified as having made an irrational decision, the response had to contradict their selection to the previous question. Results of the first question couplet on the framing of acts were grouped together to determine the amount of irrational responses. Responses were coded in Excel, with Yes=1 and No=2, before being input into SPSS for analysis. This procedure was followed for each of the question pairs on the survey - a new

variable then created to distinguish between irrational and rational respondents, coded as Irrational=0 and Rational=1.

On the first problem, which examined the framing of acts, irrational decision makers scored on average 30 on the PSS-10, while rational decision makers scored on average 26. Both groups reported a non-normal distribution on the Shapiro-Wilk test of normality.

Test of Normality			
	Shapiro -Wilk		
	Statistic	df	Sig.
Irrational	0.946	102	.000
Rational	0.939	66	0.003

Table 9: Test of normality for Framing of Acts problem

The next variable analysed is irrationality on the second framing problem. There were 37 irrational responses, and 131 rational responses. Irrational decision makers scored on average 32 on the PSS-10 (with a standard deviation of 9.34 and a median score of 35). Rational decision makers scored on average 28 on the PSS-10, with a median score also of 28 and a standard deviation of 9.28. According to the Shapiro-Wilk test, the group of irrational decision makers is normally distributed (sig=0.078), while the rational group has a non-normal distribution (.000).

Test of Normality			
	Shapiro -Wilk		
	Statistic	df	Sig.
Irrational	0.947	37	0.078
Rational	0.952	131	0

Table 10: Test of Normality for Framing under Certainty problem

The next variable analysed was rationality on the “disease problem”. 53 responses were irrational, while 115 responses were rational. The irrational group scored on average 31.7 on the PSS-10, with a standard deviation of 9.42 and a median score of 36. The highest score on the PSS-10 of this group was 46, and the lowest was 10. The rational group, in contrast, reported a mean score on the PSS-10 of 28, with a median of 27 and a standard deviation of 9.227. The minimum score on the PSS-10 was 13, with a range of 34 to the maximum score of 47.

Both groups reported a non-normal distribution according to the Shapiro-Wilk test.

Test of Normality			
	Shapiro -Wilk		
	Statistic	df	Sig.
Irrational	0.927	53	0.003
Rational	0.954	115	0.001

Table 11: Test of Normality for Framing of Outcomes problem

The next variable analysed was rationality on the time inconsistency problems. 127 respondents were classified as rational, while 41 were classified as irrational – scoring inconsistent on at least two or three of the problems. Of the irrational group, the average score on the PSS-10 was 31.7, with a standard deviation of 9.14 and a median score of 34. The irrational group had a non-significant result on the Shapiro-Wilk test of 0.108. Meanwhile, the rational group had an average and median, score of 28, with a standard deviation of 9.39. The rational group reported a non-normal distribution according to the Shapiro-Wilk test (sig=0.000).

Test of Normality			
	Shapiro -Wilk		
	Statistic	df	Sig.
Irrational	0.955	41	0.108
Rational	0.948	127	.000

Table 12: Test of Normality for Time Inconsistency

An overview of the results of the tests of rationality are outlined in Table 10.

	Frequency	Valid %
Q1 and Q2 – Framing of Acts		
Irrational	102	60.7
Rational	66	39.3
Q3 and Q4 - Framing under Certainty		
Irrational	37	22
Rational	131	78
Q5 and Q6 – Framing of Outcomes		
Irrational	53	31.5
Rational	115	68.5
Q7, Q8, Q9 Aggregated - Time Inconsistency		
Irrational	41	24.4
Rational	127	75.6

Table 13: Results from Tests of Rationality/Consistency

5.5 RESULTS OF THE FRAMING OF ACTS PROBLEM

A test of proportions was conducted to determine if irrational respondents to each question pair were more likely to be found in the stressed group or the non-stressed group. The data script used in SPSS for testing is shown in

Appendix M. The null hypothesis was that the stressed group are not more likely to provide irrational responses to the framing of acts problem.

102 (60.7%) of total respondents were inconsistent (either selecting option set AB or BA), while 66 (39.3%) were consistent (either selecting option set AA or BB).

Of the stressed group (p1) 48 of the 69 were inconsistent, while 54 of the 99 non-stressed respondents (p2) were consistent. Detailed statistics are shown in Appendix E.

An independent sample Z test of the difference of two proportions was undertaken to ascertain if the proportion of irrational decision makers within the stressed cohort was different to the proportion of rational decision makers within the non-stressed group. The results indicated a significance difference between the proportion of irrational decision makers who perceive themselves to be stressed (pi=0.69565) compared to those classified as irrational decision makers within the non-stressed group (pi=0.54545), z=1.96105, p=0.04987.

Framing of Acts						
p1	p2	SE	z	SIGz_2TL	SIGz_LTL	SIGz_UTL
0.69565	0.54545	0.07659	1.96105	0.04987	0.97506	0.02494

Table 14: Results of independent sample z test (1)

Therefore, the null hypothesis is rejected.

5.6 RESULTS OF THE FRAMING UNDER CERTAINTY PROBLEM

With the data coded in Excel, a test of proportions was also conducted to determine if irrational respondents to each question pair were more likely to be found in the stressed group, before analysing the results in SPSS. The null hypothesis was that the stressed group are not more likely to provide irrational responses to the framing under certainty problem.

37 (22%) of total respondents were inconsistent (either selecting option set AB or BA), while 131 (78%) were consistent (either selecting option set AA or BB).

Of the stressed group (p1) 21 of the 69 were inconsistent, while 16 of the 99 non-stressed respondents (p2) were inconsistent. Detailed results are shown in Appendix F.

An independent sample Z test of the difference of two proportions was undertaken to ascertain if the proportion of irrational decision makers within the stressed cohort was different to the proportion of rational decision makers within the non-stressed group. The results indicated a significance difference between the proportion of irrational decision makers who perceive themselves to be stressed (pi=0.30435) compared to those classified as irrational decision makers within the non-stressed group (pi=0.16162), z=2.19624, p=0.02807.

Framing - Sunk Cost Effect						
p1	p2	SE	z	SIGz_2TL	SIGz_LTL	SIGz_UTL
0.30435	0.16162	0.06499	2.19624	0.02807	0.98596	0.01404

Table 15: Results of independent sample z test (2)

Therefore, the null hypothesis is rejected.

5.7 RESULTS OF THE FRAMING OF OUTCOMES PROBLEM

Data from the results of the framing of outcomes problem was also subject to a test of proportions in Excel, to determine if irrational respondents were more likely to be found in the stressed group, before testing in SPSS. The null hypothesis was that the stressed group are not more likely to make irrational decisions on the framing of outcomes problem.

53 (31.5%) of total respondents were inconsistent (either selecting option set AB or BA), while 115 (68.5%) were consistent (either selecting option set AA or BB).

Of the stressed group (p1) 30 of the 69 were inconsistent, while 23 of the 99 non-stressed respondents (p2) were inconsistent. Descriptive statistics are shown in Appendix G.

An independent sample Z test of the difference of two proportions was undertaken to ascertain if the proportion of irrational decision makers within the stressed cohort was different to the proportion of rational decision makers within the non-stressed group. The results indicated a significance difference between the proportion of irrational decision makers who perceive themselves to be stressed (pi=0.43478) compared to those classified as irrational decision makers within the non-stressed group (pi=0.23232), z=2.7781, p=0.00547.

Framing – Disease problem						
p1	p2	SE	z	SIGz_2TL	SIGz_LTL	SIGz_UTL
0.43478	0.23232	0.07288	2.7781	0.00547	0.99727	0.00273

Table 16: Results of independent sample z test (3)

Therefore, the null hypothesis is rejected.

5.8 RESULTS OF THE TIME INCONSISTENCY PROBLEMS

Three question sets were presented to respondents regarding time inconsistency. The null hypothesis was that members of the stressed group are not more likely to exhibit irrational decision making on the time inconsistency problems.

For the first question set, 74 (44%) of total respondents were inconsistent (either selecting option set AB or BA), while 94 (56%) were consistent (either selecting option set AA or BB).

For the second question set, 37 (22%) of total respondents were inconsistent (either selecting option set AB or BA), while 131 (78%) were consistent (either selecting option set AA or BB).

For the third question set, 45 (26.8%) of total respondents were inconsistent (either selecting option set AB or BA), while 123 (73.2%) were consistent (either selecting option set AA or BB).

Aggregating scores from these three question sets, a new variable was created measuring time inconsistency. Respondents who were inconsistent on two or three of the three questions sets were classified as inconsistent. This data, coded in Excel, was measured with a test of proportions.

In sum, 41 (24.4%) of the respondents from the total dataset were classed as inconsistent decision makers, while 127 (75.6%) were classified as consistent.

Of the stressed group (p1) 22 of the 69 were inconsistent, while 19 of the 99 non-stressed respondents (p2) were consistent. Results of the test of proportions were as follows:

An independent sample Z test of the difference of two proportions was undertaken to ascertain if the proportion of irrational decision makers within the stressed cohort was different to the proportion of rational decision makers within the non-stressed group. The results did not indicate a significance

difference between the proportion of irrational decision makers who perceive themselves to be stressed (pi=0.31884) compared to those classified as irrational decision makers within the non-stressed group (pi=0.19192), z=1.88425, p=0.05953.

Framing - Time Inconsistency						
p1	p2	SE	z	SIGz_2TL	SIGz_LTL	SIGz_UTL
0.31884	0.19192	0.06736	1.88425	0.05953	0.97023	0.02977

Table 17: Results of independent sample z test (4)

Therefore, the null hypothesis was accepted.

5.9 LOGISTIC REGRESSION TESTS

To examine the relationship between the variables that can predict the outcomes in the first question pair examining rationality, a binary logistical regression was performed. Variables were made dichotomous for the purposes of testing the data in SPSS. As a result, a variable was created for age to examine if being over 30 is a predictor of irrational decision making. Other predictor variables included in the model were gender, education (honours degree and above), and whether or not the person was classified as stressed on the PSS-10.

Binary logistic regression was first performed to predict the outcome of irrational decision making on the first framing problem among 168 participants. The model, however, was only able to account for between 8% and 12% of variance. According to the model, included in Table 15, a person classified as stressed on the PSS-10 is 1.748 times more likely to be an irrational decision maker, but this failed to reach statistical significance (p=0.111). Statistical significance was only reached on the gender variable, as men were more 2.318 times more likely to be irrational (p=.014).

A logistical regression model was also developed for the variable of rationality on the second framing problem, regarding framing under certainty. The model found that those categorised as stressed were 2.832 times more likely to give irrational responses, with a significant value at the 5% level of significance (p=0.011). None of the other variables had a statistically significant impact and the model accounted for only 7.3% to 11.2% of variance.

A third logistic regression model was constructed for the framing of outcomes problem. This also revealed only statistical significance on the stressed variable, with the stressed cohort being 2.271 times more likely to give irrational responses to the replication of Tversky and Kahneman's (1981) disease problem. This model was able to explain between 6% and 8.9% of variance. Of the four predictor variables included in the model, only stress successfully predicted irrationality in the third framing problem.

A final regression analysis was performed to predict an outcome of time inconsistency among 168 participants. However, the final model was only able to explain between 2% and 4% of variance.

As in the previous models, four predictors were included in the model, using the Enter method. None of these predictors successfully predicted irrationality or time inconsistency.

Model 1	**Cox and Snell R2**	**Nagelkerke R2**	**β**	**Wald**	**p**	**Exp(β)**
Framing of Acts	0.089	0.12				
Predictors						
Stressed			0.559	2.54	0.111	1.748
Gender (Male)			0.841	6.033	0.014	2.318
Age (Over 30)			-0.7	3.77	0.052	0.496
Education (Ordinary Degree or Lower)			-0.493	1.878	0.171	0.611

Model 2	Cox and Snell R2	Nagelkerke R2	β	Wald	p	Exp(β)
Framing under Certainty	0.073	0.112				
Predictors						
Stressed			1.041	6.451	0.011	2.832
Gender (Male)			0.083	0.044	0.834	1.087
Age (Over 30)			-0.049	0.012	0.912	0.953
Education (Ordinary Degree or Lower)			1.156	7.851	0.005	3.178

Model 3	Cox and Snell R2	Nagelkerke R2	β	Wald	p	Exp(β)
Framing of Outcomes	0.063	0.089				
Predictors						
Stressed			0.82	5.479	0.019	2.271
Gender (Male)			0.181	0.259	0.611	1.199
Age (Over 30)			-0.579	2.053	0.152	0.561
Education (Ordinary Degree or Lower)			-0.386	0.944	0.331	0.68

Model 4	Cox and Snell R2	Nagelkerke R2	β	Wald	p	Exp(β)
Time Inconsistency	0.027	0.04				
Predictors						
Stressed			0.62	2.749	0.097	1.859
Gender (Male)			0.207	0.297	0.586	1.23
Age (Over 30)			-0.284	0.455	0.5	0.753
Education (Ordinary Degree or Lower)			-0.237	0.319	0.572	0.789

Table 18: Results of Logistical Regression Tests

CHAPTER SIX – DISCUSSION

6.1 INTRODUCTION

This chapter will present a discussion of key findings. Tests were undertaken to determine if stress is a predictor of irrational decision making in framing, involving both a monetary and non-monetary aspect, the sunk cost effect, and time inconsistency. To understand which variables influence decision making, a regression model was made using the scores from the PSS-10 and socio-demographic variables.

Before analysing the findings of the research, the scale used was tested for reliability. The scale reliability findings support its application, with results corroborating Taylor's (2014) argument that it exhibits very good measurement properties, consistent with the original findings of Cohen and Williamson (1988). The application of this scale to tests of rationality is a novel approach, with results indicating that stress can be a predictor of a person being irrational.

Findings support the dominant view in the literature that the decision making is susceptible to the framing effect. This extends less to the questions on time inconsistency. As noted by Rubenstein (2003), discounting the future is not in itself irrational. This study's test to reveal if individuals are irrational in discounting the future in one option but not in a later identical question with a different frame has supported the literature, but a statistical finding was not obtained to suggest that stressed individuals are more likely to demonstrate this inconsistency.

6.2 DISCUSSION OF FINDINGS FROM SURVEY SECTION ONE

The first key finding was that a higher proportion of the stressed group made irrational decisions in the framing of acts problem. Most of all respondents (73.8%) opted for a sure gain in the first problem, and an identical number opted to avoid a sure loss and instead gamble when the question was framed differently. This supports the existing literature, including Kahneman and Tversky's (1971) prospect theory, as the pattern of risk aversion was decided by the question frame. In Tversky and Kahneman's (1981) study, 84% of respondents elected for a sure gain, and then 87% opted for a gamble when the question was framed in terms of a loss.

This corroborates the findings of Druckman (2001) who notes also that this study is consistently replicable. As noted in the review of the literature, Etzioni (2011) and Baddeley (2015) point to such replications as a notable achievement of behavioural economics.

The results of a test of proportions on the sample groups indicate that stressed individuals are more likely to demonstrate inconsistent choices here, violating the assumption of description invariance ($p=0.04987$), a significant statistical difference at the 5% level of significance.

Statistical significance was also uncovered in the examining of framing under certainty, Tversky and Kahneman's (1981) 'theatre' question. Results from a test of proportions indicated that irrational decision makers were more likely to be found in the stressed group ($p=0.02807$). According to Tversky and Kahneman (1981) and Thaler (2015), the significant tendency for individuals to be inconsistent on this problem is an effect of psychological accounting – a sunk cost effect leads irrational decision makers to value the cost of seeing the play as €20 in the second problem.

Thaler (2015) argues that decision making characteristics can be better understood by thinking of people as naïve accountants who consider gains and losses separately, but give extra weight to losses. According to Thaler (1980), many of the characteristic features of decision making can be

understood by thinking of people as naïve accountants who consider gains and losses separately, but weigh losses more. This research corroborates the original study.

In the framing of outcomes problem, replicating Tversky and Kahneman's (1981) 'disease problem', similar tendencies for irrationality were revealed. When the problem was framed in a positive way that referenced people saved (i.e. a gain), 69.6% of all respondents chose the certain prospect of saving 200 lives.

When the problem was presented differently, emphasising how many people were expected to die (a loss), only 50% of all respondents opted for the certain prospect. Both questions offered the same scenario, described differently. Subjects are more likely to be risk averse in the domain of gains – highlighting a violation of the invariance principle. The results of this replication of Tversky and Kahneman's (1981) disease problem validate the argument that participants have higher risk acceptance in negatively framed situations rather than positive ones, as also supported by Mishra *et al*. (2011) and Benjamin and Robins (2007).

Unlike the previous examples of the framing effect, this question deals with a benefit for others, so the true utility cannot depend on the way the decision is framed (Baron, 2009). This effect is a clear divergence between decision utility and experienced utility. This study revealed that persons in the stressed group were more likely to be irrational, violating the invariance principle. The finding was statistically significant based on an independent sample z test on two proportions ($p=0.00547$), and a logistical regression analysis revealed the stressed group were 2.271 times more likely to demonstrate irrationality when faced with this question pair ($p=0.019$).

6.3 DISCUSSION OF FINDINGS FROM SURVEY SECTION TWO – TIME INCONSISTENCY

Framing effects were less likely to be evident in Section Two of the survey which examined time inconsistency. Rubinstein (2003) notes that when comparing pairs, decision makers look for dominance and choose accordingly, meaning that the framing effect is evident and influencing decisions. While evident, the results show it is not having a statistically significant effect in leading to inconsistent decisions.

According to Baddeley (2013), a large volume of experimental evidence shows that individuals exhibit time inconsistency with disproportionate impatience exhibited in the short run. The findings of this study contradict the standard exponential discounting function which predicts that a person making a choice in two situations will make choices that are consistent over time. This is also supported by studies showing that people prefer to take sooner rewards rather than later rewards (Baddeley, 2013, citing Warner and Peters, 2001).

In each of the problem pairs, the majority were consistent (56%, 78%, and 73.2% respectively). Results were aggregated to analyse time inconsistency as a single variable, but a significant difference between the stressed and non-stressed group was not found at the 5% level of significance ($p=0.05953$). At the 5% level of significance, the logistic regression model did not find any statistical significance that stressed people were more likely to make irrational decisions. The four logistical regression tests, however, did not account for a high degree of variance in any of the models.

Read *et al* (2013) argue that the framing effect has been used successfully to highlight choice patters and time inconsistency that deviate from standard economic models. However, the authors note that the rates of anomalies found are not as significant as in other framing scenarios as money problems are sensitive to magnitude.

6.4 THEORETICAL IMPLICATIONS

These findings corroborate the dominant view in the literature that stress increases behavioural biases in decision making, as noted by Gok and Atsan (2016). The framing effect has been shown to be not limited to the stressed group, while not all the stressed group erred, corroborating Paternoster and Pogarsky's (2009) argument that all people can make correct and carefully-weighed decisions without being adept at decision making.

The findings support the dominant view in the literature first espoused by Simon (1955) that constraints on cognitive capacity lead to common mistakes in probability judgements and the mishandling of information. The findings support Tversky and Kahneman's (1981) study that highlighted how individuals' choice behaviour is affected by reference points rather than the fundamental beliefs or values of the decision maker.

This study also supports the view in the literature that economists should not assume that normative models of decision making are descriptive (Muradoglu and Harvey, 2012, Thaler, 2015), and adds to the already substantial empirical attention given to the framing effect within the research literature, as noted by Maule and Villejoubert (2007).

In building a logistical regression model, this study has also examined if gender can be a predictor of irrational decision making. Previous studies have shown that females tend to score higher on measurements of perceived stress, while also performing better in decision-making tasks while under anticipatory stress in controlled experiments (Preston *et al*., 2007).

This study found in each of the framing experiments that gender was not a statistically significant predictor of irrationality. In addition, the hypothesis that the distribution of scores across genders on the PSS-10 was the same was retained following a Mann-Whitney U Test (Appendix D), contradicting reported findings of Smith, Rosenberg and Haight (2014). This study failed to find significance at the 5% confidence level ($p=0.412$).

The evidence of the effects of stress on decision making and the scanning of alternatives is inconclusive (Kowalski-Trakofler, 2003). While this study has significant findings, the results of the logistical regression indicate that there is a large degree of unexplained variance. Keinan (1987) argued that the effects of stress on decision making need to be evaluated by direct observation.

6.5 MANAGERIAL IMPLICATIONS

In the literature, it has been noted that demonstrations of framing effects offer compelling evidence of irrationality (Mandel, 2014). Applied to people working in financial services, this study offers evidence that demonstration of framing effects could be used to investigate if a correlation exists with job stress, rather than simply a measure of decision competence and critical thinking.

A managerial implication of the pattern of findings in this research is that stressed workers are exhibiting performance deficits in decision scenarios. Hence, a priority of managers should be to raise awareness of the potential impact of stress and decision making and engage in attempts to improve performance.

While highlighting the tendency of stressed people in financial services to make cognitive errors compares to their non-stressed peers, the logical regression model highlights the need for an exploration of other factors that could account for variance. For example, Griffiths, Baxter and Townley-Jones (2011) found that perceived stress can be caused by a perception of lack of management support. Other studies have found that possible predictors of stress have been excessive workloads, lack of autonomy and social support (Griffiths, Baxter and Townley-Jones, 2011). Future research could examine if similar variables may be predictors of irrationality.

Mayers (2013) notes that logistic regression examines variance in outcome according to a series of predictor variables, and in doing so measures relationships, not cause and effect. Therefore, there is scope for investigation

into the causes of irrational decision making which may have managerial solutions.

The study has not examined the potential causes of stress in the financial services sector. Future research could focus on many factors, such as job satisfaction, personality types, interpersonal conflict at work, etc. These and other factors may have inputs into the decision-making process under stress and as such, should be examined systematically.

CHAPTER SEVEN - CONCLUSIONS

7.1 LIMITATIONS AND FUTURE RESEARCH

The hypotheses developed support the research aim in three out of four instances. However, the logistical regression model indicates a high degree of variance that is unaccounted for and could be influencing results. The data as such must be treated with caution. The logistical regression suggests that a new model with additional variables included is a worthy topic for future research.

A possible influencing factor on the results of the test is the desirability effect. Baron (2008) notes that hypothetical questions do not always explain what people would do in real world situations, and instead may lead to respondents answering according to what they perceive the researcher wants. These limitations of hypothetical studies have been noted by Carlsson (2010), Mell and Walker (2014), and Thaler (2015).

Therefore, future research could ask respondents to provide justifications for their choices – which could lead to a reduction in the magnitude of framing effects observed, as noted by Hodgkinson *et al*. (1999) in their replications of Tversky and Kahneman's (1981) disease problem.

Further, Mishra *et al*. (2011) argue that while Tversky and Kahneman's 'disease' framing experiment is easily replicable, it may not be generalisable due to the novelty of the situation presented.

According to Maule and Villejoubert (2007), the framing effect lacks an underlying theory of why failures may occur. However, some researchers argue the framing effect can be reduced or even eliminated when people engage in deeper thought or if they are also required to give justifications for their choices (Hodgkinson *et al*., 1999). Further research should examine if

stressed people make more rational decisions when encouraged to deliberate longer before answering.

Maule and Villejoubert (2007) note that the editing strategies people use when processing decisions may vary depending on the context, highlighting examples of studies that replicated Kahneman and Tversky's (1981) experiments with different outcomes depending on whether the problems were labelled as statistical problems or medical problems. However, the authors note that Tversky and Kahneman were more concerned with the framing effect rather than the process of framing (Maule and Villejoubert, 2007). Similarly, this present study is only concerned in highlighting the framing effect, but an investigation into the process of framing is an area worthy of future research.

7.2 CONCLUSION

Brzezicka and Wisniewski (2014) argue that the achievements of behavioural economics result mainly from its application of the scientific approach to test and better understand economic theories. The authors note Guala's (2003) assertion that the experimental approach allows for genuine scientific knowledge to be introduced into the philosophy of science.

This study has aimed to be consistent with that approach, and has used experiments to demonstrate how seemingly inconsequential changes in the formulation of choice problems has led to significant shifts of preference. In support of the research aim, these shifts have been more evident among people who report higher stress levels.

The significance of the experiment should not be limited to a belief that higher stress leads to poor decision making. In fact, Tversky and Kahneman (1981) and Simon (1955) noted that impulsive choices on the most readily available frame can be justified in terms of the mental effort required to explore alternatives.

Rather, this study has explored decision making in accordance with Kahneman's (2012) assertion that the test of rationality is whether preferences are internally consistent. In adopting the PSS-10, this study has uncovered statistically significant findings indicating that being highly stressed is a predictor of irrational decision making.

The implications of this study extend to the current research in the literature, supporting previous findings that conflict against rational-agent theory. According to Kahneman (2012), framing experiments have demonstrated that the rational-agent theory – which asserts that people make important decisions carefully and use all available information – should be falsified.

Chang (2014) argues that while offering unique insights into an individual's behavioural approaches, framing experiments do not provide sufficient insight on a macro level, and its findings may not always be generalisable. However, given the importance of the financial services sector to the wider economy and the high degree of stress within the sector, as noted by O'Connell *et al.* (2010), there may be significant implications if the results are generalisable.

In highlighting that stress can engender a bias towards irrational decision making on a sample population drawn from the financial services sector, this paper has implications for management. Efforts to decrease stress levels notwithstanding, future research should focus on what can be done about biases, for people to improve their decisions and judgements. This supports Kahneman (2012) who argued that the way to block error in decision making is to distinguish two ways of thinking, the intuitive System 1 and the reflective System 2 - that is, fast, and slow.

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APPENDIX A – DECISION MAKING AND PERCEIVED STRESS SURVEY

The aim of this study is to analyse the correlations between decision making and stress. This will be done with a short questionnaire, including a scale known as the Perceived Stress Scale. It will take about 10 minutes to complete in total. All responses are confidential and anonymous, with data only accessible to myself and my supervisor. You may choose to opt out at any time. If you have any questions regarding this study, please contact me at Martin.Connolly@student.ncirl.ie.

Section 1

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

1. Choose your preferred option.

A sure gain of €240
25% chance to gain €1000, and a 75% chance to gain nothing.

2. Choose your preferred option.

A sure loss of €750.00
75% chance to lose €1000.00, and 25% chance to lose nothing.

Imagine that you have decided to see a play where admission is €10.00 per ticket. As you enter the theatre you discover you have lost €10.00.

3. Would you still pay €10.00 to see the play?

Yes

No

Imagine that you have decided to see a play and paid the admission price of €10.00 per ticket. As you enter the theatre you discover that you have lost the ticket. The seat was not marked and the ticket cannot be recovered.

4. Would you pay €10.00 for another ticket?

Yes

No

Imagine that your country is preparing for the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as outlined in the below options.

5. Select your preferred option:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

Again, imagine that your country is preparing for the outbreak of an unusual disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as outlined in the below options.

6. Select your preferred option.

If Program A is adopted 400 people will die.

If Program B is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Section 2

The following short questions examine your tendency to prefer sooner rewards over later rewards.

7. Imagine that you have to choose between the following two options. Select your choice.

Receiving €467.00 on September 1st, 2017
Receiving €607.00 on September 1st, 2018

8. Imagine that you have to choose between the following two options. Select your choice.

Receiving €467.00 on September 1st, 2017
Receiving €467.39 on September 2nd, 2017

9. You can receive the amounts of money indicated according to one of the two following schedules. Select which one you prefer.

Apr 1: €1000, Jul 1: €1000, Oct 1: €1000, Dec 1: €1000
Mar 1: €997, Jun 1: €997, Sep 1: €997, Nov 1: €997

10. Choose which one of the following options you would prefer.

Receive €1000 on December 1st

Receive €997 on November 1st

11. In 60 days you are supposed to receive a new stereo system to replace your current one. Upon receipt of the system, you will have to pay €960. Are you willing to delay the transaction for one day for a discount of €2?

Yes

No

12. Tomorrow you are supposed to receive a new stereo system to replace your current one. Upon receipt of the system, you will have to pay €1,080. Are you willing to delay the delivery and the payment by 60 days for a discount of €20?

Yes

No

Section 3

The questions in this scale ask about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way, ranging from never to very often. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer fairly quickly. That is, don't try to count up the number of times you felt a particular way; simply indicate whether it was very often, often, or sometimes, etc.

13. In the last month, how often have you been upset because of something that happened
unexpectedly?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

14. In the last month, how often have you felt that you were unable to control the important things in your life?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

15. In the last month, how often have you felt nervous and “stressed”?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

16. In the last month, how often have you felt confident about your ability to handle your personal problems?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

17. In the last month, how often have you felt that things were going your way?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

18. In the last month, how often have you found that you could not cope with all the things that you had to do?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

19. In the last month, how often have you been able to control irritations in your life?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

20. In the last month, how often have you felt that you were on top of things?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

21. In the last month, how often have you been angered because of things that were outside of your control?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

22. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

1. Never 2. Almost never 3. Sometimes 4. Often 5. Very often

Section 4

Finally, this section asks some brief demographic questions.

23. How old are you?

Under 18
19-29
30-39
40-49
50-59
Over 60

24. What is your gender?

Male
Female

25. What is your current marital status?

Single (never married or never in a same-sex civil partnership)
Married (first marriage)
Re-married
In a registered same-sex civil partnership
Separated
Divorced
Widowed

26. What is the highest level of education you have completed to date?

No formal education/training
Primary education
Lower secondary
Upper secondary
Technical or Vocational
Advanced Certificate or Completed Apprenticeship
Higher Certificate
Ordinary Bachelor Degree or National Diploma
Honours Bachelor Degree/Professional qualification or both
Postgraduate Diploma or Degree
Doctorate (Ph.D) or Higher

27. Which of the following statements about occupational status apply to you?

Not working at the moment
Part-time or hourly work (< 15 hours per week)
Part-time work (15 to 34 hours per week)
Full-time work
On temporary leave
In training (apprentice)

28. Which of the following best describes the sector you work in?

Accounting, banking and finance
Business, consulting and management
Charity and volunteer work
Creative arts and design
Energy and utilities
Engineering and manufacturing
Environment and agriculture
Healthcare
Hospitality and events management
Information technology
Law
Leisure, sport and tourism
Marketing, advertising and PR
Property and construction
Public services and administration
Recruitment and HR
Retail
Sales
Science and pharmaceuticals

Social care
Teacher training and education
Transport and logistics
Other
N/A

29. Which of the following best describes your current occupation?

Managers and administrators
Professional
Associate professional and technical
Clerical and secretarial
Craft and related
Personal and Protective service
Sales
Plant and machine operatives
Other occupation
No occupation

30. If currently employed, do you work in the financial services industry?

Yes
No
Not applicable

APPENDIX B – SCALE RELIABILITY RESULTS

Case Processing Summary

		N	%
Cases	Valid	168	100.0
	Excluded[a]	0	.0
	Total	168	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.927	.926	10

Item Statistics

	Mean	Std. Deviation	N
Neg_Upset_1	2.8988	1.25560	168
Neg_Control_2	2.9405	1.36115	168
Neg_Nervous_3	3.3274	1.20128	168
Neg_Cope_6	2.9405	1.26065	168
Neg_Angered_9	2.9345	1.21931	168
Neg_Difficulties_10	2.7857	1.42326	168
Reverse4	2.7560	1.09707	168
Reverse5	2.9286	1.08098	168
Reverse7	2.7798	.96294	168
Reverse8	2.9167	1.19588	168

Inter-Item Correlation Matrix

	Neg_Upset_1	Neg_Control_2	Neg_Nervous_3	Neg_Cope_6	Neg_Angered_9	Neg_Difficulties_10	Reverse4	Reverse5	Reverse7	Reverse8
Neg_Upset_1	1.000	.736	.649	.613	.551	.698	.521	.652	.348	.557
Neg_Control_2	.736	1.000	.700	.563	.618	.676	.508	.579	.355	.586
Neg_Nervous_3	.649	.700	1.000	.642	.652	.707	.452	.507	.373	.573
Neg_Cope_6	.613	.563	.642	1.000	.519	.790	.487	.537	.394	.620
Neg_Angered_9	.551	.618	.652	.519	1.000	.610	.270	.423	.391	.407
Neg_Difficulties_10	.698	.676	.707	.790	.610	1.000	.561	.632	.433	.665
Reverse4	.521	.508	.452	.487	.270	.561	1.000	.616	.397	.614
Reverse5	.652	.579	.507	.537	.423	.632	.616	1.000	.503	.746
Reverse7	.348	.355	.373	.394	.391	.433	.397	.503	1.000	.561
Reverse8	.557	.586	.573	.620	.407	.665	.614	.746	.561	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.555	.270	.790	.520	2.928	.014	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Neg_Upset_1	26.3095	70.826	.772	.668	.916
Neg_Control_2	26.2679	69.395	.770	.670	.917
Neg_Nervous_3	25.8810	71.734	.764	.647	.917
Neg_Cope_6	26.2679	71.239	.747	.657	.918
Neg_Angered_9	26.2738	73.925	.635	.547	.924
Neg_Difficulties_10	26.4226	67.060	.842	.758	.912
Reverse4	26.4524	75.638	.622	.484	.924
Reverse5	26.2798	73.796	.741	.667	.919
Reverse7	26.4286	78.917	.519	.368	.929
Reverse8	26.2917	71.908	.758	.693	.917

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
29.2083	88.717	9.41896	10

APPENDIX C – PSS-10 RESULTS

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Perceived Stress	168	100.0%	0	0.0%	168	100.0%

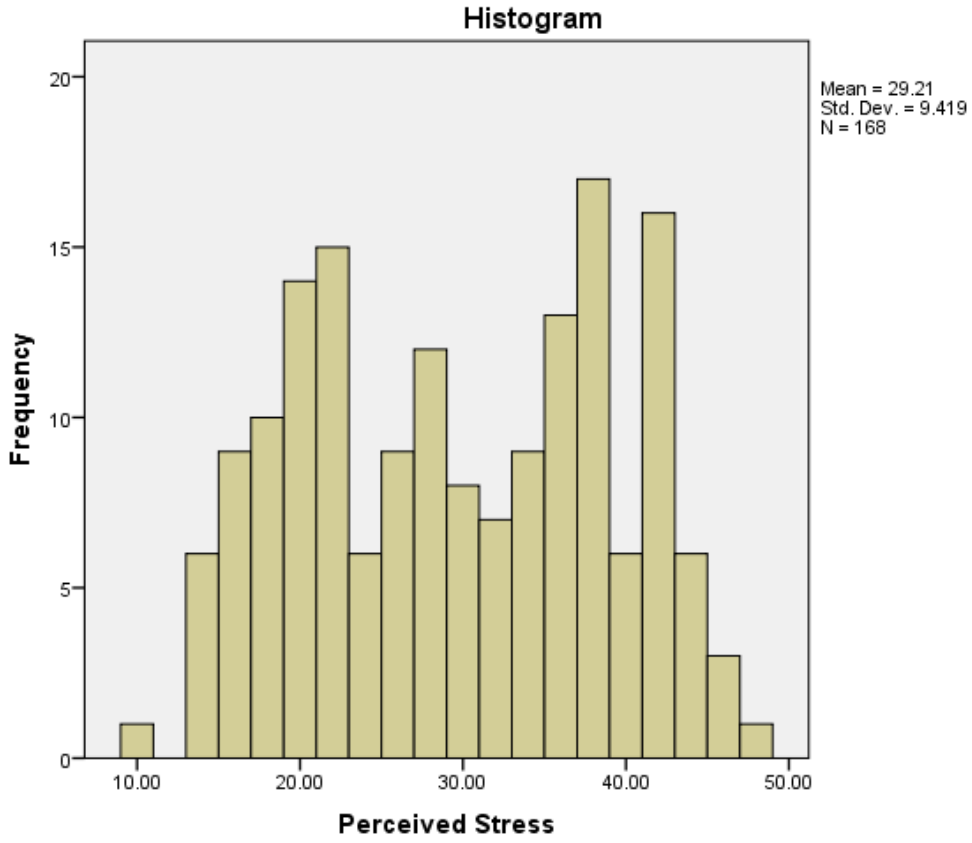
Descriptives

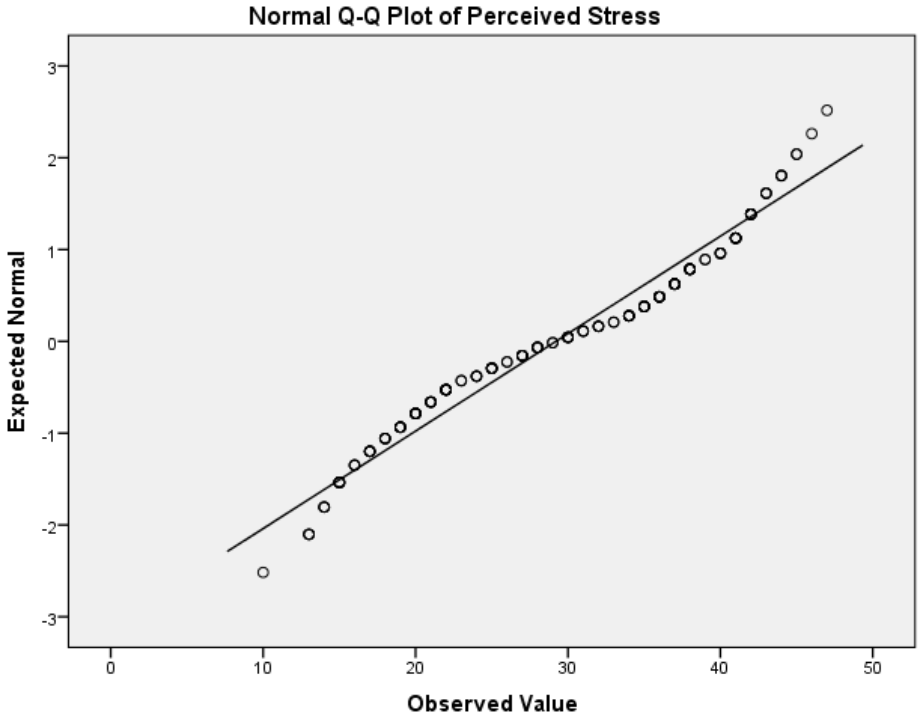
			Statistic	Std. Error
Perceived Stress	Mean		29.2083	.72669
	95% Confidence Interval for Mean	Lower Bound	27.7737	
		Upper Bound	30.6430	
	5% Trimmed Mean		29.2315	
	Median		29.5000	
	Variance		88.717	
	Std. Deviation		9.41896	
	Minimum		10.00	
	Maximum		47.00	
	Range		37.00	
	Interquartile Range		16.00	
	Skewness		-.042	.187
	Kurtosis		-1.230	.373

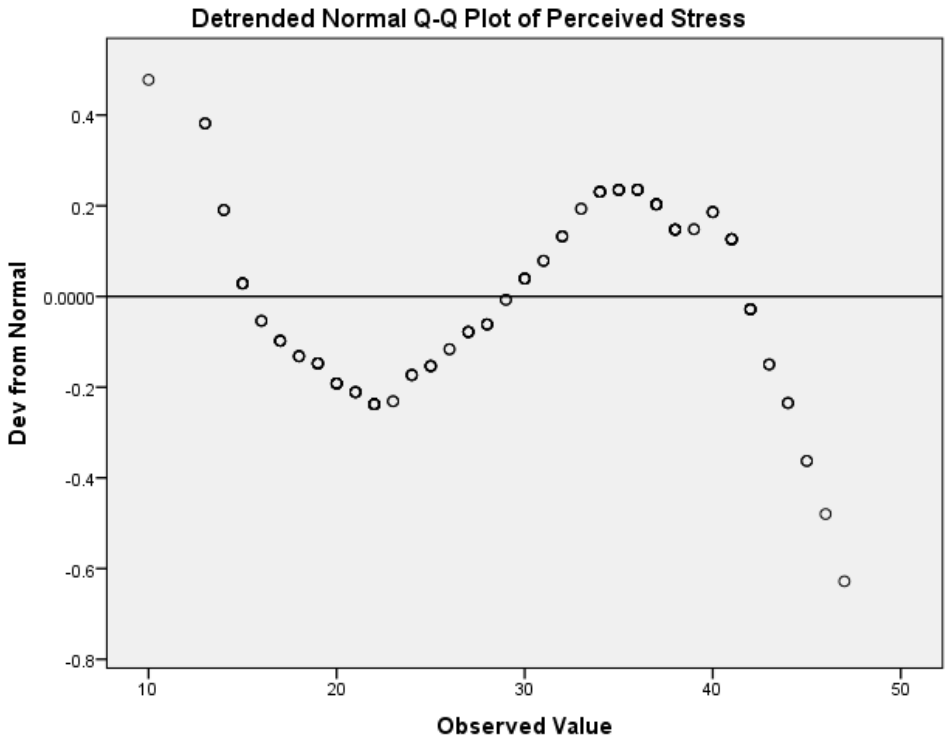
Tests of Normality

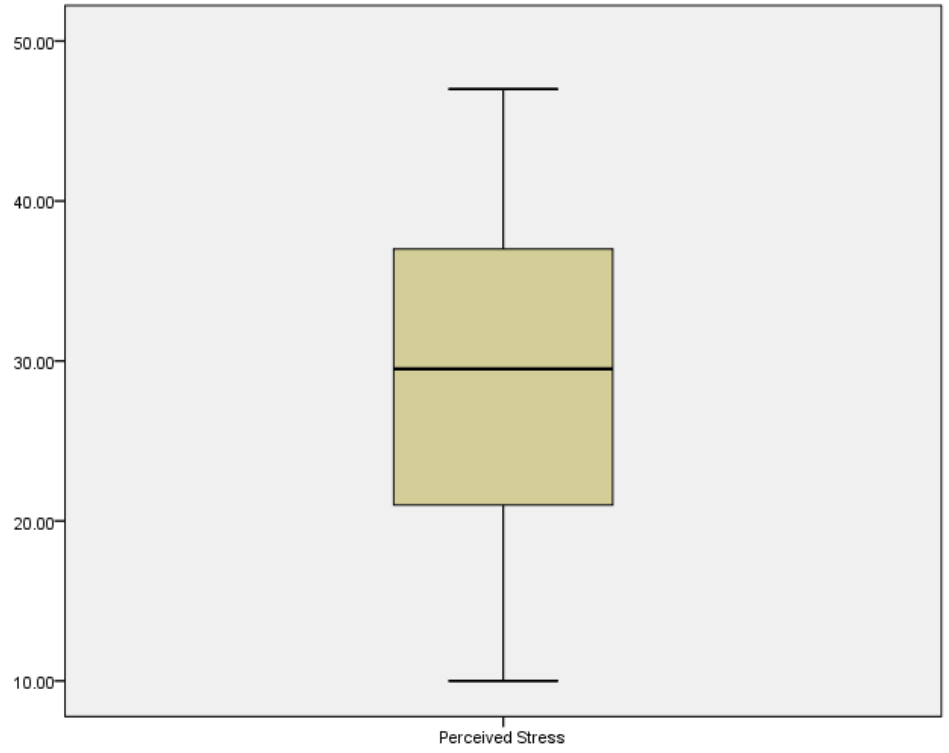
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Perceived Stress	.105	168	.000	.954	168	.000

a. Lilliefors Significance Correction


Histogram
Mean = 29.21
Std. Dev. = 9.419
N = 168
Frequency
Perceived Stress
0
5
10
15
20
10.00
20.00
30.00
40.00
50.00


Normal Q-Q Plot of Perceived Stress
Expected Normal
Observed Value
-3
-2
-1
0
1
2
3
0
10
20
30
40
50


Detrended Normal Q-Q Plot of Perceived Stress
Dev from Normal
0.4
0.2
0.0000
-0.2
-0.4
-0.6
-0.8
10
20
30
40
50
Observed Value


50.00
40.00
30.00
20.00
10.00
Perceived Stress

APPENDIX D – MANN-WHITNEY TEST RESULTS FOR THE DISTRIBUTION OF TOTAL PERCEIVED STRESS ACROSS GENDERS

Mann-Whitney Test

Ranks

	Gender	N	Mean Rank	Sum of Ranks
Perceived Stress	Male	102	83.19	8485.00
	Female	66	86.53	5711.00
	Total	168		

Test Statistics[a]

	Perceived Stress
Mann-Whitney U	3232.000
Wilcoxon W	8485.000
Z	-.436
Asymp. Sig. (2-tailed)	.663

a. Grouping Variable: Gender

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Perceived Stress is the same across categories of Gender.	Independent-Samples Mann-Whitney U Test	.663	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

APPENDIX E – THE FRAMING OF ACTS: DESCRIPTIVE STATISTICS

Case Processing Summary

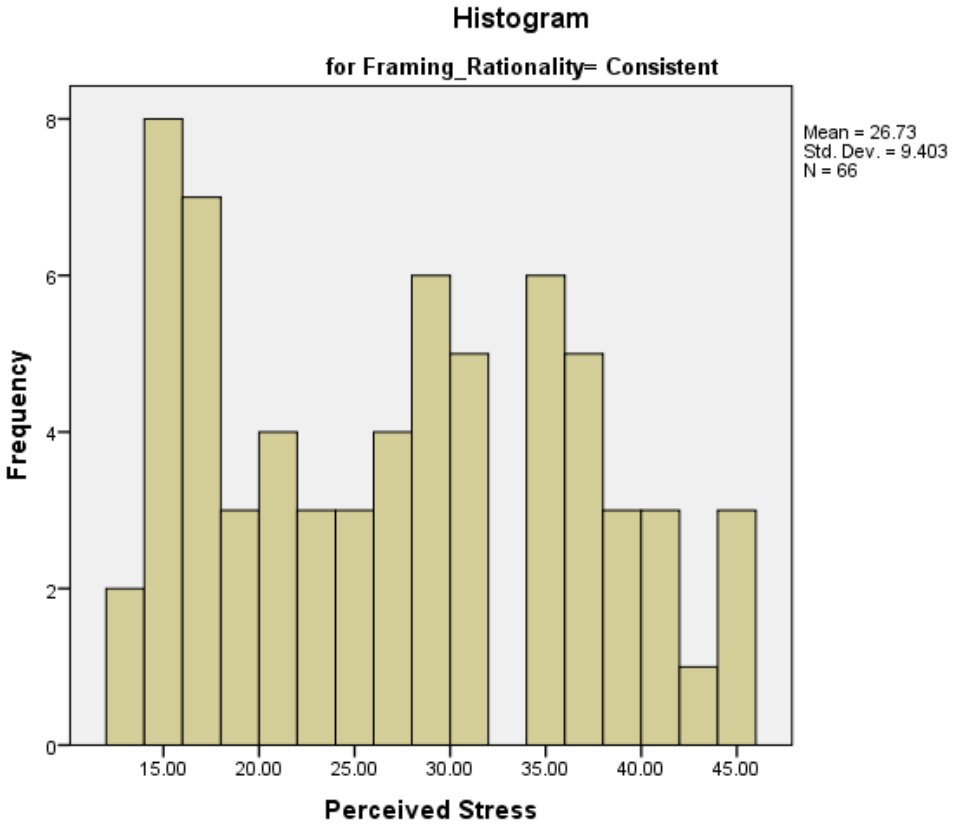
		Cases					
		Valid		Missing		Total	
	Framing_Rationality	N	Percent	N	Percent	N	Percent
Perceived Stress	Inconsistent	102	100.0%	0	0.0%	102	100.0%
	Consistent	66	100.0%	0	0.0%	66	100.0%

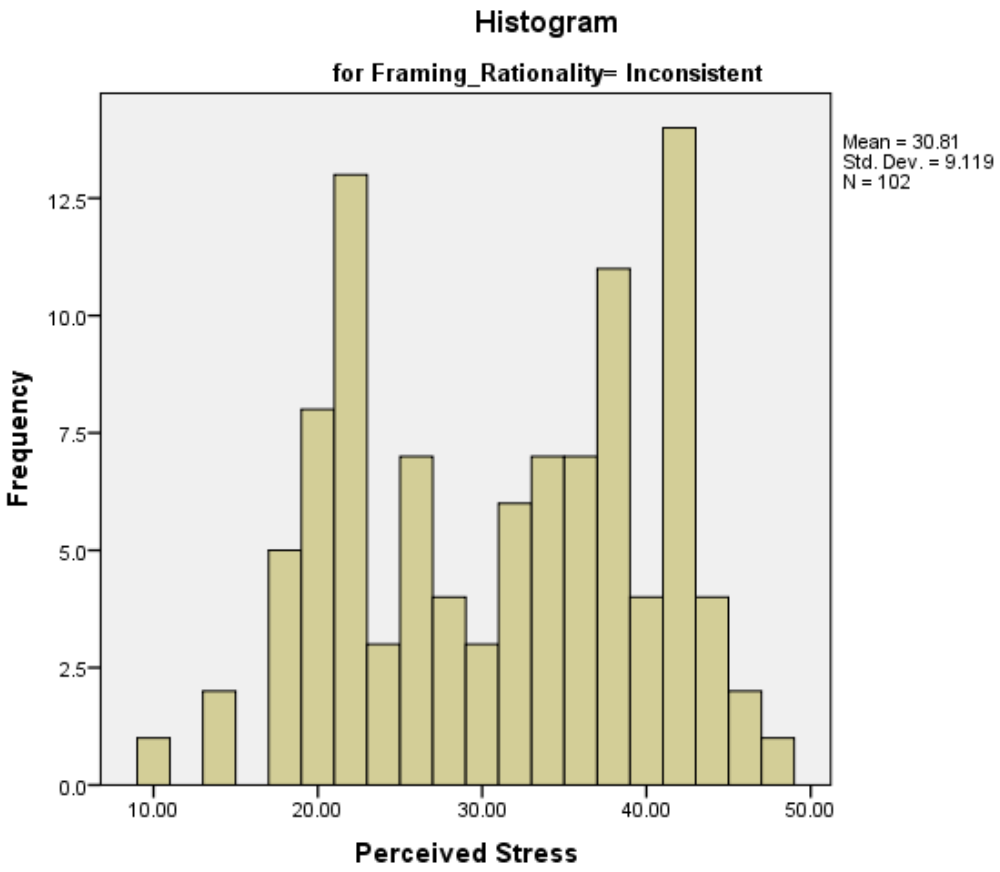
Framing_Rationality				Statistic	Std. Error
Perceived Stress	Inconsistent	Mean		30.8137	.90295
		95% Confidence Interval for Mean	Lower Bound	29.0225	
			Upper Bound	32.6049	
		5% Trimmed Mean		30.9466	
		Median		32.0000	
		Variance		83.163	
		Std. Deviation		9.11937	
		Minimum		10.00	
		Maximum		47.00	
		Range		37.00	
		Interquartile Range		16.25	
		Skewness		-.178	.239
		Kurtosis		-1.185	.474
	Consistent	Mean		26.7273	1.15743
		95% Confidence Interval for Mean	Lower Bound	24.4157	
			Upper Bound	29.0388	
		5% Trimmed Mean		26.5017	
		Median		27.0000	
		Variance		88.417	
		Std. Deviation		9.40302	
		Minimum		13.00	
		Maximum		45.00	
		Range		32.00	
		Interquartile Range		18.00	
		Skewness		.200	.295
		Kurtosis		-1.192	.582

Tests of Normality

	Framing_Rationality	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Perceived Stress	Inconsistent	.117	102	.001	.946	102	.000
	Consistent	.126	66	.011	.939	66	.003

a. Lilliefors Significance Correction




Histogram
for Framing_Rationality= Inconsistent
Mean = 30.81
Std. Dev. = 9.119
N = 102
Frequency
0.0
2.5
5.0
7.5
10.0
12.5
10.00
20.00
30.00
40.00
50.00
Perceived Stress

APPENDIX F – FRAMING UNDER CERTAINTY: DESCRIPTIVE STATISTICS

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	SunkCost_Inconsistent	N	Percent	N	Percent	N	Percent
Perceived Stress	Inconsistent	37	100.0%	0	0.0%	37	100.0%
	Consistent	131	100.0%	0	0.0%	131	100.0%

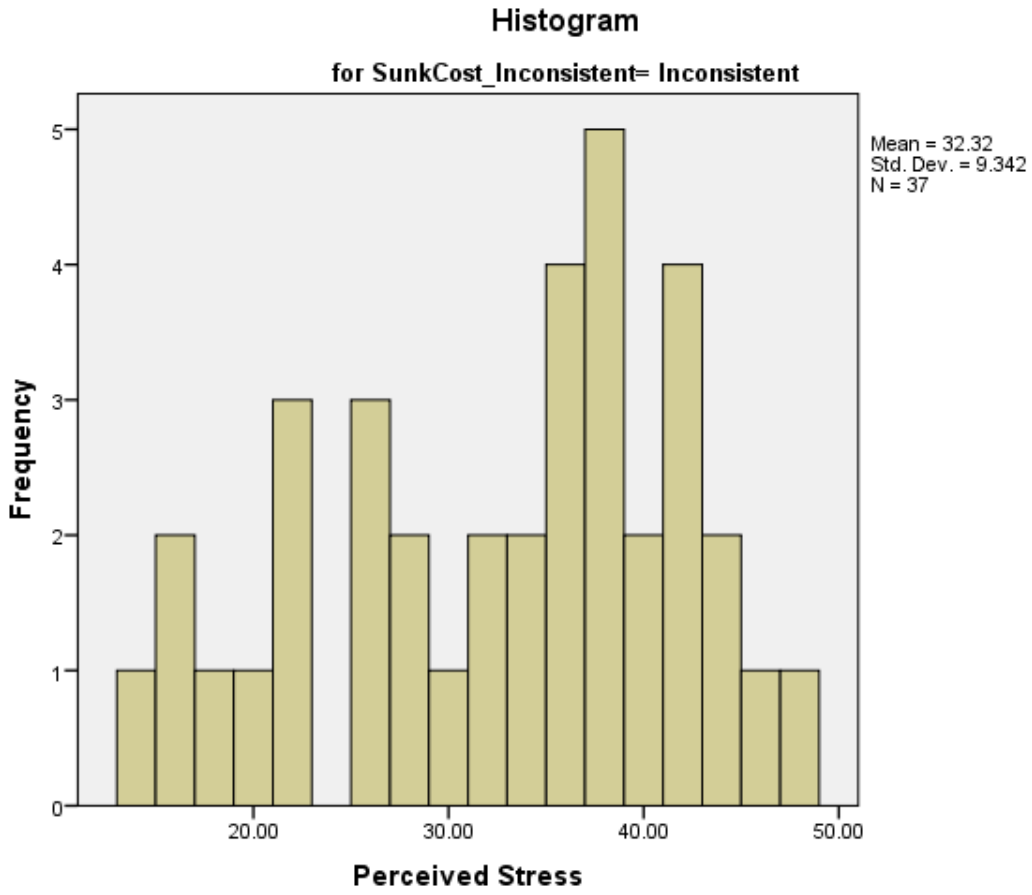
Descriptives

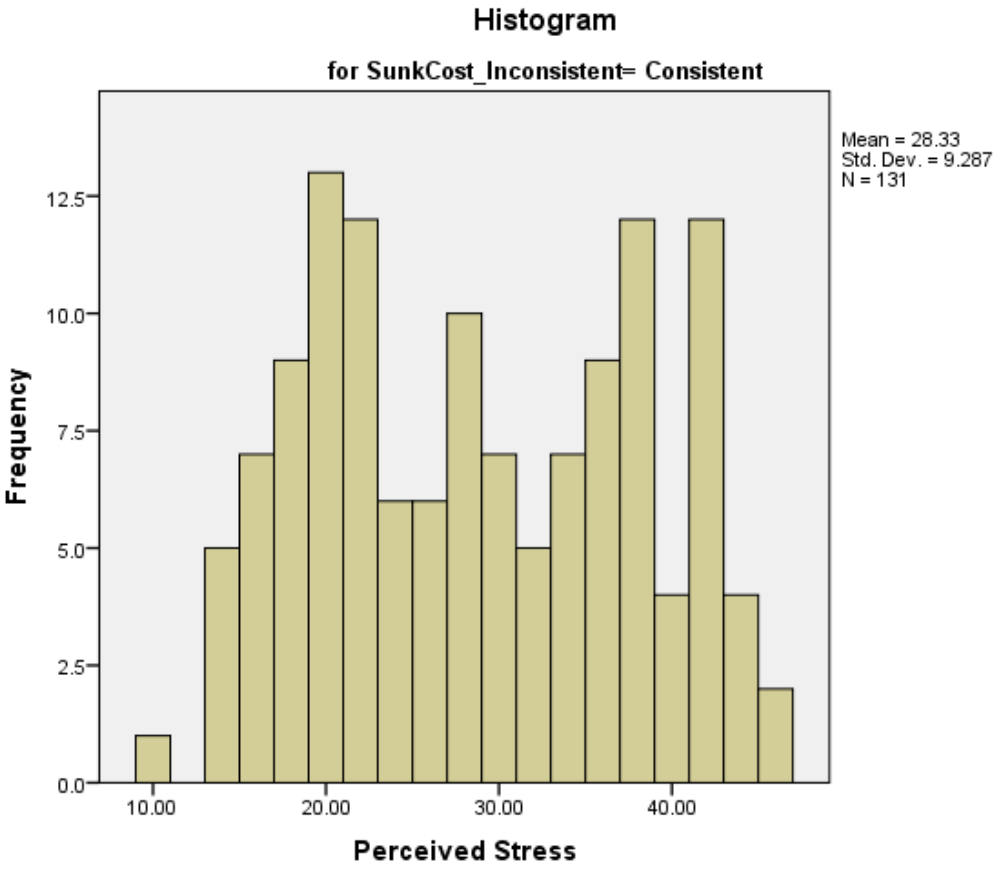
	SunkCost_Inconsistent			Statistic	Std. Error
Perceived Stress	Inconsistent	Mean		32.3243	1.53588
		95% Confidence Interval for Mean	Lower Bound	29.2094	
			Upper Bound	35.4392	
		5% Trimmed Mean		32.5270	
		Median		35.0000	
		Variance		87.281	
		Std. Deviation		9.34242	
		Minimum		14.00	
		Maximum		47.00	
		Range		33.00	
		Interquartile Range		14.50	
		Skewness		-.430	.388
		Kurtosis		-.890	.759
	Consistent	Mean		28.3282	.81143
		95% Confidence Interval for Mean	Lower Bound	26.7229	
			Upper Bound	29.9336	
		5% Trimmed Mean		28.3261	
		Median		28.0000	
		Variance		86.253	
		Std. Deviation		9.28725	
		Minimum		10.00	
		Maximum		45.00	
		Range		35.00	
		Interquartile Range		17.00	
		Skewness		.052	.212
		Kurtosis		-1.239	.420

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	SunkCost_Inconsistent	Statistic	df	Sig.	Statistic	df	Sig.
Perceived Stress	Inconsistent	.139	37	.067	.947	37	.078
	Consistent	.111	131	.000	.952	131	.000

a. Lilliefors Significance Correction




Histogram
for SunkCost_Inconsistent= Consistent
Mean = 28.33
Std. Dev. = 9.287
N = 131
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
10.00
20.00
30.00
40.00
Perceived Stress

APPENDIX G – THE FRAMING OF OUTCOMES: DESCRIPTIVE STATISTICS

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	Framing_DiseaseProblem	N	Percent	N	Percent	N	Percent
Perceived Stress	Inconsistent	53	100.0%	0	0.0%	53	100.0%
	Consistent	115	100.0%	0	0.0%	115	100.0%

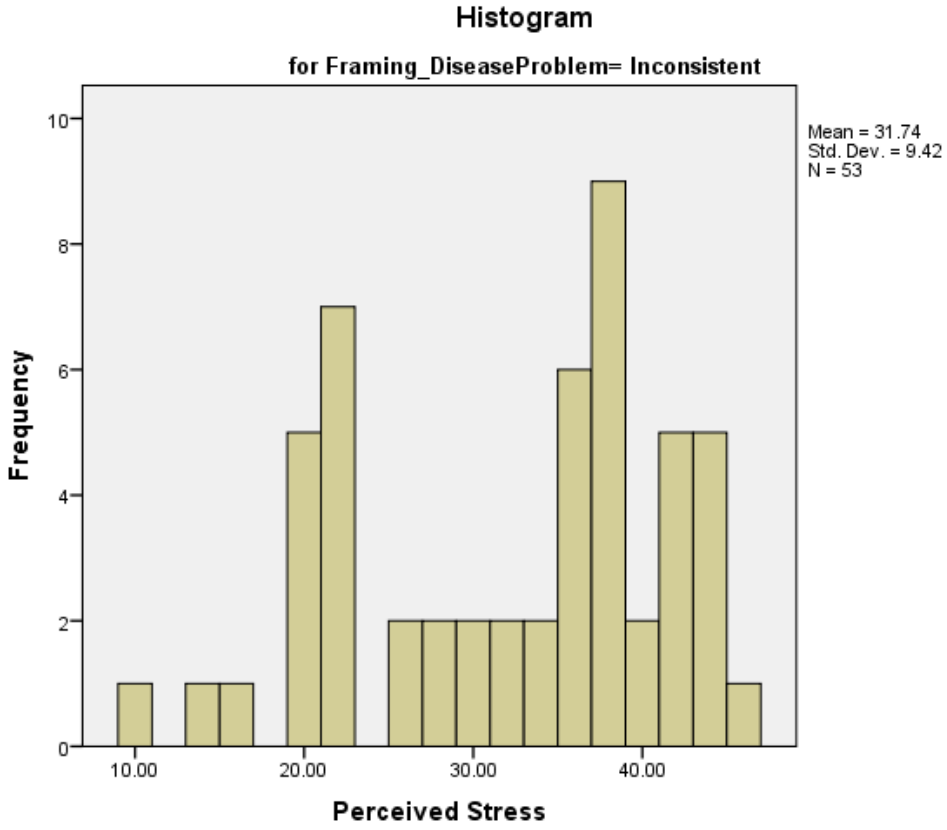
Descriptives

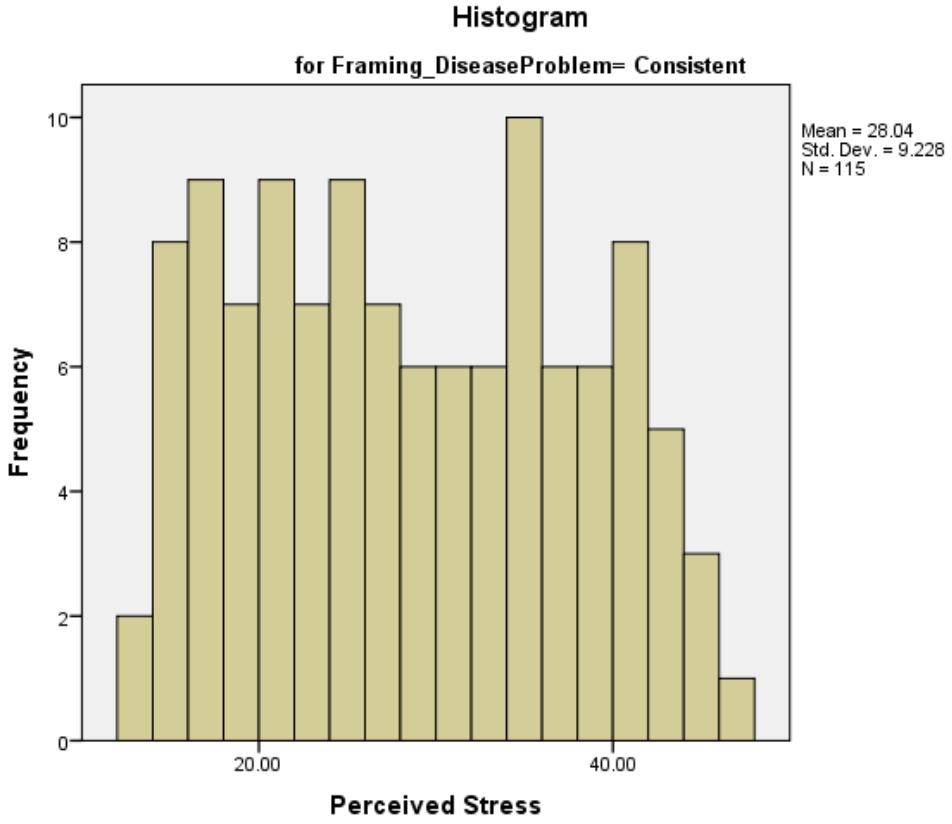
	Framing_DiseaseProblem			Statistic	Std. Error
Perceived Stress	Inconsistent	Mean		31.7358	1.29394
		95% Confidence Interval for Mean	Lower Bound	29.1394	
			Upper Bound	34.3323	
		5% Trimmed Mean		32.0891	
		Median		36.0000	
		Variance		88.737	
		Std. Deviation		9.42001	
		Minimum		10.00	
		Maximum		46.00	
		Range		36.00	
		Interquartile Range		17.00	
		Skewness		-.483	.327
		Kurtosis		-.937	.644
	Consistent	Mean		28.0435	.86047
		95% Confidence Interval for Mean	Lower Bound	26.3389	
			Upper Bound	29.7481	
		5% Trimmed Mean		27.9348	
		Median		27.0000	
		Variance		85.147	
		Std. Deviation		9.22752	
		Minimum		13.00	
		Maximum		47.00	
		Range		34.00	
		Interquartile Range		16.00	
		Skewness		.144	.226
		Kurtosis		-1.167	.447

Tests of Normality

	Framing_DiseaseProblem	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Perceived Stress	Inconsistent	.184	53	.000	.927	53	.003
	Consistent	.092	115	.019	.954	115	.001

a. Lilliefors Significance Correction




Histogram
for Framing_DiseaseProblem= Consistent
Mean = 28.04
Std. Dev. = 9.228
N = 115
Frequency
0
2
4
6
8
10
20.00
40.00
Perceived Stress

APPENDIX H - DESCRIPTIVE STATISTICS FOR TIME INCONSISTENCY PROBLEMS

Case Processing Summary

	AggScore_TimeInconsistency	Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
Perceived Stress	consistent	127	100.0%	0	0.0%	127	100.0%
	Inconsistent	41	100.0%	0	0.0%	41	100.0%

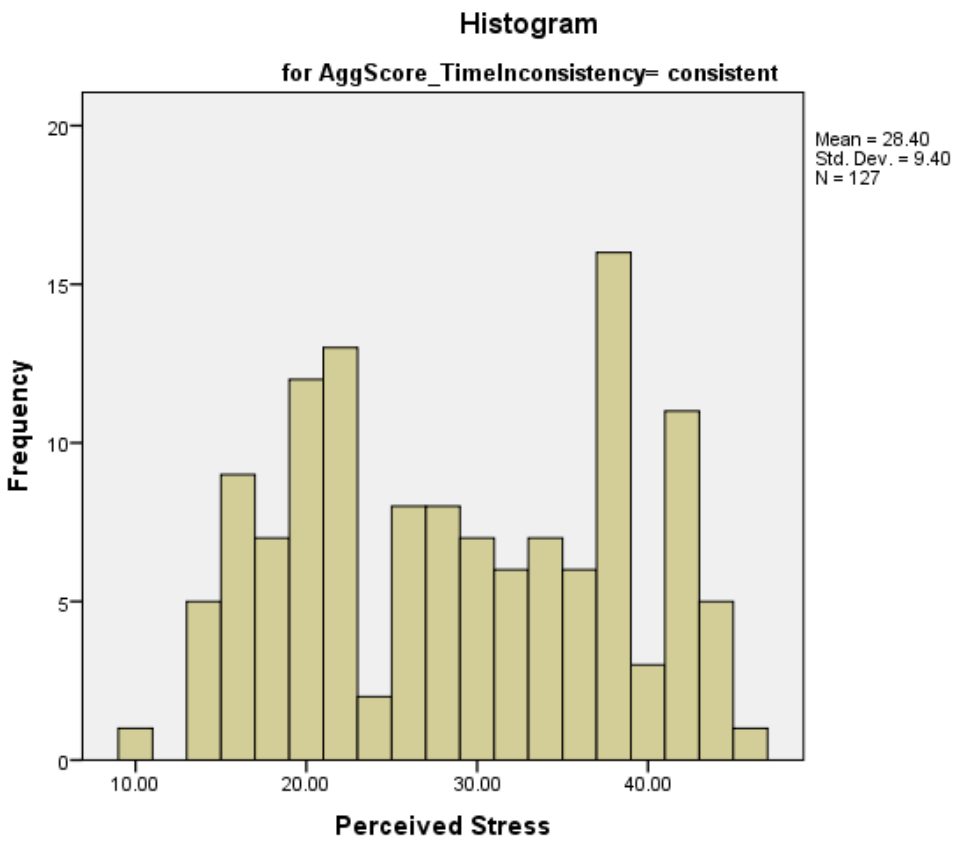
Descriptives

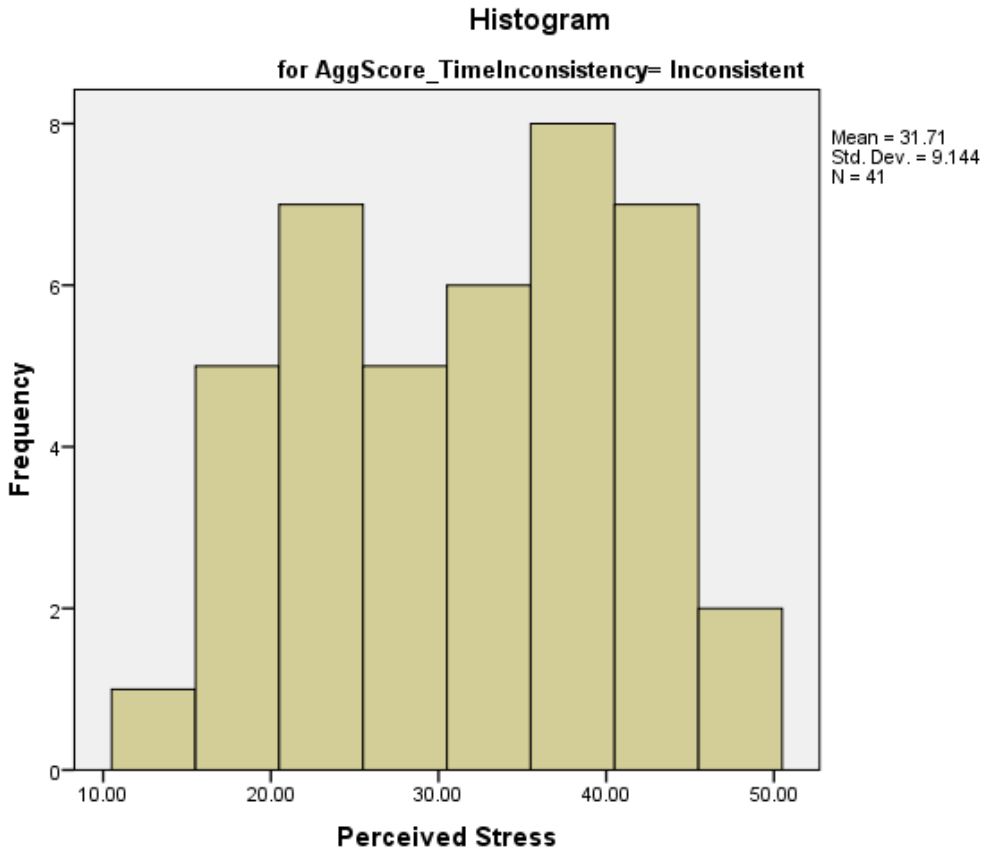
AggScore_TimeInconsistency				Statistic	Std. Error
Perceived Stress	consistent	Mean		28.4016	.83408
		95% Confidence Interval for Mean	Lower Bound	26.7509	
			Upper Bound	30.0522	
		5% Trimmed Mean		28.4081	
		Median		28.0000	
		Variance		88.353	
		Std. Deviation		9.39965	
		Minimum		10.00	
		Maximum		45.00	
		Range		35.00	
		Interquartile Range		17.00	
		Skewness		.017	.215
		Kurtosis		-1.275	.427
	Inconsistent	Mean		31.7073	1.42805
		95% Confidence Interval for Mean	Lower Bound	28.8211	
			Upper Bound	34.5935	
		5% Trimmed Mean		31.8117	
		Median		34.0000	
		Variance		83.612	
		Std. Deviation		9.14397	
		Minimum		13.00	
		Maximum		47.00	
		Range		34.00	
		Interquartile Range		16.00	
		Skewness		-.214	.369
		Kurtosis		-1.057	.724

Tests of Normality

	AggScore_TimeInconsistency	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Perceived Stress	consistent	.122	127	.000	.948	127	.000
	Inconsistent	.136	41	.056	.955	41	.108

a. Lilliefors Significance Correction




Histogram
for AggScore_TimeInconsistency= Inconsistent
Mean = 31.71
Std. Dev. = 9.144
N = 41
Frequency
0
2
4
6
8
10.00
20.00
30.00
40.00
50.00
Perceived Stress

APPENDIX I – LOGISTIC REGRESSION MODEL 1

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	15.580	4	.004
	Block	15.580	4	.004
	Model	15.580	4	.004

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	209.543[a]	.089	.120

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

Classification Table[a]

Observed			Predicted		
			Irrational		Percentage Correct
			Rational	Irrational	
Step 1	Irrational	Rational	20	46	30.3
		Irrational	15	87	85.3
	Overall Percentage				63.7

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Stressed	.559	.351	2.540	1	.111	1.748
	Male	.841	.342	6.033	1	.014	2.318
	Over30	-.700	.361	3.770	1	.052	.496
	OrdDegreeOrLower	-.493	.360	1.878	1	.171	.611
	Constant	.093	.350	.071	1	.790	1.098

a. Variable(s) entered on step 1: Stressed, Male, Over30, OrdDegreeOrLower.

APPENDIX J – LOGISTIC REGRESSION MODEL 2

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	12.680	4	.013
	Block	12.680	4	.013
	Model	12.680	4	.013

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	164.462[a]	.073	.112

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted		
			Irrational2		Percentage Correct
			Rational	Irrational	
Step 1	Irrational2	Rational	125	6	95.4
		Irrational	28	9	24.3
	Overall Percentage				79.8

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Stressed	1.041	.410	6.451	1	.011	2.832
	Male	.083	.398	.044	1	.834	1.087
	Over30	-.049	.441	.012	1	.912	.953
	OrdDegreeOrLower	1.156	.413	7.851	1	.005	3.178
	Constant	-2.193	.463	22.388	1	.000	.112

a. Variable(s) entered on step 1: Stressed, Male, Over30, OrdDegreeOrLower.

APPENDIX K – LOGISTIC REGRESSION MODEL 3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	11.006	4	.026
	Block	11.006	4	.026
	Model	11.006	4	.026

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	198.460[a]	.063	.089

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

Classification Table[a]

			Predicted		
			Irrational3		Percentage Correct
	Observed		Rational	Irrational	
Step 1	Irrational3	Rational	104	11	90.4
		Irrational	40	13	24.5
	Overall Percentage				69.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Stressed	.820	.350	5.479	1	.019	2.271
	Male	.181	.357	.259	1	.611	1.199
	Over30	-.579	.404	2.053	1	.152	.561
	OrdDegreeOrLower	-.386	.397	.944	1	.331	.680
	Constant	-.991	.379	6.835	1	.009	.371

a. Variable(s) entered on step 1: Stressed, Male, Over30, OrdDegreeOrLower.

APPENDIX L – LOGISTIC REGRESSION MODEL 4

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	4.603	4	.331
	Block	4.603	4	.331
	Model	4.603	4	.331

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	182.113[a]	.027	.040

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

Classification Table[a]

Observed			Predicted		
			IrrationalTime		Percentage Correct
			Consistent	Inconsistent	
Step 1	IrrationalTime	Consistent	127	0	100.0
		Inconsistent	41	0	.0
	Overall Percentage				75.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Stressed	.620	.374	2.749	1	.097	1.859
	Male	.207	.380	.297	1	.586	1.230
	Over30	-.284	.421	.455	1	.500	.753
	OrdDegreeOrLower	-.237	.420	.319	1	.572	.789
	Constant	-1.393	.410	11.543	1	.001	.248

a. Variable(s) entered on step 1: Stressed, Male, Over30, OrdDegreeOrLower.

APPENDIX M – DATA SCRIPT FOR LARGE-SAMPLE SIGNIFICANCE TEST FOR TWO POPULATION PROPORTIONS

```
MATRIX.

COMPUTE n1 = {84}.  /* Enter the first sample size here (change the number in curly brackets)*/

COMPUTE n2 = {84}.  /* Enter the second sample size here (change the number in curly brackets)*/

COMPUTE x1 = {33}.  /* Enter the number of "successes" for sample 1 here (change the nb in curly brackets)*/

COMPUTE x2 = {15}. /* Enter the number of "successes" for sample 2 here (change the nb in curly brackets)*/

*The remainder of the syntax calculates the z score and signficance levels given the values for n1,

        n2, x1 and x2 which you have entered.

*NB you don't need to alter anything from here on.

COMPUTE p1 = x1/n1.

COMPUTE p2 = x2/n2.

COMPUTE phat = (x1 + x2) / (n1 + n2).

COMPUTE SE_phat = SQRT(phat * (1 - phat) * ((1/n1) + (1/n2))).

COMPUTE z = (p1 - p2) /SE_phat.

COMPUTE SIGz_2TL = 2 * (1 - CDFNORM(ABS(z))).

COMPUTE SIGz_LTL = CDFNORM(Z).

COMPUTE SIGz_UTL = 1 - CDFNORM(Z).

COMPUTE ANSWER = {p1, p2, SE_phat, z, SIGz_2TL, SIGz_LTL, SIGz_UTL}.

PRINT ANSWER / FORMAT "F10.5" / CLABELS = p1, p2, SE, z, SIGz_2TL, SIGz_LTL, SIGz_UTL.

END MATRIX.
```

APPENDIX N – FREQUENCY STATISTICS FOR RESPONDENTS

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	102	60.7	60.7	60.7
	Female	66	39.3	39.3	100.0
	Total	168	100.0	100.0	

Marital_Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	111	66.1	66.1	66.1
	Married	46	27.4	27.4	93.5
	Re-married	3	1.8	1.8	95.2
	Civil partnership	2	1.2	1.2	96.4
	Separated	4	2.4	2.4	98.8
	Divorced	2	1.2	1.2	100.0
	Total	168	100.0	100.0	

Occupational_Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not working	2	1.2	1.2	1.2
	Part time (<15 hrs pw)	1	.6	.6	1.8
	Part time (15-34 hrs pw)	2	1.2	1.2	3.0
	Full time	157	93.5	93.5	96.4
	On temp leave	6	3.6	3.6	100.0
	Total	168	100.0	100.0	

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19-29	51	30.4	30.4	30.4
	30-39	80	47.6	47.6	78.0
	40-49	29	17.3	17.3	95.2
	50-59	4	2.4	2.4	97.6
	Over 60	4	2.4	2.4	100.0
	Total	168	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lower secondary	4	2.4	2.4	2.4
	Upper secondary	4	2.4	2.4	4.8
	Advanced Cert / Apprenticeship	2	1.2	1.2	6.0
	Higher cert	5	3.0	3.0	8.9
	Ord degree / national dip	35	20.8	20.8	29.8
	Hons degree / Professional Qual	91	54.2	54.2	83.9
	Postgrad diploma / degree	26	15.5	15.5	99.4
	Ph.D or higher	1	.6	.6	100.0
	Total	168	100.0	100.0	