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Financial Cognitive Biases: The Intersection of Mental Shortcuts and Investment Valuation

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Doctor in Business Administration

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September, 2023



**BUSINESS
SCHOOL**

Marketing, Operations and General Management Department

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Abstract

This thesis investigates the influence of cognition on investment valuations and decisions. Traditional financial theory suggests that investments should be valued and decided based on rational and mathematical parameters. Despite the influence of cognition on investment valuations and decisions, the theme not covered properly by existing literature, a gap that this work addresses and attempts to fill. Based on Prospect Theory, Heuristics and Judgment Biases, Principle of Expected Utility and Financial Theories about Economic Value, Perpetuity, Asset Prices and Efficient Markets, the thesis used qualitative research in a multiple method approach - literature review, descriptive case study and Delphi Technique. Research findings have shown how mental shortcuts (heuristics and biases) provide quick and easy answers to complex questions of investment valuations and decisions. However, conclusions drawn from false cognitive data can lead to worse investment valuations and decisions. The descriptive single case study revealed how the anchoring bias associated with the 330% overpricing, affected the valuation process and rational decision to sell the 'Hotel'. The case study findings were the basis of Delphi survey into the effects of heuristics and biases on Investment Valuation Assumptions (IVA). The research was carried out with N=11 experts in financial analysis and decision-making. The Delphi survey findings suggest 15 cognitive mechanisms for defining, and 15 for validating of IVA Forecasts. The finding served as the basis for the development of IVA Forecast Conceptual Model. The Model incorporates cognitive mechanisms into the rational and mathematical models of support investment valuation and decision. The model implantation, implications and management recommendations are attached. Finally, the thesis will be present conclusions, implications, limitations and recommendations for future research. The content of this work reveals opportunities for researchers, financial analysts, and decision-makers interested in improving investment valuations and decisions.

Keywords: Investment Valuation Assumptions (IVA); Bias and Heuristic; Fair Value; Investment Decisions.

Resumo

Esta tese investiga a influência da cognição nas avaliações e decisões de investimento. A teoria financeira tradicional sugere que os investimentos devem ser avaliados e decididos com base em parâmetros racionais e matemáticos. Apesar da influência da cognição nas avaliações e decisões de investimento, o tema não é devidamente abordado pela literatura existente, lacuna que este trabalho aborda e tenta preencher. Baseada na Teoria do Prospecto, Heurísticas e Vieses de Julgamento, Princípio da Utilidade Esperada e Teorias Financeiras sobre Valor Econômico, Perpetuidade, Preços de Ativos e Mercados Eficientes, a tese utilizou pesquisa qualitativa em abordagem de métodos múltiplos – revisão de literatura, estudo de caso descritivo e Técnica Delphi. Os resultados da investigação mostraram como os atalhos mentais (heurísticas e vieses) fornecem respostas rápidas e fáceis a questões complexas das avaliações e decisões de investimento. No entanto, as conclusões tiradas de dados cognitivos falsos podem levar a avaliações e decisões de investimentos piores. O estudo descritivo de caso único revelou como o viés da ancoragem associado ao sobrepreço de 330%, afetou o processo de avaliação e a decisão racional de venda do 'Hotel'. As conclusões do estudo de caso serviram de base para o inquérito Delphi sobre os efeitos das heurísticas e vieses nos pressupostos de avaliação de investimentos (IVA). A pesquisa foi realizada com N=11 especialistas em análise financeira e tomada de decisão. Os resultados da pesquisa Delphi sugerem 15 mecanismos cognitivos para definição e 15 para validação de previsões de IVA. A constatação serviu de base para o desenvolvimento do Modelo Conceitual de Previsão de IVA. O Modelo incorpora mecanismos cognitivos nos modelos racionais e matemáticos de apoio à avaliação e decisão de investimentos. A implantação do modelo, implicações e recomendações de uso foram anexadas. Por fim, a tese apresentará conclusões, implicações, limitações e recomendações para pesquisas futuras. O conteúdo deste trabalho revela oportunidades para pesquisadores, analistas financeiros e tomadores de decisão interessados em aprimorar as avaliações e decisões de investimento.

Palavras-chave: Premissas de Avaliação de Investimentos (IVA); Viés e Heurística; Valor Justo; Decisões de Investimento.

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Chapter 1

Introduction

1.1. Introduction

The thesis investigates the influence of cognition on investment valuations and decisions through multiple methods approach, organized in Seven Chapters (see section 1.8), fulfill the rules and requirements of the Doctorate in Business Administration Program at ISCTE Business School. The Chapter One present the motivations, relevance topics abstract, and methodology approaches overview this thesis. The objective is to guides the reading of the work regarding the proposal, structure, objectives and managerial contributions.

In addition to this brief introduction, Chapter One present the section 1.2. Topic Relevance; Section 1.3. Research Motivation; Section 1.4. Supporting Theories and Research Gap; section 1.5. Research Assumptions; section 1.6. Research Questions; section 1.7. Research Objectives; Section 1.8. Research Design; section 1.9. Chapters' Summaries; section 1.10. Managerial Contributions; section 1.11. Research Limitations; and section 1.12. Summary. In the next section the topic relevance will present.

1.2. Topic Relevance

The traditional investment decisions literature has theoretical bases supported by rational economic theories. The highlight for Bernoulli's utility (1713), Theory of interest Fisher (1930), Neumann and Morgenstern's axioms (1944), Markovitz's diversification (1952), Gordon and Shapiro's endless horizon (1956), Sharpe's asset pricing (1964), Fama's efficient markets (1970), Arbitrage Pricing Theory of (APM) by Cox and Ross (1976), stochastic models by Markov (1884), Merton (1976), Pindyck (1999), Schwartz & Smith (2000).

Decision-making processes have their theoretical bases supported by behavioral economics, that combine cognition and rationality. It should be highlight Simon's Assumptions (1946, 1955, 1957, and 1966), the heuristics and cognitive biases of Tversky and Kahneman (1971, 1973, 1974, 1979, and 1986), and Prospect Theory (Kahneman, 1979), the mental shortcut of Gigerenzer (1996 and 1997) and Gigerenzer and Goldstein (1996), and Kahneman Systems (2017).

This work uses rational and behavioral economic theories to back up investment decisions. Rationally, investment decisions are mostly scientifically judged by the discounted cash flow method (DCF). However, the investment valuation assumptions (IVA) used on cash flow forecasts have contributions from financial analysts' cognition. In this thesis, heuristics and biases represent cognitive mechanisms that financial analysts use shorter, more intuitive, and faster for IVA Forecasts definition.

Finally, as it will be seen in section 1.8, the work limits your conclusions by financial theories, heuristics and biases (Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986), and Prospect Theory (Kahneman, 1979). In addition, other theoretical perspectives may convey incorrect understandings of the analysis and discussions. In the upcoming section, the Research motivations are disclosed.

1.3. Research Motivation

Surveys like these serve, among other purposes, to sustain convictions, and dispel myths. The author's motivation comes from 22 years of experience in finance acting in investments valuation, assets and liability restructuring, credit analyses, mergers and acquisitions operations, financial strategies, project finance structuring, financial education for executives, articles and books written on finance, that naturally lead to findings and conclusions.

Rational investment decisions are based on current forecasts of future findings, which often turn out to be different than expected. Differences between budgeted and realized are widespread, of course, and can change an investment decision that has yet to be taken. If the decision has been taken, its outcome will incur a probable loss.

Throughout my professional career, I witnessed investment decisions without a theoretical foundation to support them. Theoretical financial arguments sometimes do not convince decision-makers about the supposed "best investment decisions." These decision-makers often use mental shortcuts to select their investments and are successful in their choices, with the superior outcome to the investment analysts themselves. Understanding as cognition can improve investment decisions was the initial quest of the research. Surprisingly, the research revealed that cognitive mechanisms (mental shortcuts) and their flaws (false cognitive) can significantly affect the rational financial models of investment valuation.

Understanding how mental shortcuts affect the investments valuation and decision, in summary, is the firstly and principal motivation to this research. In secondly, it is my evolution

how financial analyst, something that has been noticed. Finally, I am motivated to share my findings with the academic community and my students. The following sections presents the theoretical gaps, assumptions, questions, and objectives of the research.

1.4. Supporting Theories and Research Gap

This section introduces a concise literature review on the Expected Utility Theory, Risk Investments Theories, and Behavioral Economics Theories, and Research Gap, compiled into four divisions: section 1.4.1. Supporting Theories; and section 1.4.2. Research Gap.

1.4.1. Supporting Theories

This section is comprised of three subdivisions: section 1.4.1.1. Expected Utility (EU) Theory, section 1.4.1.2. Risk Investments Theories, and finally, section 1.4.1.3. Behavioral Economics Theories, in sequence.

The theories mentioned above were selected because they best suit the research objectives (see section 1.8.): (a) The thesis is about investment valuation and decision. The principles of Expected Utility support rational investment decisions. Per economics theories, Utility is the degree of profitability or satisfaction we obtain from using things. In finance, Utility is measured by cash flow generated by investment for the investor. This factor justifies the choice for Expected Utility Theory; (b) The research explores the Financial Theories of the 1930s to 1970s, which are the basis of rational investment decisions. In rational investment valuation theories, the cash flow forecasts are decapitalized at risk-adjusted rates, defining the fair value of the investment (fairness opinion). (c) Finally, the research explores the Prospect Theory of Kahneman (1979) and the Heuristics and Cognitive Biases of Tversky and Kahneman (1971, 1973, 1974, 1979 e 1986). Investment decisions are influenced by the cognition of those who make them. Investor risk aversion outweighs earnings appetite. Mental shortcuts, known as heuristics and biases, are cognitive mechanisms that interfere with investment decisions. These are the principles of Behavioral Economics used to build these theses.

1.4.1.1. Expected Utility Theory

As detailed Chapter Two, in economics, utility stands for an economic agent's satisfaction or financial findings, which makes it possible to explain the behavior finding from the decision made. The Expected Utility (EU) theory is the most used to support risk decisions. It is a

normative model of descriptive behavioral choices. In practice, the EU's mathematical lottery process simulates expected findings (u) and probabilities (p) of the decision made. The Expected Utility (EU) of an event can define by the formula 1, below:

$$EU = \sum p \times u(i) \quad (1)$$

Through EU principles (Bernoulli 1713, Neumann and Morgenstern's 1944), people should rationally choose alternatives that maximize completeness, transitivity, continuity, and independence axioms.

1.4.1.2. Risk Investment Theories

Risk investment decisions are based on projections of expected findings (u) and probabilities (p) of occurrence, following EU principles, as theoretically detailed in Chapter Two. In investments decision, (u) are represented by cash flow forecasts, while (p) influences the cost of capital rate.

Fama's (1970) efficient markets Assumption, the investments' fair value must be related to cash flow forecasts, and these values only change when new information affects future forecasts. Following Fama's principles, investment decisions should be evaluated by the utility produced for their owners, not market prices. According to Bernoulli (1713), Fisher (1930), Neumann and Morgenstern (1944), and Fama (1970), investment decisions should maximize the Expected Utility (EU) for the investor. This way, the EU is the economic value (EV) determined by free cash flows (FCF_t) forecasts for investors over time, decapitalized by a rate appropriate to the risk, according to formula 2 of present value, below.

$$EV = \sum \{FCF_t / (1+k)^t\} \quad (2)$$

The discounted cash flow (DCF) model is the most used in investment decisions. The DCF models use the investment valuation assumptions (IVA) in future cash flow forecasts. However, free cash flows are forecasts, not promises, of future findings. Therefore, the DCF model regulates the variability of cash flow forecasts by risk-adjusted rates in the cost of capital (k). Higher risks lead to higher rates, reducing the economic value (EV) and the interest in investing. To determine risk-adjusted rates, follows the theories of the Markowitz portfolio (1952), the Capital Asset Pricing Model (CAPM) by Sharpe (1964) and Lintner (1965), and the Arbitrage Pricing Theory of (APM) by Ross (1976), others.

1.4.1.3. Behavioral Economics Theories

As will be presented throughout the thesis, traditional theories on investment valuations and decisions recommend the use of slow, rational, complex and logical processes aligned with Kahneman's System 2 (2017). Valuation reports serve as a support tool in investment decisions. The fact is that, at some level, investment valuations and decisions are affected by cognition of those involved in the process.

To support such statements, Chapter Two will present the principles of behavioral economics of Simon (1946, 1955, 1957, and 1966), heuristics and cognitive biases of Tversky and Kahneman (1971, 1973, 1974, 1979, and 1986), and Prospect Theory Kahneman (1979). In the next sub-section, we will present the research gap.

1.4.2. Research Gap

Investments valuation Theories have a vast literature based on financial and risk modeling techniques, which lead to rational, mathematical parameters for decision-making. However, few studies exist on cognition influence in valuation and decision of investments. To Cunha, Martins, and Neto (2012), valuation reports are based on subjective views about the enterprise that constitute an approximation of reality, incorporating a certain margin of error. Damodaran (2020) comments that all investment valuations are considered a priori-biased, carrying human biases.

In investments, cognitive shortcuts (heuristics and biases) create intuitive, fast, and straightforward responses to investment valuation assumptions (IVA) forecasts, thus following the principles of Kahneman's System 1 (2017). These cognitive mechanisms are often used when the investment valuation assumptions (IVA) are not supported by research, are expensive to get, or do not have a good relationship with forecasts for future findings. Milli, Lieder and Griffiths (2021) found a plausible range of conditions where it is better to be equipped with a fast System 1 than a slow System 2. False cognitive are seen when failures in heuristic shortcuts lead to lousy investment valuation assumptions (IVA). According Stolwijk and Vis (2020) oftentimes, heuristics are useful, but they may also lead to systematic biases that can be detrimental for decision making in a representative democracy. Santos and Cunha (2015) investigated 106 Public Offering of Shares valuation reports, showing false cognition affecting the investment findings.

This research was carried out only once. And searched the cognition influence on valuation and decision of investments. The research suggests that the body of knowledge in the current literature needs to include new cognitive principles in investment valuations and decisions, as shown in Table 1.

Table 1 *Research gaps*

Research gaps
influence of cognition on investment valuations and decisions
profit/loos valuation (EV) caused by using cognitive shortcuts
Hybrid Models (rational and cognitive) to investment valuation and decision

Source: the Author

Table 1 shows the Research Gap. As will be seen in section 1.8. the research objective was to close these gaps until presenting a Hybrid Conceptual Models (rational and cognitive) to support investment valuations and decisions. It should be highlighting the findings on the effects of mental shortcuts in the investments that will be presented in Chapters Four and Five of the thesis. These findings can fill the gaps in the literature observed. As an example, the Case Study of Chapter Four will reveal how cognitive failures could lead to wrong investment decisions. In the next section, the research assumptions are disclosed.

1.5. Research Assumptions

The development of the research question and the conduct of the research were based on the following premises: (i) Utility stands the satisfaction or finance findings to an economic agent, that makes it possible to explain the behavior finding from the investment decision made (Bernoulli, 1713, Neumann and Morgenstern, 1944). (ii) The investment value (fairness opinion) should be related directly to future expectations of return, and inversely with discount rates, following Fisher (1930), Fama (1970), Markowitz (1952), Sharpe (1964), Lintner (1965), and Ross (1976). (iii) The investment valuation assumptions (IVA) forecast are, at least in part, define by mental shortcuts, subject to the effects of cognitive failures, following Simon (1946, 1955, 1957, and 1966), Tversky and Kahneman (1971, 1973, 1974, 1979, and 1986), and Kahneman (1979).

1.6. Research Questions

This section compiles three subsections: section 1.6.1. Research Question One; section 1.6.2. Research Question Two. Each research question is, therefore, followed by a Justification rooted in the existing epistemology on the subject under review.

1.6.1. Research Question 1

How do heuristics and biases work in investment valuation and decision?

1.6.1.1. Justification

The development of the research question and the conduct of the research were based on the following premises: (i) Utility stands for the satisfaction or finance findings to an economic agent that makes it possible to explain the behavior finding from the investment decision made (Bernoulli, 1713; Neumann and Morgenstern, 1944). (ii) The investment value (fairness opinion) should be related directly to future expectations of return and inversely to discount rates, following Fisher (1930), Fama (1970), Markowitz (1952), Sharpe (1964), Lintner (1965), and Ross (1976). (iii) The investment valuation assumptions (IVA) forecast are at least in part defined by mental shortcuts, subject to the effects of cognitive failures, following Simon (1946, 1955, 1957, and 1966), Tversky and Kahneman (1971, 1973, 1974, 1979, and 1986), and Kahneman (1979).

Our final answer to the Research Question is discussed in Chapter Four which pointed out an overprice in the buy-offer of 330 percent, caused by anchoring bias, making the sale transaction unfeasible of 'Hotel.' It should be highlight the 'Hotel's' valuation report among the case validation materials. In the scenario topic of this report, it can observe the effect of the anchoring bias on the forecast used investment valuation assumptions (IVA) forecasts exceptionally optimistic about justifying the overprice value. Thus, the single case study also revealed the effects of false cognitive shortcuts (heuristics and biases) on investment valuation assumptions (IVA) forecasts mistaken.

As discussed in further sections, the survey provides scholars, decision-makers, and practitioners with a new perspective on financial decisions influenced by mental shortcuts. In addition, the knowledge of the cognitive factors that influence valuations and decisions of investments revealed in Chapter Four provides support, foundations, and insights for building the Conceptual Model, as will present the Chapter Five.

1.6.2. Research Question Two

How to use heuristics and biases to improve investment valuation and decision?

1.6.1.2. Justification

The answer to Research Question Two is discussed in Chapters Five and Six. Based on the financial theories that consider use rational mathematical parameters to investment decision process, the investment valuation reports forecasts are influenced by mental shortcuts. And, the literature on investment valuation has many gaps in this regard. The previous studies lack a theoretical framework linking the cognitive Conceptual Models to investment valuation.

The research of the Chapter Five managed to address this issue to contribute to this literature body of knowledge. In it, the Delphi method will be used to create an agile investment valuation model adding cognitive elements to traditional ways of doing things. In the Delphi survey, N=11 experts in the field answered questions about how heuristics and cognitive biases affect investment valuation assumptions (IVA) forecasts.

Findings revealed a convergence of cognitive mechanisms in the definition of valuation assumptions (IVA) and solutions to minimize the effects of false cognition in investment decisions. Therefore, the research addressed this other issue to complement the literature body of knowledge.

A Doctoral Business Administration program has one of the main objectives to solve problems linked in the business high-level, including investment decisions. The Chapter Six presents a plan to implement the IVA Forecast model.

This research is justified by reporting how cognitive shortcuts influence investment valuation and investment decisions, having as a solution a Hybrid Conceptual Model (rational and cognitive) for investments valuation assumptions (IVA) forecasts, based both on literature and findings of the field studies carried out.

1.7. Research Objectives

The present research introduces the following general (subsection 1.7.1) and specific (subsection 1.7.2) objectives.

1.7.1. General Research Objectives

The general research objective is to contribute to reduce theoretical gaps exists in literature on investment valuations and decisions. Supported in behavioral economic theories filling, the work reveals the influence of mental shortcuts (heuristics and judgment biases) in investment valuations and decisions. The thesis also objective to present a Hybrid Conceptual Model that incorporates principles of cognition in investments valuation.

1.7.2. Specific Research Objectives

The thesis seeks answers to the two research questions (subsections 6.1. and 6.2). The specific objectives are detailed in topics 1.7.2.1. and 1.7.2.2. below.

1.7.2.1. Specific Objective One

As will be presented in the single case study of Chapter Four, when we understand "How do heuristics and biases work in investment valuation and decision", we can avoid serious errors in investment valuations and decisions. Whether in its theoretical foundations, or its links with investment decision making models, this understanding is the first specific objective of this thesis.

1.7.2.2. Specific Objective Two

The second specific research objective is proposing a Hybrid Conceptual Model, that incorporates smart cognitive mechanisms into traditional investment valuations, and that responds in an agile and reliable to the fair value of investment. By incorporating "traces" of smart cognitive capabilities in investment valuations and decisions, the Conceptual Model attempts answer by "How to use heuristics and biases to improve investment valuation and decision?".

1.8. Research Design

This study was designed to understand the influence of cognition in investment valuations and investment decisions. It was initially designed to investigate investments in the Brazilian business markets, where the author is located mainly, as a starting point. However, with the development of the research, other business environments may present similarities that should also be investigated.

Table 2 *Research's purpose*

Chapters	Purpose
Chapter Two	understand how the heuristics and biases of investment decisions work.
Chapter Four	points out how mental shortcuts of heuristics and biases are relevant to investment valuation and decision.
Chapter Five	suggests the basis a Conceptual Model to improve investment valuation.

Source: the Author

The qualitative research design was chosen for this DBA thesis consisting of three separate and connected approaches, present in Chapter Two, Four, and Five. Given the subjective nature of the phenomenon and the lack of previous literature on the subject. Primary raw data were collected, stored on digital media, and analyzed. The research's purpose is illustrated in the Table 2. The sum Chapters objectives, in turn, provide answers to the two research questions (see section 1.6.).

The Chapter Two comprises a theoretical review of the field literature on investment judgment, covering the traditional financial theories on investments and the principles of behavioral economics applied in decision-making processes. The survey findings suggest gaps in theories about the judgment of corporate investments, which can be filled.

The Chapter Four was designed as a single case study (Yin, 2018) in which data collection was carried out using a single buyer-seller negotiation transaction as the study sample. The proposal was to observe the effects of false cognitive linked anchoring biases on to the 'Hotel' buyer-seller negotiation. Key findings pointed out an overprice in the buy-offer of 330 percent, causing anchoring bias and severely interfering in the valuation and decision-sell processes of a 'Hotel.' Nevertheless, this methodological choice generated the opportunity to deepen the knowledge about the theme, providing a new perspective on financial decisions influenced by mental shortcuts. In addition, the case study's findings provided elementary clues for constructing the Hybrid Conceptual Model of investment valuation presented in Chapter Five of this thesis.

The objective of Chapter Five research was to present elements to develop an agile solution for investment valuations and decisions, which incorporates cognitive mechanisms

highlighted by experts. The Chapter Five comprises a qualitative methodology in which data collection took place from semi-structured questionnaires applied to N=11 experts in finance and decision-making, all with more than 15 years of experience. The questionnaires contained six questions on mental shortcuts influence the investments valuation assumptions (IVA) forecasts and six questions on how to avoid the effects of cognitive failures in the IVA Forecasts. A total of three rounds were held until the N=11 experts reached a consensus.

The findings revealed 15 cognitive mechanisms used for elaborating IVA Forecasts and 15 validation mechanisms of these first versions. In Chapter Six suggested a step-by-step deployment of the investment valuation assumptions model, named IVA Forecast. The Conceptual Model for defining IVA Forecasts in two steps: the first step is quick and intuitive, followed by a second, slow and rational, to validation of the IVA Forecasts found in the first step. The research design is summarized in Table 3 as follows:

Table 3. *Research design summary*

Chapter	Methodology	Approach	Philosophy	Time horizon
Two	Literature Review	Inductive	Interpretivism	Cross-Sectional
Four	Single Case Study	Inductive	Interpretivism	Cross-Sectional
Five	Delphi method	Inductive	Interpretivism	Cross-Sectional

Source: the Author

As show in Table 3. the Chapter Two proposes to investigate the field literature on cognition effect in investment valuation and decision. To do, it will present the economic and financial theories that support investment valuations and decisions. Then, the Chapter Two highlight the gaps perceived in the literature on cognition effect on investment valuation and decision, and seek to fill them with behavior economics theories. Highlight for Prospect Theory (Kahneman 1979). Therefore, structure scientific knowledge on the cognition influence in investment valuations and decisions, was a fundamental step in building this thesis.

The Literature Review on Finance (Markowitz 1952; Sharpe 1964; Lintner 1965, Fama 1970; Ross 1976), and Decisions-making processes (Simon 1946, 1955, 1957, and 1966; Tversky and Kahneman 1971, 1973, 1974, 1979, and 1986; and Kahneman, 1979), used

abductive approach. Their conclusions served a Case Study with on single unit of analysis (Yin, 2018), abductive approach, which pave the way for others researchs. As Delphi method (Linstone and Turoff, 1975; Okoli and Pawlowski, 2004; Bhattacharya, 2011; Winkler, Kuklinski; and Moser 2015; Yıldırım and Büyüköztürk, 2018; and Kaartemo and Nyström, 2021), with interpretive approach and applied in Chapter Five, according to this Table 3.

1.9. Chapters' Summaries

The Chapters summary Two, Three, Four, Five, Six and Seven they were organized into the following divisions: subsection 1.9.1. Chapter Two Summary; subsection 1.9.2. Chapter Three Summary; subsection 1.9.3. Chapter Four Summary; subsection 1.9.4. Chapter Five Summary; subsection 1.9.5. Chapter Six Summary; subsection 1.9.6. Chapter Seven Summary. The principals Chapters Summaries will be revisited in Chapter Seven, sections 7.2. In the subsection a follow, will see the Chapter Two summary is introduced.

1.9.1. Chapter Two Summary

The Chapter Two proposes to investigate the field literature on cognition effect in investment valuation and decision. To do, it will present the economic and financial theories that support investment valuations and decisions. Then, the Chapter Two highlight the gaps perceived in the literature on cognition effect on investment valuation and decision, and seek to fill them with behavior economics theories. Highlight for Prospect Theory (Kahneman 1979).

Therefore, structure scientific knowledge on the cognition influence in investment valuations and decisions, was a fundamental step in building this thesis. This was the contribution of Chapter Two.

Literature Review on Finance (Markowitz, 1952; Sharpe, 1964; Lintner 1965; Fama, 1970; Ross 1976), and Decisions-making processes (Simon 1946, 1955, 1957, and 1966; Tversky and Kahneman 1971, 1973, 1974, 1979; and 1986, and Kahneman, 1979), abductive approach. Case Study with on single unit of analysis (Yin, 2018), abductive approach. Delphi method (Linstone and Turoff; 1975, Okoli and Pawlowski; 2004, Bhattacharya, 2011; Winkler, Kuklinski and Moser, 2015; Yıldırım and Büyüköztürk, 2018; and Kaartemo and Nyström, 2021), interpretive approach.

1.9.2. Chapter Three Summary

Chapter Three presents the qualitative methodologies used in this Thesis, and motivation for choosing methods. The findings from the literature review in Chapter Two to define the research problem. The literature review also brought base to research findings of Yin's (2018) single case study of Chapter Four, as well as to structure the steps of Delphi Technique applied in Chapter Five.

1.9.3. Chapter Four Summary

In the social sciences, a case study is a type of research used to describe events over time. The research presented in Chapter Two (Yin, 2018) looked into a single case study involving financial decisions about Type I buyer-seller negotiation (Dias, 2020) between two parties and one negotiated issue. Key findings pointed out an overprice in the buy-offer, causing anchoring bias and severely interfering in the valuation and decision-sell processes of 'Hotel.' Therefore, an inductive, interpretive approach was adopted, combining multiple methods, including archival research, newspaper reports, and direct participation by of the author. The primary purpose of this survey was seeking new elements to construct a Hybrid Conceptual Model for investment valuation presented in Chapter Five. Finally, Chapter Four will be revisited in Chapter Three (see section 7.2.2).

1.9.4. Chapter Five Summary

Based on finds gained in Chapter Four, will be structure in Chapter Five initial Delphi survey. The questionnaire will be employed with N=11 experts in the field finance and decision make process. The finding of Chapter Five are used to construct the investment valuation IVA Forecasts Conceptual Model revealed in Chapter Six.

The research identified cognitive mechanisms that experts use to improve their investment valuations and decisions. These findings have led to the suggestion to two-stage processes that incorporate cognitive mechanisms into investment valuations.

The purpose of the research presented in Chapter Five is to complement the knowledge gained in the literature review of Chapter Two and case study of Chapter Four, and to

consolidate the study. The research aims to identify cognitive mechanisms experts use in decision-making processes and financial analysis and suggest ways to incorporate these findings into investment. The Hybrid Conceptual Model of investments valuation assumptions (IVA) forecasts presented in the Chapter Five of this thesis, suggests preparing investment valuation reports in two steps. Chapter Five will be revisited in Chapter Seven.

1.9.5. Chapter Six Summary

The Chapter Six presents the implantation of the IVA Forecast model in two stages, bringing application the knowledge gained in this research. The investment valuation assumptions (IVA) forecast model, incorporate the thesis findings on mental shortcuts and cognitive mechanisms applied on investment valuation.

The valuation Conceptual Model (IVA) used the principles revealed the answers of the N=11 experts to the Delphi survey questionnaires, to produce an investment fair value in steps: one (initial IVA), and two (to be validated).

1.9.6. Chapter Seven Summary

The Hybrid Conceptual Model of investments valuation assumptions (IVA) forecasts presented in the Chapter Six attempts to reduce effects of false cognition in fair value, and to incorporate cognitive intelligence in the investment valuation. The Chapter Six present also the implementation stages of the valuation reports model prepared in two stages - the first with investment valuation assumptions (IVA) forecasts faster and intuitive, followed by the second, slower and rational, making diligence of first IVA Forecasts.

The Chapter Six bringing application to the knowledge gained in this research, and will be revisited in Chapter Five. In the next section, the managerial contributions are disclosed.

1.10. Managerial Contributions

Some managerial contributions that this study provides to the corporate segment, encompass (i) Understanding the influence of mental shortcuts (heuristics and biases) on investment valuations and decisions, leading to (ii) Association between mental shortcuts and investment valuation assumptions (IVA) forecasts, (iii) Develop ways to measures the impact of false

cognition on investment valuations and decisions; (iv) Contribute with practical examples where the false cognitive caused losses to investments, avoiding future error; (v) Present conceptual investment valuation model, of fast and reliable execution, that incorporate mental shortcuts to improve investment decisions. Finally, according to Gioia and Pitre (1990), this work is classified as (i) incremental and (ii) practically useful, as depicted in the following Figure 1.

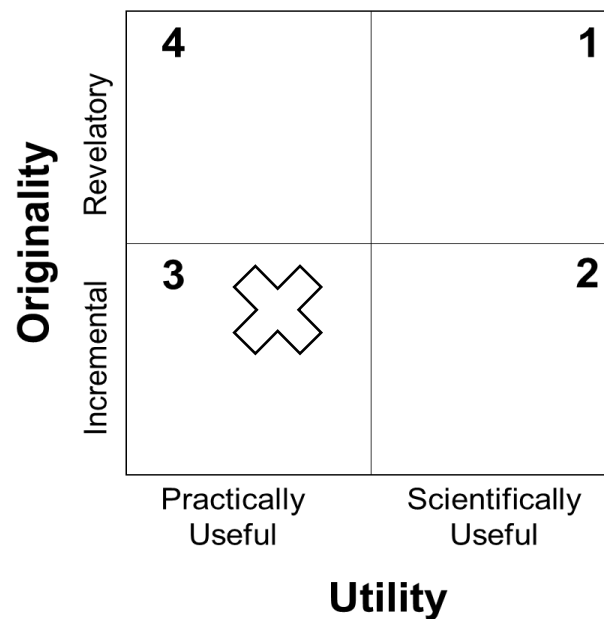


Figure 1 Gioia methodology

Source: Gioia, D. A., and Pitre, E. (1990).

Figure 1 shows that the main contributions this thesis: have (a) practically useful perspective in identifying of mental shortcuts effects investment valuations and decisions and; (b) are based on field literature on finance and decision-making processes, which provides incremental findings to other researches. It is highlight that the managerial contributions provided were supported by qualitative research using the Case study method and the Delphi Technique.

This research adds new empirical data on how financial analysts and decision makers are affected by their cognitions into a strategy perspective considering the environmental uncertainties contingency, not entirely addressed by the current academic literature. Finally, Managerial Contributions are revisited in Chapter Seven (see sections 7.3. and 7.4).

1.11. Research Limitations

This study is limited to (i) Investment Analysis and Decisions theories, (ii) in the Brazilian market environment, and (iii) Theories on cognitive influence in decisions (Tversky and Kahneman 1971, 1973, 1974, 1979, and 1986; Kahneman 1979). Other analyses and decisions in others countries' markets or types of influence in decisions are not part of the present research and should be investigated in separate studies. One must also consider the evidence used for the theoretical foundation of research and prioritize electronic searches of articles, most of them in the public domain, thus excluding other essential Sources of consultation, whether public or private.

Farther, the descriptive single case study method (Yin, 2018), applied in Chapter Four, limits your conclusions to the specific analyzed context. In this case study context, the alleged investment decision error of the case study had support restricted in financial Theory, thus disregarding other potentially relevant aspects to business, society, and others. Moreover, the research justified supposed financial error only due to Kahneman and Tversky's anchoring bias effect, disregarding other potentially relevant aspects.

The conclusions obtained in the Chapter Five are limited to applying the Delphi Technique, and other types of research are not part of your scope. The work is restricted to the raw data of the N=11 interviewees, and the findings are limited to topics of investment decision-making. Other topics are separate from the object of this work. The work is limited to the economic environment of Brazil, and the same research in other regions is separate from the object of this work.

The survey had support restricted in theories about heuristics and biases (Gigerenzer 1996 and 1997; Gigerenzer and Goldstein 1996; Kahneman and Tversky, 1974), decision-make (Kahneman's 2017), and finance and economics (Bernoulli, 1713; Fisher, 1930; Neumann and Morgenstern, 1944; Markovitz, 1952; Gordon and Shapiro, 1956; Sharpe, 1964; Fama, 1970; Cox and Ross, 1976; Markov, 1884; Merton, 1976; Pindyck, 1999; Schwartz and Smith 2000), disregarding other potentially relevant theoretical aspects.

The research does qualitative research with inductive logic. Studies using quantitative methods and deductive logic are not part of the scope of this work. The research limitations will be revisited in section 7.6.

1.12. Summary

Chapter One addressed the following divisions: section 1.1. Introduction; section 1.2. Topic Relevance; section 1.3. Research Motivation; section 1.4. Supporting Theories and Research Gap; section 1.5. Research Assumptions; section 1.6. Research Questions; section 1.7. Research Objectives; section 1.8. Research Design; section 1.9. Chapters' Summaries; section 1.10. Managerial Contributions; section 1.11. Research Limitations; and section 1.12. Summary, introducing the topic under investigation as well as motivation, objectives, limitations, and so on. Finally, the literature review will be presented in Chapter Two bellow.

Chapter 2

Literature Review: Risk Investment Decisions Theories

2.1. Introduction

Investments in projects are judged with rational mathematical parameters. Risky projects can build or destroy companies, careers and fortunes. Being able to fully rationalize the intelligence of the investment judgment seems unlikely. To a greater or lesser extent, cognition interferes with the judges' preference. But would it be possible to identify cognitive traits of the judges' intelligence when deciding on corporate investments?

Tura Zada and Şimsek (2022), commented that the traditional finance theories are insufficient to explain the behavior of individual investors, where behavioral finance theory takes into account the investor's psychological aspects. To Parmitasari, Syariati and Sumarlin (2022), reasonable emotional control has an impact on better decision making. According authors, the emotions could drive positive investor outcomes in the financial markets. To Pradeepkumar (2021), in the current capitalist world, several theoretical and conceptual studies have established that man is effortlessly irrational in nature at the time of making investment decisions. According Pradhan (2021), individuals are expected to be rational and follow the approach prescribed under different traditional finance theories while constructing portfolios. However, for the author, studies from different parts of the world show that individuals do not act rationally due to cognitive limitations and influence of emotions and feelings. According Charles and Kasilingam (2016), the human decision-making process is a complex phenomenon which is determined by many physical, environmental, and behavioral factors.

Simple or complex, decisions are part of life. Corporate investment decisions rely on Bernoulli's utility (1713), Neumann and Morgenstern's axioms (1944), Allais' risk aversion (1953), Markovitz' diversification (1952), Sharpe's asset pricing (1964), Fama's efficient markets (1970). By comparing expected and wanted returns, rational parameters evaluate the profitability and utility of the investment to determine whether the project is economically viable. Research published by Graham and Harvey (2001), with 392 CFOs points to the internal rate of return (IRR) and net present value (NPV) as the most widely used feasibility parameters in investment decisions.

However, determining the economic viability of a project does not mean certainty of its success, since the analyses and decision support parameters are based on forecasts, not promises, of cash flows. Traditional investment theory compensates for potential variability in projected cash flows by adding additional risk premiums run in the discount rates.

Even with robustness of the discounted cash flow method, it is common investment analysts presenting complementary risk studies in their reports. The studies simulate the impacts of changes in random variables of project. The goal is generated probability curves in decision parameters to contribute with new elements to support judgment.

And now, owners the probability curves from parameters, what to do: approve or reject the project? The idea is tempting, but can make the judgment more complex. Consider A and B projects (Table 4), both with NPVs of \$100, investment of \$1000, expected economic values (EV)* of \$1100.

Table 4 *Comparative analysis of projects*

Project	Investment	Economic Value (EV) – Scenario		
		Pessimistic	Expected*	Optimistic
A	\$1000	\$1050	\$1100	\$1150
B	\$1000	\$0	\$1100	\$2200

Source: the Author

With positive NPVs, A and B projects should be approved. The scenario analysis also reveals that A is always feasible. However, variations in B, can be loss all investment, bankruptcy, or, ruin the judge's career. Highlighted that optimistic scenario to B, brings great wealth to the investor and associated benefits. These facts bring in news elements to the judgment. High-risk investments projects have great ranges in probability curves of decision-making parameters. To consider evaluating such projects using only rational approval parameters, seems unlikely. It is moment that cognitive aspects of the judge defining the paths chosen.

To Wali, Ur Rehman and Zahid (2022) the behavioral finance theories are built on human psychology; which attempts to understand the effect of emotions and cognitive errors on individual investor behavior. According Wali, Ur Rehman and Zahid (2022), behavioral finance has been a developing area that observes human behavior in finance. Research of Pradeepkumar (2021), examined the significance of behavioral finance in filling the gap

between the actual decisions and influencing variables, by comparing the different heuristics of various types of investors. According to Parveen and Siddiqui (2018) investors are thought of as rational individuals, who carefully take all economic decisions every time. However, In stock prices analysis of 229 Pakistani companies, the authors observed irregularities in investor behavior amidst the 2008 financial crisis. Botelho, Mason and Harrison (2015) suggest that sophisticated models prove to be weak, for evaluating venture capital investments.

According to the Assumptions Parmitasari, Syariati and Sumarlin (2022), in the efficient market theory of Fama (1970), a market with information available to all investors would render them rational. However, financial behavior emerged because investors were sometimes ir-rational. Kahneman and Tversky (Kahneman and Tversky 1979), with their Prospect Theory, explained that the outcomes were not the only considerations of investors, but a variety of potential gains and losses also penetrated their minds. The interaction of return and risk could make investors irrational. This irrational behavior raised several real impacts, one of which is the emergence of bias in decision making. Some preferences were able to influence decisions, e.g., overconfidence, disposition effect, herding effect, mental accounting, confirmation bias, hindsight bias, house money effect, endowment effect, loss aversion, framing, home bias, self-attribution bias, conservatism bias, regret aversion, recency, anchoring, and representativeness. The list of mental shortcuts, or judgment heuristics and biases, is long and growing, and it is not the objective of this thesis to define or exhaust it. So, what would the purpose of the thesis be? Understand how mental shortcuts affect investments. Simon (1957) suggests replacing the principle of utility optimization with a more realistic view of human economic behavior, it thus provides elements for our initial assumptions (Table 5) about how cognitive intelligence can improve investments valuations and decisions.

Table 5 *List and description of the initial assumptions*

Assumptions	
A#1	Heuristics and biases affect investment valuations and decisions.
A#2	Heuristics and biases can improve investment valuations and decisions.

Source: the Author

To Raman and Kumar (2021), the investors are unknowingly under the influence of a bias while making an investment decision that can impact the quality of their choices. To

Charles and Kasilingam (2016), Behavioral finance incorporates psychological concepts in the financial discipline to understand the behavior of investors' investment decisions. Barberis e Thaler (2002) states that some financial phenomena can be plausibly understood using rational models. Damodaran (2012) states that even quantitative valuation models carry cognitive biases, as they start from subjective assumptions, defined and judged by analysts.

According to Box (1976), "all models are wrong" for simplifying reality (aphorism of parsimony). And because they are wrong, we must be alert to the flaws and improve them (selective concern). Ferreira (2016) comments although the undeniable usefulness of investment decision-making models, new studies point to non-rational elements which can significantly interfere when making decisions.

But, how can cognitive aspects be incorporated into investment appraisal models? According to Box (1978) it would be remarkable if any system existing in the real world could be represented exactly by any model. However, when models are skillfully constructed, they provide excellent approximations of reality and can contribute to judgment. As the title of Box's (1978) article says: "All models are wrong, but some are useful".

To Pradeepkumar (2021), the behavioral finance concentrates on how psychological effects can affect market outcomes. Thus, this concept is gaining more significance as it helps in elucidating the difference between the actual behavior and the expectations of a resourceful and rational investor behavior. According Raman and Kumar (2021), the growing discipline of behavioral finance has emphasized the various biases that play an essential role in an investor's investment decisions or behavior. According Stolwijk and Vis (2020) heuristics are cognitive shortcuts that facilitate judgements and decision making. Berg and Moss (2022) investigated the nature of the cognitive processes that underlie decision-making behavior, and found the effects of availability heuristics that pertain to the of information stored in memory. Heimer and Imas (2022) show that constraints can improve financial decision-making by disciplining behavioral biases, limited leverage traders' ability to borrow to open new positions.

In order to advance the construction of hybrid (rational and cognitive) models of investment appraisal, certain initial research questions about the cognitive capacity of decision makers need to be answered, as presented in Table 6. Heuristics is the science of fact-finding via cognitive decision-making processes. The objective of Chapter is to present principles based on the heuristics and biases judgment of Herbert Simon (1946, 1955, 1957, and 1966), Amos Tversky and Daniel Kahneman (1971, 1973, 1974, 1979 and 1986) to support judgment about

investments in corporate projects.

Table 6 *List and description of the initial research questions*

Research Questions (RQ)	
RQ#1	How do heuristics and biases work in investment valuation and decision?
RQ#2	How to use heuristics and biases to improve investment valuation and decision?

Source: the Author

This Chapter makes a theoretical review of the field literature on the judgment of corporate investments. The findings suggest their gaps in theories about the judgment of corporate investments, which can be filled.

The Chapter 2. Risk Investment Heuristics is divided into the following sections: 2.1. Chapter Introduction, 2.2. Risk Decisions, 2.3 Risk Investments Theories, 2.4. Cognition, Heuristics, Bias, and Judgment, 2.5. Methodology, 2.6. Critical Analysis, Discussion and Conclusions, 2.7. Research Limitations, and 2.8. Chapter Summary, as we will see below.

2.2. Risk Decisions

Bazerman and Moore (2012) they say "if you have no alternatives to choose from, you have no decision to make. But if you have alternatives, you have a decision to make." Risk is probability that outcomes get out from the expected. Risky decisions are those with uncertain outcomes.

The Expected Utility (EU) theory is the most used to support risk decisions. It is a normative model of descriptive behavioral choices. The EU's mathematical lottery process simulates expected findings (u) and probabilities (p) of decision made. The Expected Utility (EU) of an event can be defined by the formula 3, below.

$$EU = \sum_{i=1}^n p \times u(i) \quad (3)$$

In accordance with EU principles, people should rationally choose alternatives that maximize the axioms of completeness, transitivity, continuity and independence. The risk tolerance is the individual's degree of willingness to get involved with uncertain outcome of

decisions. Risk aversion is an individual's reluctance to get involved in decisions of uncertain outcome. Experiments by Allais (1953), Kahneman and Tversky (1979) prove that individuals are risk averse and violate the EU's axioms of rationality. According Constantinople, Piet and Brody (2019) the article "Prospect Theory: An Analysis of Decision under Risk" (Kahneman and Tversky, 1979) accounted for the ways in which humans deviate of Expected Utility (EU) normative. Kahneman (2003) suggests distinguishing between the extreme decision processes of types ONE and TWO, as shown in Table 7.

Table 7 *Decision-making kind*

kind ONE	kind TWO
Cognitive	Rational
Fast	Slow
Intuitive	Conscious
Effortless	Effort
Explicit	Implicit
Emotional	Logical

Source: adapted from Kahneman (2003)

Alba-Juez (2021) draw on Kahneman's (2011) description of mental life by the metaphor of two agents, System 1 and System 2, which respectively produce fast and slow thinking. We must also consider that investment decisions of the type TWO use valuation reports that can be expensive. Type ONE investment decisions are undeniably cheaper and faster. Bazerman (2012) suggests decision processes structured in six stages, as Figure 2. Bazerman (2012), however, cites Hammond, Keeney, and Raiffa (1999) who suggest other decision structures with more or less steps, that cover the same elements.



Figure 2 Stages of rational decision-making.
Source: adapted from Bazerman (2012)

2.3. Risk Investments Theories

According to Kahneman (2003), decisions of the type TWO are slow, conscious, systematic, explicit and logical. Risk investment decisions are based on projections of expected findings (u) and probabilities (p) of occurrence, EU elements.

Fama's (1970) efficient markets Assumption, the economic values (values) of assets (investments) should be related to future expectations of return. To the author, these values only change with new information that affects risks and outcomes expectations future. Following Fama's principles, decisions about investments must be related to utility produced for their owners - measured by value - and not by market prices. Adding now the postulates of Bernoulli (1713), Neumann and Morgenstern (1944) and Fama (1970), investment decisions should maximize the Expected Utility for the investor, where EU is the present value of the free cash flows (FCF_t) expected for investors over time, or simply, economic value (EV), as presented in formula 4.

$$EV = \sum \{FCF_t / (1+k)^t\} \quad (4)$$

The discounted cash flow (DCF) model is the most used in investment decisions. Deliberation No. 527 of the *Comissão de Valores Mobiliários - CVM* (2007), regulator of the Brazilian capital market, show that "the concept of value in use of an asset (EV) is based on the present value of estimated future cash flows." The term "estimated" means that the future cash flows are random variables, impossible to predict accurately. Thus, the fair value of an asset (EV) is associated with the cash generating capacity for investors and risk rates of investments.

DCF model regulates variability of projected flows by adding risk premiums to discount rates. Higher risks lead to higher rates, reducing the economic value (EV) and the interest in invest. To determine of risk-adjusted rates follows the theories of Markowitz portfolio (1952), Capital Asset Pricing Model (CAPM) by Sharpe (1964), Arbitrage Pricing Theory of (APM) by Ross (1976), between others. The most used model to determine cost of equity is the CAPM developed by Sharpe (1964) and Lintner (1965).

The CAPM Model incorporates returns as a function of risks incurred, adding rates to the gain obtained in risk-free investment alternatives. The model assumes the marginal volatility of returns determined by the asset's beta index (β_i) is the correct way to measure risk in investment. According to Brealey, Myers, and Allen (2007), the beta indicates the asset's degree of sensitivity to market fluctuations.

With the diffusion of the CAPM and globalization of capital markets, different approaches for including beta (β), have emerged. The approaches use statistical techniques of regression between returns of companies, sectors and markets. Sectoral beta, for example, assumes that firms in the same sector have similar risks, but may have different forms of financing and tax rates. The use of sectoral beta has been supported by academic researches. Koller, Goedhart and Wesseles (2015) who comment: to estimate beta, it is recommended to use sectorial assets rather than a specific company.

2.3.1 Risk Investments Selection

Following UE principles by Bernoulli (1713), Neumann and Morgenstern (1944), Markovitz diversification (1952), Allais risk aversion (1953), Kahneman and Tversky (1979), Sharpe's asset pricing (1964), and Fama's efficient markets (1970), the investments selection is made by analyzing mathematical parameters such as: payback time, internal rate of return (IRR), and net present value (NPV).

Ross, Westerfield, Jordan and Jaffe (2018) define payback as time required to recover an investment. In the more refined version, discounted payback, future cash flows are converted into present values using rate appropriate to the business risk. Payback is criticized for disregarding the cash flows after recover investment, reducing the interest of investors by longer-lived projects. However, the parameter is very useful in judgments about investments in sectors with a fast innovation, where projects usually have shorter life cycles.

According to Ross, Westerfield, Jordan and Jaffe (2018) the internal rate of return (IRR) defines expected profitability in each project for investor. When IRR exceeds the return desired by the investor (K rate), the project should be accepted. If the K rate exceeds IRR, the project should be rejected. If the IRR and K are equal rate, the investor is indifferent. By using all projected cash flows and clear approval criteria, IRR makes a more rational judgment of preference than payback. However, the IRR is not recommended to choose investments that excluding each other or with multiple return rates.

To Ross, Westerfield, Jordan and Jaffe (2018) the net present value (NPV) measures the added utility for investor. When the present value (EV) of free cash projected with uncertainties, outperforms the investment made today with certainty, we have added utility (NPV +) and project should be approved. If the expected utility by the added investment is

negative (NPV-), should it be rejected. If the utility added by the investment is zero (NPV = 0), the investor will be indifferent regarding the approval.

Determining the economic viability of project, however, does not mean certainty of its success. Cash flow models use projections, not promises, of future findings. This because the assumptions used in the projections are random variables, without defined route. Thus, risk analyzes simulate changes in random variables, causing the projected cash flows to evolve in many, or even infinite, routes. It should be highlight sensitivity analyzes, scenario analyzes and Monte Carlo simulation, as described in Table 8.

Table 8 *Kinds of risk analysis*

Analysis	Description	Purpose
Sensitivity	measures the impact on approval parameters after making changes to a random variable in the project.	identify which one, or which, random variables that have the greatest impact on project.
	measure impacts on approval parameters, after simulating pessimistic and optimistic conditions in the random variables of the project.	The study allows to estimate simulated future findings.
Monte Carlo Simulation	performs stochastic simulations simultaneously randomized in the key random variables of the project.	build interval distributions for future findings and project approval parameters.

Source: the Author

Of all the risk analyzes, Monte Carlo simulation is the most refined. The simulation excludes unrealistic scenarios, making analyzes and inferences for statistical measures of position, dispersion, and correlation of project's key random variables. The choice of the best stochastic process follows principles of Markov (1884), Black and Scholes (1973), Merton (1976), Brennan and Schwartz (1985), Macdonald and Siegel (1985 and 1986), Gibson and Schwartz (1990), Schwartz (1997), Pindyck (1999) and Schwartz and Smith (2000).

The evolution of computing today, allow risk analysis to be performed at low cost. Spreadsheets supported by statistical packages reduce the cost of implementing the models, which increases the popularity of the methods. Figure 3 presents the historical evolution of theories on investment decisions.

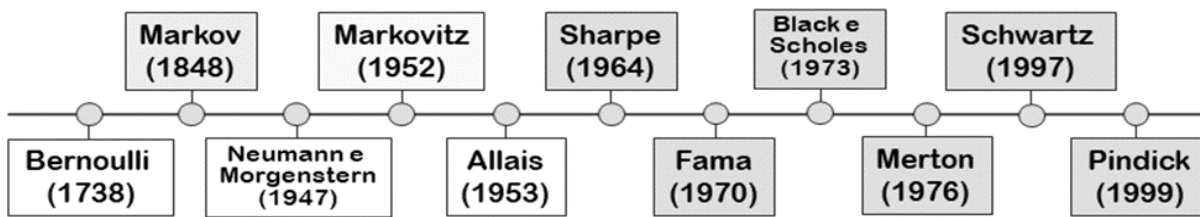


Figure 3 Investment decision theories

Source: the Author

2.3.2. Weaknesses of Risk Investment Theories

According to Brealey, Myers and Allen (2019) most companies use more than one method to make their investment decisions, however, NPV would be the preferred technique used.

Aligned with the principles of Bernoulli (1713), Neumann and Morgenstern (1944), Markovitz (1952) diversification, Sharpe (1964) and Fama (1970), investment decisions should prioritize the added utility (NPV) for investor. However, rational models can contradict the axioms of EU: completeness, transitivity, continuity, and independence. Many projects have low transitivity as they cannot be sold, for example. The project valuation may assume Gordon's principle of perpetuity (1956), while investor has finite life, which hurts the axiom of continuity. Thus, parameters such as expected return (IRR) and replacement time (payback) assist in the judgment and must be considered. Figure 3 shows the research on the popularity of investment decision parameters published by Graham and Harvey (2001). The survey of 392 CFOs of large companies in the United States and Canada revealed a preference for IRR in the investment judgment.

Neumann and Morgenstern (1944), Damodaran (2012) highlighted the fragility of the concept of rationality in investment decisions. According Pradhan (2021), behavioral biases causes individuals to make suboptimal decisions, like holding poorly diversified portfolios, excessive or minimal trading, and taking excessive or too little risk with their portfolios. According Parmitasari, Syariati and Sumarlin (2022), affection is a part of bounded rationality in decision making. To authors the emotions, have a variety of actual effects on humans. In investment activities, the negative role of emotions has been well documented as one of the biases of decision making, reflected in stock prices. Studies show that abrupt oscillations in stock prices are not always associated with new information received by the market, confronting

the rationality of economic agents, implicit in Fama (1970).

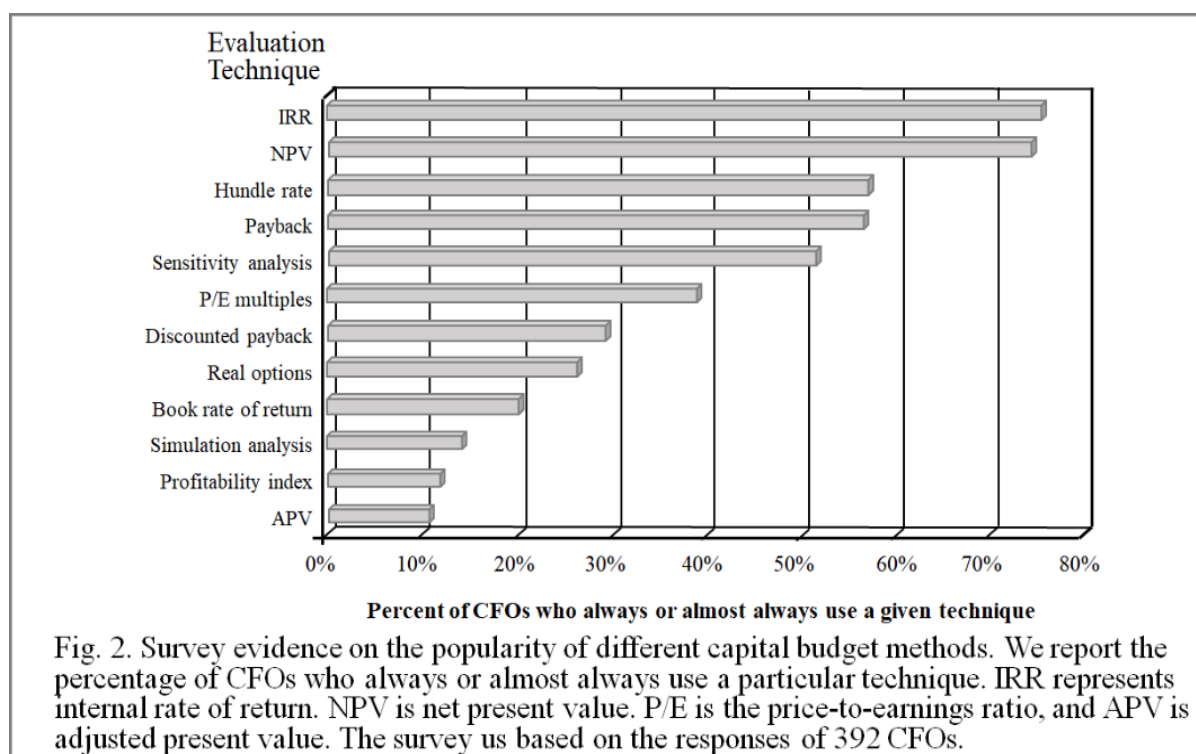


Figure 4 Popularity of Investment Decision Making Techniques

Source: Graham and Harvey (2001)

Charles and Kasilingam (2016) comment that many behavioral bias factors determine the investment behavior of investors, including the emotions, heuristics and personality factors. Ferreira (2016) cites the price swings in speculative bubbles, followed by asset price gaps in capital markets, that bring evidence to irrational patterns of investors. According Ferreira (2016), Meyer (2011) criticizes research on entrepreneurship centered on sophisticated data methods that ignore skills of the people involved in the evaluation. Mason, Botelho, and Harrison (2016) reveal that sophisticated models are flawed when evaluating the potential of venture capital investments, and there is evidence of the use of heuristic methodologies in the choices made by investors. Kahneman (2003) reveal research with experienced decision makers under pressure, that ignore viable alternatives, just not remembered.

According to Bazerman (2012), researches has discovered clever and sophisticated cognitive shortcuts that our brains use to make decision. But they also point to common mistakes that even brilliant people make on a regular basis. Olave-Rojas and Álvarez-Miranda

(2021) filled gaps on the designed investment strategies with framework relies in the heuristically solving. According Braik, Sheta, and Al-Hiary (2021) meta-heuristic search algorithms were successfully used to solve a variety of problems in engineering, science, business, and finance. Nobel Prize winners March and Simon (1958) suggest that individual judgment is limited by prescriptive models. According to the authors, the best alternative would be the use of hybrid descriptive models, combining the reasoning of the prescriptive models and the cognitive experiences obtained from previously lived events, as shown in Figure 5.

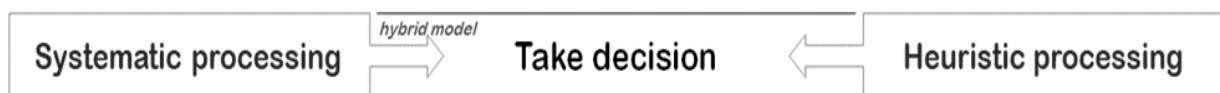


Figure 5 Taking decision with Hybrid Models

Source: the Author

Svoboda (2022), provides a detailed comprehensive overview of biases that can affect investors' behavior and risk perception, and a demonstration of risk understanding approaches. Among the findings, the author found that investor's demographic characteristics, such as age, marital status or education, have a direct impact on his behavior. Bazerman (2012) states that rational decision models are based on a set of assumptions that determine how a decision should be made, not how a decision IS made. But will to reveal the workings of cognitive shortcuts and repeatedly made vise errors help make better investments?

2.4. Cognition, Heuristics, Bias, and Judgment

It is hard to ignore the ability of certain individuals to choose good investments, even with minimal information. However, the vast investment literature focuses on rational decision parameters. Let's look at the criticism of payback, the most cognitive of the rational investment selection parameters. It is common for decision-makers to define a maximum time to recover the investment. But wouldn't it be legitimate to want to recover the investment until sometime? Cognitive processes develop our languages, thoughts and memories. Cognition is the psychological function of searching for knowledge in our senses, characteristics and experiences.

Research of Iram, Bilal and Ahmad (2023) show that overconfidence and availability

heuristics have a significant positive impact on investment decisions, while financial literacy plays an essential intervening role between the overconfidence heuristic, availability heuristic, and investment decision-making. Tura Zada and Şimsek (2022), reveal such as overconfidence, herd behavior, loss aversion, and uncertainty, affect investment decisions of individual investors. Using behavioral finance theory, the research reveals also these factors differ according to the demographic characteristics of investors. Examining emotion's role in illusion of control and overconfidence in investment decision making, Vidya, A. (2021) concluded that the early investors are more open to experience and eager to face risks. The study also found that the illusion of control exhibited a substantial significant effect of as much as 86.4% toward overconfidence, followed by a considerable increase in decision making.

Heuristics and biases are cognition-based simplifying rules used to support judgment and choice. Choices are the finding of mental processes of judgment and selection by preferences. Preferences are judgment criteria that support choices. Our judgment makes cognitive evaluation of elements that support the selection of the "best choice". Heuristics and biases are mental shortcuts traced by cognition, which structure our judgment, preferences and choices. False cognitive are caused by inconsistencies in mental databases, which can lead to inappropriate decisions. Vidya, A. (2021) made findings on bias mechanisms in constructing investment decision. The findings of study also point to the unique chain effects of biases affecting the decision-making process of nascent investors in the emerging market. Yuan and Zhan (2022), make recommendations on individual investors' behaviors face investment risks, considering the psychological bias affect perceptions adversely to most of them.

Intelligence is the capacity - logic, of abstraction, memorization, comprehension, self-knowledge, communication, learning, emotional control, planning - applied to solve-problems. Thus, intelligent judgments must be related to the decision maker's cognitive ability to discern. Following EU principles, heuristics and biases simulate outcomes and probability of a decision made, using data stored in cognition to do so. Kinatta, Kaawaase, Munene, Nkote, and Nkundabanyanga (2022), examines the relationship between investor cognitive bias, investor intuitive attributes and investment decision quality in commercial real estate in Uganda. The findings indicate that investor cognitive bias and investor intuitive attributes are positive and significant determinants of investment decision quality in commercial real estate. Stolwijk and Vis (2020) conduct a survey experiment with as main participants n=211 Dutch politicians. The findings suggest that the politicians use the representativeness heuristic when their judgements and decision making. According Linsi, L., and Schaffner, F. (2019), the degree to which

investment heuristics can bias aggregate capital flows depends on the levels of uncertainty and self-referentiality that structure the environments under which investment decisions are being made.

False cognitive occur when this mental shortcut does not make good simulations for probabilities (p) and findings (u), compromising the findings estimated by the EU. According Constantinople, Piet and Brody (2019), in a situation of risk, people exhibit cognitive probability distortion, noticing losses loom larger than gains. Research on cognition, heuristics, biases, and judgment has sparked academic interest with vast economic, social, and political applications. It should be highlight the research of Herbert Simon (1946, 1955, 1957, and 1966), Amos Tversky, and Daniel Kahneman (1971, 1973, 1974, 1979 and 1986).

In "Management Proverbs" published in 1946, Simon suggests that cognition-based decisions should maximize utility. By Simon's (1957) theory of bounded rationality, individuals are constrained in their ability to process information. We must also consider that opposite extremes, unlimited alternatives, can lead to confusion, or even remorse for the excess of options not chosen. The author points out that heuristics are the product of limited mental data processing abilities, which lead humans to construct simplified (limited) models of the world that expedite and enable acceptable choices.

Simon (1959) suggested that economic agents use balance and adaptation to optimize their objectives. According to the author, choices become more complex when the external environment is volatile and internal conflicts among multiple objectives affect the optimization of findings. Thus, understanding the internal conflicts and dynamic capacity of economic agents is fundamental to define the best choice.

Simon (1959) called the "gambler's fallacy" the cognitive flaw of thinking that taking 9 heads on a non-addicted coin, interferes with the 50% odds per side of the 10th flip. Absences, omissions, and distortions of data can reveal a perceived world quite different from the real world. Simon (1980) compared the ability of economic agents to adapt to the environment, to honeydew dripping by gravity into the center of the pot. The author concludes that bounded rationality is related to the forces of the external environment, internal characteristics, and the agent's ability to adapt.

Simon and Schaeffer (1989) revealed that experienced chess players create cognitive shortcuts. However, chess boards with randomly distributed pieces and no logical evolution of

moves, nullify the cognitive advantages of experienced chess players. Simon (1990) concluded that humans use heuristic shortcuts to make decisions and deal with the complexity of life. Simon (1993) suggests that human memory is organized like a well-indexed encyclopedia. Hints of perception are the indexed items, which give access to stored information about the perceived scene and the relevant actions.

Simon uses the term satisficing to synthesize the effect of bounded rationality. Satisficing replaces the rational concept of maximization, with the subjective and imprecise idea of acceptable choices. According to Simon (1996) "when people do not know how to optimize, they may well satisfy themselves by finding a good solution." Simon and Baumol (2004) point out that: i) satisficing can lead to choices different from those directed by the decision maker's experiences; ii) satisficing can reduce transaction costs; and iii) limited information can bring imperfections in the analysis of alternatives.

According to Sbicca (2014) the bounded rationality proposed by Simon, characterizes the way decisions are made by humans. People do not try to understand the world as an integral system, but have treatable partial models and identify recurrent patterns. The People don't take into account all the available information. They tend to focus on what concerns them rather in contradictory information, selecting what may be relevant, reducing information overload. Herbert Simon's pioneering research on decision making in organizations was a major reason why Simon was awarded the Nobel Prize in Economics in 1978.

Aligned with the postulates of Bernoulli (1713), Neumann and Morgenstern (1944), authors Tversky and Kahneman (1973) indicate that cognitive decisions are based on EU principles. Using data stored in the decision maker's mind, the judgment heuristics define expected utility (EU) by simulating the probabilities (p) and the findings (u) for the available choices. The use of EU is the main convergence between rational and cognitive decision processes. Using data stored in the mind, reducing time and costs of making choices, differentiates heuristics from the decisions of the type TWO.

Allais (1953) proves risk aversion, violating basic EU axioms. In Prospect Theory, Kahneman and Tversky (1979), highlight the evolution of the graphical curves of values on the X axis and utility on the Y axis. The concave shape of the loss quadrant and convex shape of the gain quadrant reinforces that the investor's loss aversion is greater than gain appreciation. This hurts the EU axioms of transitivity and substitutability.

In "*Judgment under Uncertainty: heuristics and biases*", Tversky and Kahneman (1974) postulate that individuals use sophisticated cognitive simplifying strategies called judgment heuristics. However, the authors point out that "in general, these heuristics are entirely useful, but sometimes they lead to serious and systematic errors" by mistaken cognitive biases. According to Kahneman and Tversky's "law of small numbers" (1971) the objective probability of a small data set may not be the same as the subjective probability of the population from which we make inferences. Thus, wrong decisions can be made because they are based on small and abnormal samples of data. This fact is commonplace in emerging investments, where long and reliable histories of data often do not exist. By the "law of small numbers" more available data in the mind has a greater influence on decisions than vaguely accessible data. This corroborates Simon's (1959) conclusions that absences, omissions, and distortions of data can reveal a world different from the real one.

Kahneman and (1971 and 1979) prove that even *experts* in statistical principles are susceptible to heuristics and biases. Kahneman and Tversky (1983) reveal cognitive flaws of biases that overestimate probabilities arising from *availability heuristics*. Tversky and Kahneman (1984) observed biases based on anchoring *heuristics* producing estimation failures for utility (u) due to previously anchored values.

Bateson (1954) and Goffman (1974) reveal principles of framing, as a cognitive device that cuts out angle of the fact or problem being addressed, making it more familiar, and therefore more real. Kahneman (2002) detected violations of cognitive rationality when the problem is poorly framed. The bias affects the decision-making process by predicting multiple analyses and actions as a solution to the same problem. The author further suggests that even experienced decision makers may not realize the influence of bias on their decisions.

Gigerenzer (1996), suggests that to understand how people reason in different circumstances, heuristic models valid and invalid predictions support judgment. Thaler (2000) Thaler (2000) affirms that our rational judgment is restricted by (1) attributing greater weight to present than future events and (2) conflict of own and third parties' interests. Goldstein and Gigerenzer (2002) consider heuristics as adaptive strategies that have evolved in conjunction with fundamental psychological mechanisms. Rubinstein (2006) suggests that it is almost impossible to publish an article ignoring biases. Enhanced by practice and academia, heuristics are cognitive methods of supporting problem judgment, objective... The Cartesian method of judgment, for example, has influence in all existing human sciences. Descartes (1637) suggests

separating judgments into four stages (See Table 9).

Table 9 *Cartesian Method*

Stages	Description
First	question knowledge, facts, opinions or established beliefs;
Second	divide the problems into smaller problems;
Third	ordering the problems, from the simplest to the most complicated, until the complete solution of the problems;
Fourth	list and review the conclusions.

Source: the Author

General Problem Solver by Simon and Newell (1972) suggests judgmental, rule-based method. Kahneman (2002) distinguishes extreme decision-making processes from System ONE and System TWO. While the heuristics and biases approach makes more intuitive choices, the more deliberative System TWO respects principles of bounded rationality. Figure 5 alludes to Bazerman's (2012) six stages of cognition-based judgments - heuristics and biases - in line with Kahneman's (2002) System One. The image highlights the proposed judgment stages and the decision-maker's susceptibility to the effects of false cognitions, as illustrated in Figure 6.



Figure 6 Heuristic stages and cognitive bias

Source: the Author

For Edwards (2007) people and organizations have many investment options available to them, where the main limitation, in most cases, is the lack of physical and financial resources to analyze and make the projects viable. This fact can serve as a stimulus to the use of cognitive decision-making processes. Attention should be paid to not making decisions that are too sub-optimal.

The Assumptions of Simon's bounded rationality and Kahneman and Tversky's Prospects, brought principles and foundations to studies on decision-making processes and

judgments. According to Shicca (2014), the concept of heuristics with rules that simplify decision making, inspires authors to conduct theoretical experiments on the judgment process of economic agents.

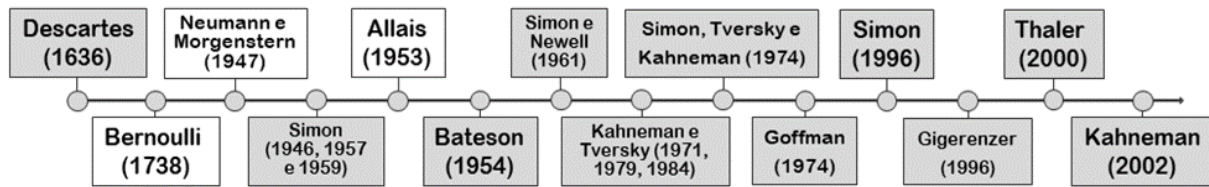


Figure 7 Theories about cognition, heuristics and biases

Source: the Author

2.4.1. Heuristics and Biases in Corporate Decisions

According Raheja and Dhiman (2020), know the behavioral biases would help understand the relationship between investment decision-making and risk tolerance of investors. According Wanlin, Zhang, and Jingwen (2021), mathematical model is first constructed to maximize a project's profit considering financing costs, while heuristics are designed to gain a feasible project schedule and its financial plan. To Braik, Sheta, and Al-Hiary (2021), the basic optimization characteristics, as well as solving several challenging engineering problems, follow is the dynamic behavior of capuchin monkeys.

For Bazerman (2012), judgment refers to the cognitive aspects of the decision-making process. Our cognitive process (data – information – knowledge) makes human judgment something so natural, that excellent decisions are made, without realizing it. Table 10 presents the cognitive process of data collection and classification, which underpins knowledge for the sake of judgment.

Table 10 *Cognitive Process*

Date	Information	Knowledge
simple observations	data processing	knowledge that allows intuition

Source: the Author

The cognition collects and classifies data into classes of associated events or with the same population group. Heuristics and biases interweave memories, preferences, and choices for the sake of judgment. However, false cognitive can disorganize the decision process. The scientific use of heuristics and judgment biases is justified by possible improvements in make-decision.

Judgmental heuristics and biases are mental shortcuts that simulate outcomes (u) and probabilities (p) for the choices disposed of at the decision moment, following EU postulates. Highlight is the term “decision moment” mentioned above, which follows the principles of Market Efficiency by Fama (1970). Making cognitive analogies to simulate acceptable choices findings is the goal of using judgmental heuristics. The false cognitive occur when extrapolations about judgment are based on imperfect, or deformed, samples of cognitive data.

Overconfidence in data with low integrity are the basis of judgment biases. For Bazerman (2012) "overconfidence can be the mother of all biases". Ahmad and Shah (2020) reveal how overconfidence influences investment decisions, investor behavior and the returns obtained. The authors also highlight the mediating aspects of risk perception and the moderating role of financial education. The findings suggest that overconfidence can impair the quality of investment decisions and performance, while financial education and risk perception can improve their quality. The following Table 11 shows the judgment heuristics and biases.

Table 11 *Judgment heuristics and biases*

Author	Heuristics and biases
Tversky and Kahneman	Representativeness
	Availability
	Anchoring
Kahneman	Framework

Source: the Author

2.4.1.1. Representativeness (Heuristics and Biases)

Deductions simulate findings or conclusions. Representativeness is the quality of a sample in describing properties of a population. Well representative samples, are data sets with the same

properties as the population. Well-representative samples make good deductions for outcomes (u) and probabilities (p) from a risk judgment. Dias, Avila, Campani and Maranhão (2019) reveal traces of representativeness heuristics and overconfidence biases in entrepreneurs, which can affect the finding of investments.

Following principles of the Cartesian method (1636), representativeness, heuristics and biases, are mental shortcuts that draw from cognitive samples deductions for judgment-relevant variables. By tying the "loose ends" of cognition, representative samples construct convincing deductions that are very useful when there are no formal models to support judgment. Bazerman (2012) state that it is common to see people using the representativeness heuristic to answer questions related to samples.

Corporate decision-makers are avid readers of reports, opinions, surveys, articles, magazines, newspapers, books, spreadsheets, etc., and sometimes books. By broadening their cognitive samples, decision-makers should expect to improve the quality of the inferences made in their judgments.

Illusions are errors of perception or understanding. Overconfidence in representativeness can lead to illusions incited by nebulous, incompatible, or invisible samples of cognitive data. Thus, the false cognitive associate with representativeness is born of illusions about the population. Kahneman and Tversky (1972) state that representativeness false cognitive arise when the cognitive sample does not reflect the behavior of the population.

When illusions are excluded, truth must be obtained. False cognitive association with representativeness can be avoided by judiciously cognitive sampling. The proposed suggests a balance between cognitive sample expansion efforts and Simon's (1957) bounded rationality.

2.4.1.2. Availability (Heuristics and Biases)

Reminiscence is the ability of memory to recall past events. Whether by intensity, emotion, proximity, time... cognitive data is more, or less available in memory. Cognitive records with greater availability, weigh more in the judgment, than less alive in memory. The findings of the study by Salman, Khan, Khan and Khan (2021) revealed a strong relationship between the availability heuristic and investment decision making.

Availability heuristics and biases are mental shortcuts built with memories and

forgetfulness. Access the data more "visible" in memory, it can be a good strategy to make judgments. The judge's cognition accumulates (or deletes) data in memory, the most vivid being known as selective data, which can improve or worsen the judgment. Klayman and There (1987) suggest that positive Assumptions emerge intuitively when using selective data to test cases where the variables of interest are not present.

Corporate decision-makers accumulate a lot of cognitive data in their memory. But it is hard to imagine them memorizing all that data. That is a good reason not to delete their messages. By preserving their query Sources from their auxiliary memories, corporate decision-makers reduce the adverse effects of availability biases.

False cognitive associated with availability biases discard relevant data from the judgment, only less vivid in memory. By over-confidence on selective data, generated by availability false cognitive make false beliefs about the judgment. Ahmed, Rasool, Saleem, Khan, Kanwal (2022) suggest use of artificial technology to guide investment decisions. Thus, false cognitive associates with availability cause amnesia, which affects the quality of the judgment. It follows that availability-supported judgments should pursue reminiscence: memory's ability to recall the past, rather than considering only selective memory data. It is concluded that judgments based on availability should check for new evidence in and out of cognition, rather stop the searches only in selective memory data.

2.4.1.3. Anchoring (Heuristics and Biases)

Anchoring, heuristics and biases, are mental shortcuts that extrapolate the properties of the primitive data to its population. The inductive ability of primitive data, follows the trend of valuing the first impression. Anchoring can provide excellent predictions in favor of judgment. Parveen and Siddiqui (2018) applied Logit regression to find the relationship between disposition effect, anchoring heuristic and overconfidence bias of investors in Pakistani stock market. According to the authors, anchoring heuristics are used by Pakistani investors in their financial decision making and help them to generate positive returns. According to Bazerman (2012), Epley and Gilovich (2006) suggest that anchoring to the first impression may be a good strategy until plausible adjustments occur.

Diligent is the virtue of being zealous. In the Brazilian Closed Complementary Pension Entities (EFPC) it is directors and counselors who judge the investments. Anxieties can make

bad judgments about investments. The Previc Guide to Best Investment Practices (2019) states that: the duty of due diligence requires directors and advisors to seek out the relevant information needed to support their decisions.

The false cognitive associate with anchoring are born of overconfidence in the first impression, which leads to the focalize of having a single, definitive opinion. Judgments based exclusively on primitive data, cover up evidence of data received later. According to Bazerman (2012), overconfidence can make deals impossible despite a positive bargaining range. Nooteboom's (2004) reveals preferences for illogical anchors, even without clear judgment variables. Flaws of anchoring are avoided with due diligence from first impressions received about targets in judgment. In Chapter Four, this thesis will use Anchoring principles to support and identify losses caused by false cognitive.

2.4.1.4. Framing (Heuristics and Biases)

Knowledge is blending the ability to know (cognizant) and what can be known (knowable). Frame is the dimensional or visual plane of a target. Target is point, object, objective. Problems are barriers to the target. Cognitive algorithms take problems like data entry, and return with acceptable choices (SIMON,1957).

But how do, mental shortcuts, heuristics and biases of framing solve problems? Incredible: by taking "Legos apart". Framing techniques cut problems (large frames) into frames that are smaller, clearer and easier to solve. Thus, they follow principles from Descartes (1637), Bateson (1954), Goffman (1974), and Kahneman (2002). Corporate decision-makers use framing by dividing planning (larger frames) into topics (smaller frames) ordering from knowledge about the target.

According to Kahneman (2002), "what you see is all there is." Thus, framings disregard events ignored by the judge, until the moment of the decision. Bad frameworks arise from overconfidence about what is known. The fallacy of planning, by Buehler, Griffin, Ros (1994), suggests a human tendency to underestimate time, efforts and obstacles to accomplish something.

Kahneman (2002), define this false cognition as framing effect, that create plan confused, mistaken, incorrect, and inadequate targets. The good framing of judgments is

associated with the decision maker's cognitive knowledge / ignorance, until the decision moment. Highlight is the term “decision moment”, that is crucial for framing (heuristics and biases).

Finally, this subsection shown in Figure 8. The image associates the influence of heuristics and biases, as well as their false cognitions, in decision making, as reported in subsections 2.4.1.1., 2.4.1.2., 2.4.1.3., and 2.4.1.4.



Figure 8 Judgment heuristics and biases

Source: the Author

2.5. Critical Analysis, Discussion and Conclusions

According to Raheja and Dhiman (2020), investors must understand the subjective part of their behavior and control their emotions when making decisions for their investments. Yuan and Zhan (2022), make recommendations on individual investors' behaviors face investment risks, considering the psychological bias affect perceptions adversely to most of them.

Simple or complex, corporate investments are valued by formal parameters that follow Bernoulli's EU (1713), Neumann and Morgenstern's axioms (1944), diversification by Markovitz (1952), Allais' risk aversion (1953), Gordon and Shapiro's perpetual horizon (1956), pricing of Sharpe's assets (1964) and efficient markets of Fame (1970), stochastic models by Markov (1884), Merton (1976), Pindyck (1999) and Schwartz and Smith (2000), Kahneman's (2003) type decision-making processes.

To a greater or lesser extent, corporate investments are judged by cognitive parameters that follow the postulates of Descartes (1636), Bernoulli's EU principles (1713), Neumann and

Morgenstern (1944), Simon's limited rationality (1946, 1957 and 1959), Allais' risk aversion (1953), Kahneman and Tversky's heuristics and biases (1971, 1979 and 1986) and Kahneman (2002), Kahneman's (2003) ONE-type decision-making processes. However, the specialized literature on investments focuses on rational parameters for the selection of financial theories, often discarding relevant aspects of cognitive intelligence.

Judgment heuristics and biases are intelligent mechanisms that use the cognitive process (data - information - knowledge) in support of judgment. However, cognitive false by:

1. deduction based on samples that do not reflect the behavior of the population (representativeness bias),
2. amnesia of cognitive data revealing to the judgment (availability bias),
3. induction focused by first impression (anchoring bias),
4. ignorance about the target that leads to poor framing (framing bias),

can lead to bias judgment and huge losses, for example, to investments.

The RATIONAL and COGNITIVE models to support judgment have in common the objectives of maximizing of the EU of Bernoulli (1713) and axioms Neumann and Morgenstern (1944), which for finance, corresponds to the current economic value (EV) of investments. To a greater or lesser extent, corporate decision makers combine the *data, processes, principles, analysis, parameters of...* RATIONAL and COGNITIVE methods in favor of the choice of the best investments. Our belief is that the cognitive methods applied to investments are still poorly covered by the academy, justifying our efforts to improve them. According Ahmed, Rasool, Saleem, Khan, Kanwal (2022) the proper training and education to the investors is also an appropriate path to overcome these biases.

The literature review covered the main rational and cognitive theories on investment judgment in order to answer the two research questions (RQs). In application of the framing technique, Table 12 reveals the summary Table of questions (RQs) and answers (SQs) by class of heuristics and judgment bias. Ahmad (2020) provides empirical insights into the impact of heuristics and biases on the findings of short- and long-term investments. The findings suggest that the lack of confidence has negative influence at quality of investment decisions. Therefore, recognizing cognitive biases of judgment can lead to better investments.

Table 12 *Questions and answers*

REPRESENTATIVENESS (Heuristics and Biases)			
RQ#1	How do REPRESENTATIVENESS heuristics and biases work in investment valuation and decision?	SQ#1	using deductions based on cognitive samples to connect loose ends in investment valuation, but they can create illusory connections in judgmental choices.
RQ#2	How to improve investment REPRESENTATIVENESS heuristics?	SQ#3	use mental shortcuts to forecast investment valuation assumptions, and validate the assumptions later with sample expansion with due diligence.

Source: the Author

AVAILABILITY (Heuristics and Biases)			
RQ#1	How do AVAILABILITY heuristics and biases work in investment valuation and decision?	SQ#1	using selective data, such as of similar business, to connect loose ends about investment assumptions, but which can create false cognitive data through selective amnesia that ignores other important elements.
RQ#2	How to use AVAILABILITY heuristics and biases to improve investment valuation and decision?	SQ#2	use mental shortcuts to forecast investment valuation assumptions, and validate the assumptions later with sample expansion with due diligence.

Source: the Author

ANCHORING (Heuristics and Biases)			
RQ#1	How do ANCHORING heuristics and biases work in investment valuation and decision?	SQ#1	using inducing properties of data primitive to connect loose ends about investment, but which can lead investment valuations and decisions based only on primitive data, disregarding other evidence.
RQ#2	How to use ANCHORING heuristics and biases to improve investment valuation and decision?	SQ#2	use mental shortcuts to forecast investment valuation assumptions, and validate the assumptions later with sample expansion with due diligence.

Source: the Author

FRAMEWORK (Heuristics and Biases)			
RQ#1	How do FRAMEWORK heuristics and biases work in investment valuation and decision?	SQ#1	using the mental shortcuts to frame assumptions and get a fair value for the investment, but which can lead a bad investment by disregards facts for judgment.
RQ#2	How to use FRAMEWORK heuristics and biases to improve investment valuation and decision?	SQ#2	use mental shortcuts to forecast investment valuation assumptions, and validate the assumptions later with sample expansion with due diligence.

Source: the Author

The objective of thesis is to find answers to the two research questions (Table 6) this work, thus allowing the understanding of the effects of mental shortcuts (heuristics and biases) in the evaluation and decision of investments, as well as, the contribution to construction of hybrids models (rational and cognitive) to improve such valuations and decisions. In subtopics 2.5.1. Kahneman's System 2: Rational Investment Decisions, 2.5.2. Kahneman's System 1: Cognitive Investment Valuation and Decisions and 2.5.3. Kahneman's Systems and Investment Valuation Assumptions (IVA) Forecasts, it will be present the critical analysis and conclusions

used how support theoretical for answer the research questions.

2.5.1. Kahneman's System 2: Rational Investment Valuation Models

Rational investment decisions follow principles of Bernoulli's utility (1713), Theory of interest Fisher (1930), Neumann and Morgenstern's axioms (1944), Markovitz's diversification (1952), Gordon and Shapiro's endless horizon (1956), Sharpe's asset pricing (1964), Fama's efficient markets (1970), Arbitrage Pricing Theory of (APM) by Cox and Ross (1976), stochastic models by Markov (1884), Merton (1976), Pindyck (1999), Schwartz and Smith (2000), and System 2 decision-make of Kahneman (2017).

The discounted cash flow (DCF) method is the most used in investment decisions. Following financial theory principles, investments should maximize Expected Utility (E.U.) for the investor, and its value (fairness opinion) is rationally defined by the discounted cash flow method. Therefore, the investment value, and fairness opinion, keep the relationship to projected free cash flows (FCF) and discount rates (k), as illustrated:

$$\text{Fairness Opinion} = \sum \{FCF_t / (1+k)^t\}$$

Thus, the companies' value fairness opinion is associated with the cash-generating capacity for investors and risk rates of investments. Deliberation No. 527 of the Brazilian Comissão de Valores Mobiliários¹ CVM (2007) shows that "the concept of value in use of an asset is based on the present value of estimated future cash flows" (p. 29). Thus, the fairness opinion can be obtained by discounted free cash flows at the risk-adjusted cost of capital.

The determined risk-adjusted rates (k) follow the theories of Markowitz portfolio (1952), Capital Asset Pricing Model (CAPM) by Sharpe (1964), and Arbitrage Pricing Theory of (APM) by Cox and Ross (1976), among others. The greater the variability of expected free cash flows (FCF), the higher the discount rates and the lower the fairness value. Since free cash flows are forecasts, not promises, of future findings, it is common to see analysts carry out a complementary risk assessment, such as sensitivity and scenario analyses and Monte Carlo simulation. To Li and Feng (2021), risk stochastic assessment are become prevalent in financial reporting due to increasingly sophisticated regulatory requirements.

¹ The equivalent to the US Securities and Exchange Commission (SEC)

The projection of free cash flows to fairness opinion valuation follows a rational, slow, conscious, effort, implicit and logical process in line with Kahneman's System 2 (2017). There are forms to projecting cash flows to obtain a company value fairness opinion. Highlights to methods: discounted dividend, free cash flow to equity (FCFE), and free cash flow to firm (FCFF) method. In the 'Hotel' case, fairness opinion was determined by the FCFF nominal BRL, using as the discount rate (k), the weighted average cost of capital (WACC) in current BRL, as the model shown in Figure 9, as follows:

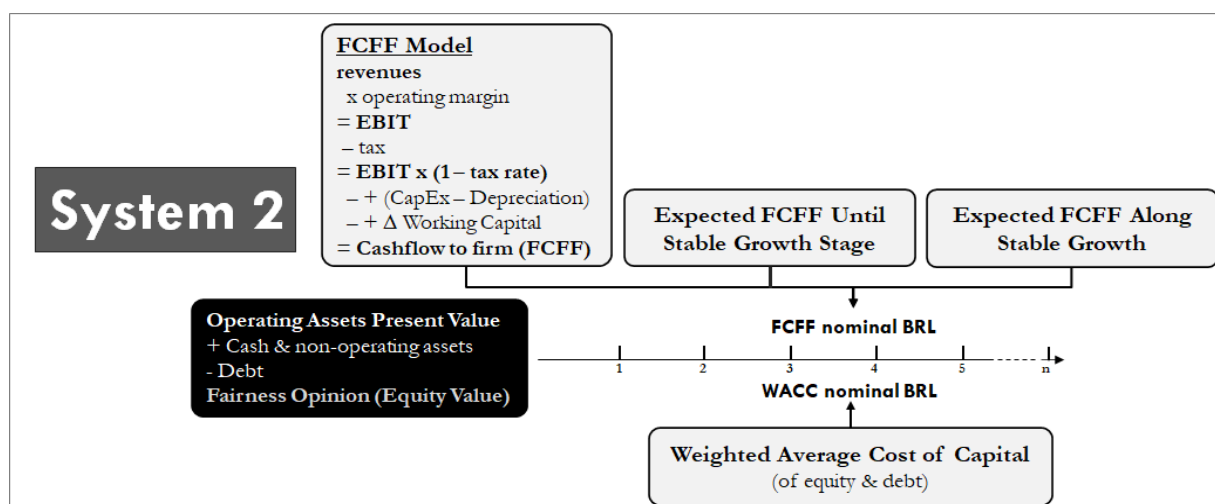


Figure 9 Free cash flow to firm (FCFF) model

Source: adapted from Damodaran (2019)

Figure 9 shows a fairness opinion finding from a slow and rationalized process, following Kahneman's System 2 (2017). However, Neumann and Morgenstern (1944) and Damodaran (2012) highlighted the fragility of the concept of rationality in investment decisions. According Alba-Juez (2021), research in psychology suggests that the 'intuitive' System 1 is frequently more influential than the 'rational' System 2. The author further states that research in psychology suggests that System 1 is the secret author of many of human beings' choices and judgments.

Pradeepkumar (2021), research the moderating effects, and technical anomalies based on different heuristic concepts like anchoring and adjustment, herd mentality, overconfidence, outcome bias and self-control bias. Ahmed, Rasool, Saleem, Khan, Kanwal (2022) examined relationships between behavioral biases and investment decisions, and concluded that risk is the main factor that discourages investment decisions. The authors also concluded that blue-chip stocks are used in risk elimination when making investment decisions. Constantinople,

Piet and Brody (2019) reinforce Prospect Theory effects consistent with ongoing learning. Research of authors shown rats exhibit trial history effects consistent with ongoing learning, and in a situation of risk the humans exhibit biases similar those animals, in particular in tasks with rewards. The Figure 10 highlights the recommendations for creating hybrid descriptive models for investment decisions, combining reasoning from prescriptive and cognitive models.

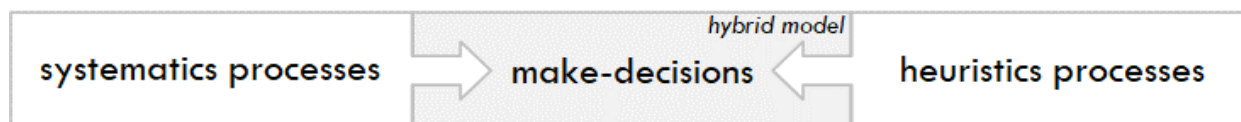


Figure 9 Investment decision-making process with Hybrid Models

Source: the Author

Following Figure 10, Morewedge and Kahneman (2010) use a dual-system view, in which System 1 generates impressions and tentative judgments, which may be accepted, blocked, or corrected by the controlled processes of System 2. Again, this highlights cognitive biases' effects on the company value fairness opinion definition.

2.5.2. Kahneman's System 1: Influence of Cognition on Investment Valuation and Decision

Firstly, Bazerman (2012) states that rational decision models are based on assumptions that determine how a decision 'should' be made, not how a decision 'is' made. Following expected utility (E.U.) principles, heuristics simulate outcomes to conclusions- make, using cognitive data to do so. Therefore, biases occur when cognition does not make good simulations of the E.U.

Secondly, to a greater or lesser degree, investments are judged by cognitive parameters that follow the postulates of Descartes (1844), Bernoulli's E.U. principles (1713), Neumann and Morgenstern (1944), Simon's limited rationality (1946 and 1955), Allais's paradox (1953), Prospect Theory, heuristics and cognitive biases of Kahneman and Tversky's (1971, 1973, 1979 and 1986) and System 1 Kahneman's (2017). However, the specialized investment literature focuses on rational parameters for selecting financial theories, often discarding relevant aspects of cognitive intelligence.

To Kahneman, Sinoby, and Sunstein (2022), Daniel Kahneman, and Amos Tversky, both Nobel Prize laureates, "exposed the workings of human judgment in a way that should

make every decision-maker stop and think. With the same relevance, it should be highlight Simon. Also, a Nobel Prize laureate, with his theoretical contributions to economics and human judgment. Simon's bounded rationality Assumptions and Kahneman's and Tversky Perspectives brought principles and foundations for studies on decision-making processes and judgments." To Sbicca (2014), heuristics are rules that simplify decision-making and have inspired authors to conduct theoretical experiments on economic agents' judgment process. Heuristics and biases have been widely studied in behavioral economics because of their relevance implications.

Then, Judgment heuristics are intelligent mechanisms that use the cognitive process (data - information - knowledge) in support of the judgment. However, cognitive false (cognitive biases) may lead to poor judgment. Table 13 presents Kahneman's and Tversky's heuristics and biases and their effects on decisions that can lead, in investments case, to losses due to judgment bias or bring excellent profitability with the good use of heuristics.

Table 1 *Heuristics and biases effects*

Heuristic and bias	Effects
Representativeness	deduction based on cognitive samples that do reflect (not reflect) the behavior of the population analyzed.
Availability	memories (forgetting's) of cognitive data livelier (less lively) that help (harm) the judgment.
Anchor	induction focused by first impression that can make good (bad) estimates how judgment support.

Source: adapted from Kahneman and Tversky (1971, 1973, 1979, and 1986)

It should be highlighted in Table 13 the Anchoring, heuristics and biases, that induction the decision-maker to value the primitive data because of the cognitive weight of the first impression. The Anchoring mental shortcuts will be the subject of discussion in the case study presented in Chapter Four of this thesis. To Kahneman, Sinoby and Sunstein (2022), "The extent to which extraneous factors or inappropriate heuristics may influence our judgments on the simplest matters is astonishing – whether these are personal preconceptions, confirmation bias, anchoring, framing and others. According Berg and Moss (2022), anchoring effects demonstrate that people use any available information sampled from memory as a reference for

making judgments of frequency. Kaustia, Alho, and Puttonen (2008) found a more significant anchoring effect on students than on experienced market professionals. Ahmad and Shah (2020) reveal how overconfidence influences investment decisions, investor behavior, and the returns obtained. The findings suggest that overconfidence can impair the quality of investment decisions and performance, while financial education and risk perception can improve their quality.

Fairness opinion valuations are affected by analysts' heuristics and biases, which can be increased or decrease valuation findings. For example, Figure 11 shows the heuristics and cognitive biases effects on the free cash flow to firm (FCFF) method.

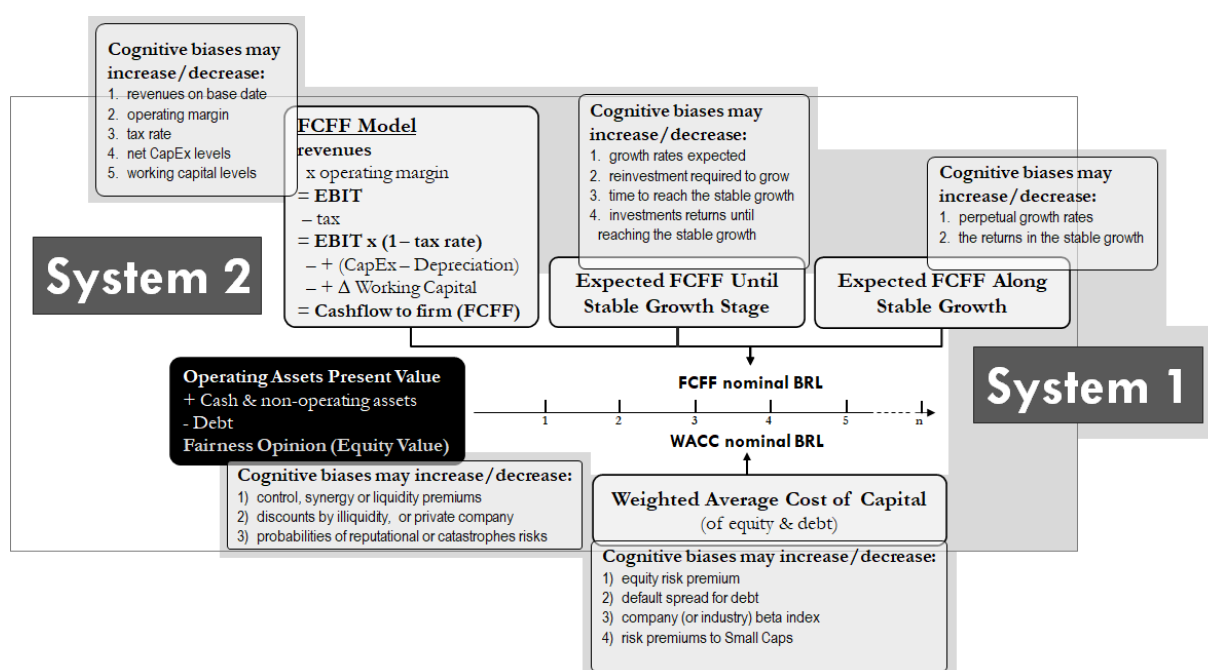


Figure 10 Heuristics and biases effects in fairness opinion valuation

Source: adapted from Damodaran (2019)

Figure 11 alludes to the influence of heuristics and cognitive biases (Kahneman's System 1) in defining the assumptions used in investment valuation (Kahneman's System 2) and, consequently, its effects on the finding of fairness opinions. Nooteboom (2003) reveals preferences for illogical anchors, even without clear judgment variables. However, Anchoring can provide excellent predictions in favor of judgment. Epley and Gilovich (2006) suggest that Anchoring to the first impression may be a good strategy until reasonable adjustments occur.

It will see in Chapter Four of the thesis, Anchored decisions cover up evidence of data

received later. In the 'Hotel' case, the anchor of the first offer interfered with the valuation and the sale decision, as addressed in the following topics. When extrapolating the primitive data from the first impression to the fairness opinion, the anchoring bias may make the decision maker ignore other relevant information received later, which can significantly modify the valuation findings.

2.5.3. Kahneman's Systems and Investment Valuation Assumptions (IVA) Forecasts

Even though investments are based on mathematical assumptions, their fair value is determined by how people think about them. According of Parmitasari, Syariati and Sumarlin (2022), economic actors chase their interests and, although they are defines as rational creatures, they are limited by biases in their decision making. Quantitative research of Wali, Ur Rehman and Zahid (2022), indicated that investors incorporate behavioral biases in their investment decision-making. According the authors, for investor intuitive attributes, confidence degree and loss aversion are positive and significant determinants of investment decision quality, whereas herding behavior is a negative and significant determinant of investment decision quality in commercial. The findings of study of Charles and Kasilingam (2016) reveal that heuristics bias factor act as a partial mediator of defining the relationship path between emotions and personality of investors.

As we saw in previous subtopic 3.2.1, the rational investment choices follow principles of Bernoulli's utility (1713), Theory of interest Fisher (1930), Neumann and Morgenstern's axioms (1944), Markovitz's diversification (1952), Gordon and Shapiro's endless horizon (1956), Sharpe's asset pricing (1964), Fama's efficient markets (1970), Arbitrage Pricing Theory of (APM) by Cox and Ross (1976), stochastic models by Markov (1884), Merton (1976), Pindyck (1999), Schwartz and Smith (2000). In investment decisions, the choices and rational processes are supported by valuation reports, which must present, in a balanced way, the business's economic potential and fair value (fairness opinion). Following financial theory principles, investments should maximize the Expected Utility (E.U.) for the investor, and its value (fairness opinion) is rationally defined by the discounted cash flow method. So, the investment value (fairness opinion) keeps the relationship to projected free cash flows (FCF) and discount rates (k), as illustrated in formula 5, bellow:

$$\text{Fairness Opinion} = \sum \{FCF_t / (1+k)^t\} \quad (5)$$

The discounted cash flow (DCF) method is the most used in investment decisions. However, the fairness opinion value is based on the investment valuation assumptions (IVA) forecast, which is not confident of future findings for projected cash flows. To Cunha, Martins, and Neto (2012), valuation reports are based on subjective views about the enterprise (IVA) that constitute an approximation of reality, incorporating a certain margin of error. Investment valuation assumptions (IVA) forecast used in the DCF method is defined in rational, slow, and complex processes, in line with the principles of Kahneman's System 2 (2017). According Alba-Juez (2021) Kahneman's two cognitive systems (System 1 and System 2 respectively) may affect our pragmatic decisions and judgements.

In investments, however, heuristics and biases, create intuitive, fast, and straight forward responses to the valuation assumptions (IVA) definition, following the principles of Kahneman's System 1 (2017). Alba-Juez (2021) suggest that the capabilities of System 1 include mental, linguistic and socio-pragmatic activities. To Braik, Sheta, and Al-Hiary (2021), meta-heuristic algorithms share common features since they are population-based approaches that use a set of tuning parameters to evolve new solutions based on the natural behavior of creatures. Iram, Bilal and Ahmad (2023) investigated the link between heuristic behavioral factors and the investment selection of women entrepreneurs, and conclude argue that financial literacy is an efficient way to improve the decisions. According Linsi, L., and Schaffner, F. (2019), several recent publications have argued that the use of heuristics by financial investors can distort global capital flows, but scholars have paid little attention to the scope conditions that determine when heuristics become influential (and when they don't).

According Wanlin, Zhang, and Jingwen (2021), few studies have proposed heuristic methods to deal the financed-based problem. To the authors the heuristics can devise or update schedules and the corresponding cash flow and resource-demand profiles, helping practitioners achieve expected profits and implement project control. In investment valuation, the cognitive mechanisms are most often used when making valuation assumptions (IVA): Investment valuation assumptions (IVA) forecast used in the DCF method is defined in rational, slow, and complex processes, in line with the principles of Kahneman's System 2 (2017). However, heuristics and investment biases create intuitive, fast, and straightforward responses to the valuation assumptions (IVA) definition, following the principles of Kahneman's System 1 (2017). Therefore, these cognitive mechanisms are most often used when making valuation assumptions (IVA):

1. are not supported by research (e.g., markets in the start-up phase).
2. are expensive (eg, acquisition of reports), or
3. do not have good relationship with expected findings (e.g., changes in the industry).

Milli, Lieder and Griffiths (2021) found a plausible range of conditions where it is better to be equipped with a fast System 1 than a slow System 2. False cognitive are seen when failures in heuristic shortcuts lead to lousy investment valuation assumptions (IVA). Damodaran (2020) comments that all investment valuations are considered a priori-biased, carrying human biases. According Constantinople, Piet and Brody (2019) people exhibit probability distortion (they overweight events with low probabilities), loss aversion (losses loom larger than gains), and reference dependence (outcomes are evaluated as gains or losses relative to an internal reference point). Santos and Cunha (2015) investigated 106 Public Offering of Shares valuation reports, evidencing the false cognitive presence, mainly in the reports that evaluated the contracting companies themselves.

According Kinatta et al., (2022), few studies have focused on investor cognitive bias and investor intuitive attributes on investment decision quality. This work investigates the influence of cognitive biases and heuristics on investment decisions, to support a build the agile model for valuing investments. Three rounds of responses were performed until the final model. The findings revealed the presence of cognitive mechanisms in investment valuation assumptions (IVA) forecast and ways to minimize the effects of false cognitive in investment decisions. Findings also revealed a convergence of cognitive mechanisms in defining the valuation assumptions (IVA) and solutions to minimize effects of false cognitive in investment decisions.

The Delphi method applied in Chapter Five use recommendation of N=11 experts in investment valuation and decision-making, this paper proposes a theoretical model to improve IVA Forecasts besides reducing false cognitive. The survey is supported by rational financial decision theories, heuristics, and cognitive biases of Tversky and Kahneman (1971, 1973, 1974, 1979 e 1986), the Prospect Theory of Kahneman (1979), and Systems 1 and 2 of Kahneman (2017). However, other theoretical perspectives may convey incorrect understandings of the analysis and discussions. The IVA Forecast Conceptual Model add cognitive elements to traditional ways of doing things to help make investment decisions.

2.6. Summary

This literature review on risk investment decisions theories aimed to answer the two initial questions presented in Table 6, propose research lines for the thesis, and to define standardized criteria for the analysis and filtering of findings. To this end, Chapter Two presented sections 2.1. Introduction, 2.2. Risk Decisions, 2.3 Risk Investments Theories, 2.4. Cognition, Heuristics, Bias, and Judgment, 2.5. Critical Analysis, Discussion and Conclusions, and 2.6. Summary. In the next Chapter it will be present the other research methodologies adopted in the thesis.

Chapter 3

Methodology

3.1. Introduction

The Chapter Two of the thesis used a theoretical literature review and analysis of concepts presented in relevant topics of 188 documents scientific and reports, mostly from Scopus and Google Scholar databases, on the themes behavior finance, decision-make process, risk decisions, investments, cognition, heuristics and biases. It is, therefore, conceptual research, which seeks, through the theoretical framework of rational and cognitive decision-making processes, understand and improve the judgment of corporate investments.

The literature compilation, brought together studies of the same nature carried out in different knowledge and published in scientific journals, normally linked to business management. The articles were chosen and classified according to their chronology and relevance. The objectives are the following:

- (a) to answer the two initial research questions (Table 6)
- (b) to propose research lines for this thesis,
- (c) to define standardized criteria for the analysis and filtering of findings.

The Chapter Two findings serve basis for the search for evidence the presence of mental shortcuts (heuristics and biases) in investment valuation and decision. In Chapter Four will see scientific analysis of the 'Hotel' buyer-seller negotiation, anchored in the offer above 330 percent over fair value. It should be highlight findings on the influence of heuristics and biases of Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986, on the definitions of the Six investment valuation assumptions (IVA) forecast of Free Cash Flow to Firm model.

The Chapter Four findings, in turn, serve as the basis for the construction of the questionnaire applied in the Delphi research presented in Chapter Five. In this Chapter it will be will present the subtopics 3.2. Case Study Methodology; 3.3. Delphi Method; 3.4. Analyze and Process Findings, Leading to Final Conceptual Model, and 3.5. Summary.

3.2. Case Study Methodology

The case study takes a comprehensive approach to the research object within a certain context with the aim of answering explanatory questions starting with “how?”, or understanding questions starting with “why?” (Yin, 2018), which are also common to experimental methods. As an example, we have the research questions (RQ) presented in Table 6 of this thesis, seeking clarification on “How do heuristics and biases work in investment valuation and decision?” and “How to use heuristics and biases to improve investment valuation and decision?”

It should be highlight that 'Hotel' buyer-seller negotiation case study had the direct participation of the author. This is common in experimental methods how in case study, scientific experiment which is usually carried out in a laboratory context, consists of observing a phenomenon under conditions that the investigator can control. It uses propositions to conduct data capture (Yin 2018) through the development of a conceptual framework and the formulation of research questions, which are the basis of the case study. The methodology can encompass several research methods in the same study and combine quantitative and qualitative data (Yin 2018), including texts and documents, interviews, questionnaires, surveys, databases, archival records, direct observation and physical objects.

The case study design is the plan that guides the process of collection, analysis and interpretation of observations and that allows drawing conclusions about the causal relationships between the variables investigated and generalizing them to larger populations. Every good case study design incorporates a theory, which serves as the general plan for investigation, data search and interpretation. According to Yin (2018) the research design is the logical link between the collected data and the research questions, and must ensure that after the research is completed, the results obtained answer the research questions.

The first step in any investigation is the clear identification of the research questions, and in the case study method, the research questions are identified throughout the literature review process (Yin, 2018). In the present investigation, the researcher defined the main research question throughout the literature review process and its consistency was assessed after completing the document analysis.

The first step in any investigation is the clear identification of research questions, and in the case study method, research questions are identified throughout the literature review process (Yin, 2018). In the present investigation, the researcher defined the main research

question throughout the literature review process and its consistency was assessed after completing the document analysis. To Yin (2018), the research design, or case study planning, is constituted by the definition of:

1) Research Questions (RQ):

- RQ#1 How do heuristics and biases work in investment valuation and decision?
- RQ#2 How to use heuristics and biases to improve investment valuation and decision?

2) Assumptions (A):

- A#1 Heuristics and biases affect investment valuations and decisions.
- A#2 Heuristics and biases can improve investment valuations and decisions.

3) Unit of Analysis: the case analysis unit is the 'Hotel' buyer-seller negotiation, involving the parties: 'Consultant,' 'Seller' and 'Buyer' for this purpose (Yin 2018).

In subtopic 3.2.1. the design applied to the 'Hotel' buyer-seller negotiation single case study it will be present.

3.2.1. Single Case Study 'Hotel' Design

The descriptive single case study on a buyer-seller negotiation transaction, considered Prospect Theory on a 'Hotel' sale. Key findings pointed out an overprice in the buy-offer of 330 percent, causing anchoring bias, severely interfering in the valuation and decision sell processes of 'Hotel.' In order to understand how the mental shortcuts linked to Anchoring affected the valuation and decision to sell the 'Hotel', the present work uses existing and already applied theories and knowledge and replicates in different context (Yin, 2018).

The research investigated a single case study involving financial decisions about Type I buyer-seller negotiation (Dias, 2020) between two parties and one issue negotiated. The research design applied to single case study a 'Hotel' buyer-seller negotiation will be adopt an inductive, interpretive approach, combining multiple methods, including archival research and direct participation by of the author. The case analysis unit is the 'Hotel' buyer-seller negotiation, involving the parties: 'Consultant,' 'Seller' and 'Buyer' for this purpose (Yin 2018), using multiple Sources of evidence are used (Yin, 2018), it appears that, given the problem identified and the qualitative nature of the information required, the single case study is a good

option as the research method to be used in this study.

The 'Hotel' case study combines quantitative and qualitative data (Yin 2018), including texts and documents, surveys, databases, archival records, and direct observation. Thus, the purpose of research design was to guide the process of data collection, analysis, interpretation, and triangulation. The present investigation fulfills the four conditions defined by Yin (2018) that justify the researcher's choice of the case study method, specifically:

- 1) The phenomenon under analysis is contemporary;
- 2) The questions to be investigated are of the “how” type;
- 3) The researcher participated directly, acting as a financial analyst responsible for the 'Hotel' valuation, but had no control over the buyer-seller negotiation decision.
- 4) Various Sources of evidence are used (report, contracts, economic data and news reports).

The developed case study uses existing theories and knowledge to explain how errors in investment valuation and decision could have been avoided. Therefore, explanatory case studies represent theoretical and analytical generalizations, as opposed to the statistical generalizations typical of positivist research (Yin, 2018) that see reality as objective and as something that is independent of the researcher.

The case is limited to this unit of analysis in its economic, legal, tax, social, geographic, and behavioral restrictions. Other types of negotiation are not part of this work and should be studied separately. Furthermore, the research analyzes and conclusions are based on Prospect Theory. We consider this a significant restriction since other theoretical perspectives can bring controversies to analyzes and findings obtained.

Research suggests that knowing the heuristics, biases and your false cognitive can help make better decisions. The improvements in financial decisions justify understanding how the anchoring bias interfered with the 'Hotel' sale. The case brings real context that reflects anchoring bias interferences in financial decisions, besides parameters to measure the economic impact of these interferences. In the next section it will be present the findings and analysis obtained from the data collection stage, analyzed from the specific context of the Hotel buyer-seller negotiation. Kahneman, Sinoby, e Sunstein (2022) give relevance to framing the 'context' to show the presence and effects of biases.

3.3. Delphi Method

Developed by military personnel in the 1950s and improved by Linstone and Turoff (1975) use a structured and systematic approach (Linstone and Turoff, 1975; Okoli and Pawlowski, 2004; Winkler, Kuklinski and Moser, 2015; Yıldırım and Büyüköztürk, 2018; Kaartemo and Nyström, 2021). As a corporate decision analysis method, Delphi method was first developed by N. Dalkey and O. Helmer (1963) at the Rand Corporation. The Delphi is a method conceived to obtain the most reliable consensus of opinion within group-decision making exercises (N. Dalkey and O. Helmer, 1963). It has been also recommended for application in various domains, like industrial quality evaluation, investment decisions (J. Dong and H. Huo, 2017), amongst other examples. The characteristics that distinguish this method from other traditional qualitative methods are: anonymous responses, controlled feedback, and statistical group responses.

The Delphi method is particularly relevant when very little data is available in the literature, but experts have relevant and valid inputs about the focus of the research (Bhattacharya et al., 2011). In this case, an experts group will be more relevant and practical than an individual in overcoming or answering a complex problem (Winkler, Kuklinski, and Moser, 2015; Yıldırım and Büyüköztürk, 2018). In short, the author's approach is a existing modifications from the traditional Delphi (Linstone and Turoff, 1975) and can be described as an online Delphi method anonymous. Figure 12 represents the entire research methodology used by the authors for this specific research.

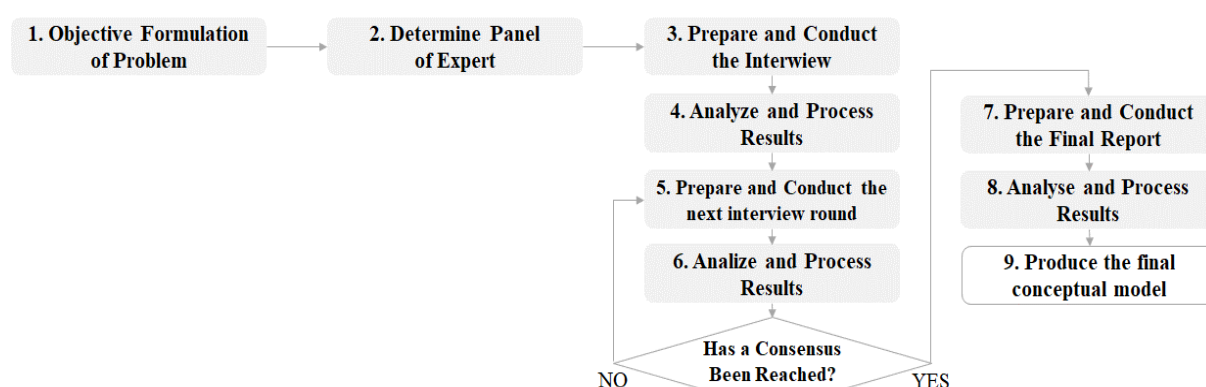


Figure 12 Delphi Technique - Research methodology process flow

Source: adapted from Linstone and Turoff, 1975

Considering the limited data on the cognitive influence mechanisms on investment valuation assumptions (IVA) definition, the authors focus on the Delphi method approach. The survey followed the principle of Linstone and Turoff (1975), Okoli and Pawlowski (2004), Bhattacharya (2011), Winkler, Kuklinski, and Moser (2015), and Yıldırım and Büyüköztürk (2018), Kaartemo and Nyström (2021). Next, we'll see the subtopics 3.3.1. Delphi Research Objectives, 3.3.2. Determine Panel of Expert, 3.3.3 Prepare and Conduct Expert Interviews (First Round), 3.3.4 Analyze and Process Findings (First Round), 3.3.5 Prepare and Conduct Expert Interviews (Second Round), 3.3.6 Analyze and Process Findings (Second Round), 3.3.7 Prepare and Conduct Expert Interviews (Third and Final Round), 3.3.8 Analyze and Process Findings (Third and Final Round), and 3.3.9. Analyze and Process Findings, Leading to Final Conceptual Model.

3.3.1. Delphi Research Objectives

Found assumptions to respond the research questions (Table 6), the objective of Delphi Technique applied in Chapter Five is to develop a Conceptual Model supported by experts' cognitive mechanisms (mental shortcuts) that improve investment valuation assumptions (IVA) forecast. As a restriction, the model should maintain valuation report delivery time from the finance analyst's point of view.

This objective was communicated to the participants. It should be noted that this goal is part of the doctoral thesis of one of the authors; this context was also communicated to the participants, aiming to understand: (i) Which cognitive mechanisms can improve the six investment valuation assumptions (IVA) forecasts? (ii) How to prevent false cognitive from distorting the six investment valuation assumptions (IVA) forecasts?

3.3.2. Determine Panel of Expert

Aiming to expand theoretical views on investments and reduce bias from a group of participants, the authors obtained candidates from different backgrounds. By doing so, the authors aimed to achieve a broad overview of the objective at hand and eliminate inherent bias increasing the study's internal validity (Linstone and Turoff, 1975). The author looked for three key characteristics in the candidates, criteria for choosing:

- 1) Minimum of ten years of experience delivering investment valuations report;
- 2) Minimum of ten years of academic experience in financial theories;
- 3) A minimum of ten years of academic decision-making experience

It should be highlight the candidate's profile with a high-level academic degree and extensive experience in consulting services. Having those characteristics in mind, the authors selected a total of 11 participants from different backgrounds, all based in Brazil and with at least 15 years of professional experience, as shown in Table 14:

Table 14 *Experts participating on the Delphi Study*

Expert Role	Academic Degree				#Σ
	MBA	MSc	DBA	Dr.	
<i>Financial analyst</i>	1	0	0	0	1
<i>Executive-level finance teachers</i>	0	1	0	0	1
<i>Financial analyst plus executive-level finance teachers</i>	0	4	0	2	6
<i>Academic-level decision-make professors</i>	0	1	1	1	3
total participants (#Σ)	1	6	1	3	11

Source: the Author

The experts brought desired diversity to the study, given your different roles and backgrounds. As a finding, all these experts were invited to participate in the Delphi study performed online between September 2022 and December 2022, with some sessions taking place over Zoom and others via phone.

3.3.3. Expert Interviews First Round

In topics 3.3.3.1. and 3.3.3.2. will be presented the prepare and conduct expert interviews, as well as the analyze and findings after first round of Delphi method.

3.3.3.1. Prepare and Conduct Expert Interviews (First Round)

In order to frame the cognitive mechanisms can be use to determine the six investment valuation assumptions (IVA) forecast of Free Cash Flow Model. The questionnaire made objective descriptions for:

- (a) the concept of fair value (fairness opinion),
- (b) the six IVA used forecast on Free Cash Flow to Firm (FCFF), and
- (c) Systems 1 and 2 (Kahneman, 2017) processes, applied in IVA Forecasts.

The dimensions were previously identified and collected from the traditional financial literature, decisions-making processes by System 1 and 2 of Kahneman (2017), Prospect Theory of Kahneman (1979), heuristics, and cognitive biases of Tversky and Kahneman (1971, 1973, 1974, 1979 e 1986).

The participants were then asked to identify cognitive mechanisms the used in the conducts, techniques, analyses, activities, practices, processes or events that aim to:

- 1. improve investment valuation assumptions (IVA) forecasts, and
- 2. prevent false cognitive from distorting their (IVA) forecasts.

Figure 13 shows the framework used in the interviews with the participants, allowing visualization of the proposed questionnaire:

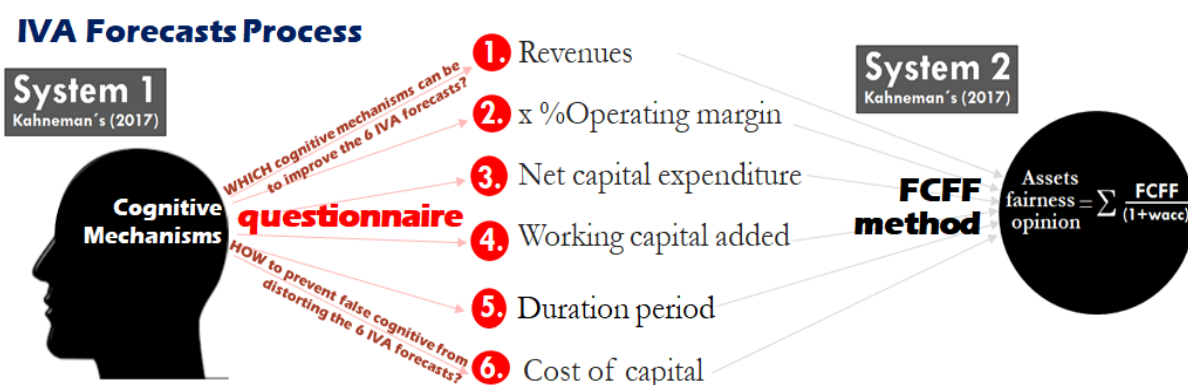


Figure 13 IVA Forecast process

Source: the Author

3.3.3.2. Analyze and Process Findings (First Round)

Once the inputs from all the participants were collected, proceeded data analyze and group by investment valuation assumptions (IVA) type. To ensure that the participants begin the next phase with same inputs, a brief description of each of those inputs (cognitive mechanisms) was presented.

3.3.4. Expert Interviews Second Round

In topics 3.3.4.1. and 3.3.4.2. will be presented the prepare and conduct expert interviews, as well as the final analyzes and findings of Delphi method.

3.3.4.1. Prepare and Conduct Expert Interviews (Second Round)

The questionnaire was sent for a second time to all the participants, but now adding the others contributions from expert, obtained in the first phase. In second phase, the questionnaire also asking the analyze and validate of each inputs - techniques, analyses, activities, practices, or processes based in mechanism cognitive – brought by other participants regarding its applicability and effectiveness on an investment valuation assumptions (IVA) definition. Thus, the participants were able to validate the input regarding its effectiveness, suggest and justification their additions.

3.3.4.2. Analyze and Process Findings (Second Round)

With all the second interviews (questionnaires) completed, were analyzed the findings and updated the framework. Finally, the recommendations of experts were grouped, sorting them into classes of investments valuations assumptions (IVA) and type of questions:

1. WHICH cognitive mechanisms can be to improve the 6 IVA Forecasts?
2. HOW to prevent false cognitive from distorting the 6 IVA Forecasts?

3.3.5. Third and Final of Round Expert Interviews

In topics 3.3.5.1. and 3.3.5.2. will be presented the prepare and conduct expert interviews, as well as the final analyzes and findings of Delphi method.

3.3.5.1. Prepare and Conduct Expert Interviews (Third and Final Round)

In final and third round, all the participants as individuals presented the questionnaire version evaluating, concluding, and highlighting essential cognitive mechanisms to investment valuation assumptions (IVA) definition, and prevent distortions caused by false cognitive. To this end, the same procedure as in the previous round was repeated.

3.3.5.2. Analyze and Process Findings (Third and Final Round)

Once all the third interview validations were complete and analyzed, findings were made and updated the answers framework. First, the expert's recommendations were classing in the six kind investments valuations assumptions (IVA), and grouped two answers types about HOW the cognitive mechanisms can:

1. improve the 6 IVA Forecasts.
2. prevent distortions by false cognitive in the 6 IVA Forecasts.

3.4. Analyze and Process Findings, Leading to Final Conceptual Model

It is worth highlighting that, as the Chapter Four research seeks answers to "HOW do heuristics and biases work in investment valuation and decision?", the Delphi Model applied in this Chapter investigates "HOW to use heuristics and biases to improve investment valuation and decision?"

The analysis of findings suggested a framework showcasing the techniques, analyses, activities, practices, or processes that the experts provided and agreed upon. This is the elementary Conceptual basis to can fulfil the objective of developing an investment valuation model incorporating cognitive mechanisms to:

1. improve the 6 IVA with, and
2. prevent false cognitive distortion on the 6 IVA.

Figure 14 summarizes the variation of the traditional Delphi Technique (Linstone and Turoff, 1975) applied. It should be highlight, on the left side, the use of theories that defined the problem and research questions. At the center is the application of the Delphi method to its stages. On the Right are the conclusions that give rise to the foundations to produce the final Conceptual Model.

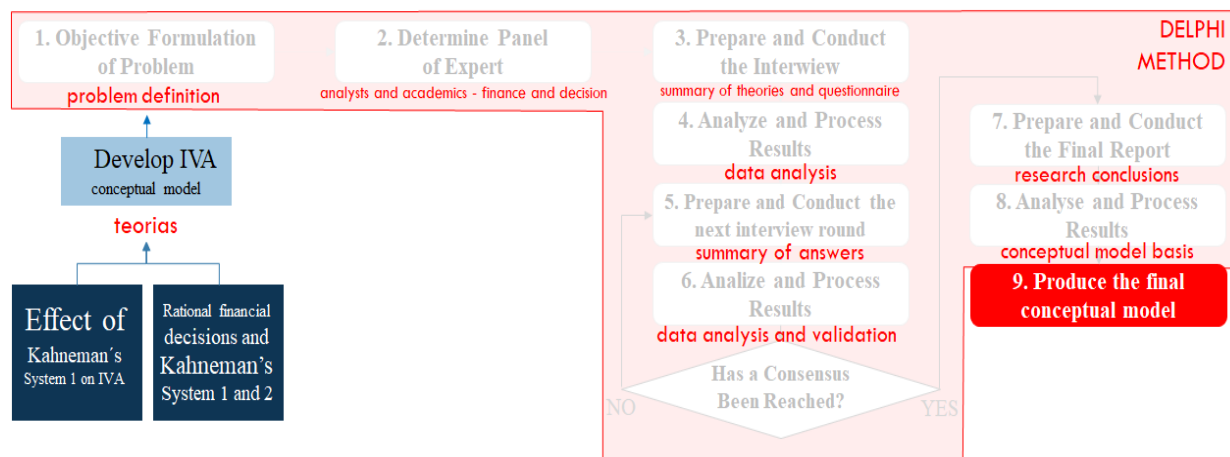


Figure 114 Delphi Technique - Research methodology process flow applied

Source: the Author

3.5. Chapter Three Summary

The Chapter Three presented the methodologies used in this thesis. The objective was to answer the two initial questions presented in Table 6, as well as, propose ways to improve investment valuation and decisions by build conceptual Hybrid Model (IVA Forecast) of investment valuation assumptions definition. To this end, the Chapter Three it will be present the section 3.2. Case Study Methodology; section 3.3. Delphi Method; 3.4. Analyze and Process Findings, Leading to Final Conceptual Model, and section 3.5. Summary. In Chapter Four it will be present the 'Hotel' buyer-seller negotiation case study, and Chapter Five the applied of Delphi Technique.

Chapter 4

Case Study

4.1. Introduction

Business negotiations, such as buyer-seller negotiations, have attracted scholars' attention over the past decades (Dias, M. et al., 2022). In 2007, the 'Consultant' advised the 'Hotel' sale process. The purpose of the service would be to present the fair opinion value to 'Hotel' sale. Davidoff (2005) states, "A fairness opinion is a valuation provided by an outside advisor, ...that a transaction meets a threshold level of fairness from a financial perspective." In buyer-seller negotiation, fairness opinions provide parameters for decision-makers to make their choices, being a critical stage in mergers, acquisitions, and divestitures transactions of assets and liabilities, as illustrated in Table 15. As we can see (Table 14) the fairness opinion (pricing and offering) corresponds to one of the mergers and acquisitions negotiation stages. The offer pricing and legal and tax structures are defined at this stage to maximize financial value.

Table 2 *The M&A lifecycle*

Stages	Description
Identify the right deal	either through active selection of companies or business units, or by reacting to offers in the market (one-on-one or by auction).
Pricing and offer	initial pricing of a company, as well as which legal and tax structure will be most suitable.
Due diligence	supply of documents for contingency assessment of the company, financial aspects, culture, integrity, operational benefits, and real estate analyses.
Closing	purchase agreement is drafted, the relevant authorities are informed and consulted, and the closing procedures are carried out.

Source: adapted from Deloitte (2022)

In finance decisions, heuristics play a role in decision-making, replacing difficult questions with easier ones. False cognitive are flaws in these shortcuts that can lead to worse decisions. The Chapter address the anchoring effect regarding financial decisions on a buyer-

seller negotiation, in which the unit of analysis is the acquisition of a 'Hotel' in Rio de Janeiro, southeastern Brazil (Yin, 2018). One of the authors participated directly in the negotiation, hereafter the 'Consultant.' For compliance reasons, the real identity of the parties involved in the negotiation, hereafter referred to as 'Hotel,' 'Seller,' and 'Buyer', were preserved.

Based on Prospect Theory (Kahneman and Tversky, 1979), fairness opinions values wrap slow process - systematic, explicit, and logical - that rationalize investment decisions. Damodaran (2020) comments that all investment valuations are considered a priori biased, carrying human biases. Milli, Lieder and Griffiths (2021) found a plausible range of conditions where it is better to be equipped with a fast System 1 than a slow System 2.

The case addressed a buyer-seller Type 1 negotiation, in which two parties negotiated one issue (Dias, 2020) in 2007 in Rio de Janeiro, southeastern Brazil, involving the acquisition of 100 percent of the Hotel's control. The case is limited to the unit of analysis (the hotel acquisition) in its economic, legal, tax, social, geographic, temporality, and behavioral restrictions. Moreover, other types of negotiations are not part of this work and should be studied separately. Finally, this research is supported by financial principles and Prospect Theory, heuristics, and cognitive bias (Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986). Other theoretical perspectives may convey incorrect understandings of the analysis and discussions.

The descriptive single case study on a buyer-seller negotiation transaction, considered Prospect Theory on a 'Hotel' sale. Key findings pointed out an overprice in the buy-offer of 330 percent, causing anchoring bias, severely interfering in the valuation and decision sell processes of 'Hotel.' This research provides scholars, decision-makers, and practitioners with a new perspective on financial decisions influenced by the anchoring effect. After careful analysis, implications are discussed, and managerial recommendations for best practices are enclosed. Provides like this, some insights into finance principles and theories about the decision-making process. Next, it will be outlined our research methodology and presented first-order findings based on the leading author's triangulation of historical data, accounts, and interpretations. Finally, the present analysis compiles theoretical implications, discussion, and recommendations for future research.

The case study presents in Chapter Four “Anchoring on ‘Hotel’ Buyer-Seller Negotiation” is divided into sections 4.1. Introduction, 4.2. ‘Hotel’ Buyer-Seller Negotiation: Context, Findings and Analysis, 4.3. ‘Hotel’ Buyer-Seller Negotiation: Implications and

Discussion, and 4.4. Summary, as we will see below.

4.2. 'Hotel' Buyer-Seller Negotiation: Context, Findings and Analysis

After the 12-year break caused by the second world war, the 1950 FIFA World Cup was held in Brazil. The games were performed six host cities: Belo Horizonte, Curitiba, Porto Alegre, Recife, Rio de Janeiro and São Paulo. At the request of the Brazilian president, the 'Hotel' was built in Rio de Janeiro at the end of the 1940s to host foreign authorities, celebrities, journalists, and tourists during the FIFA World Cup.

In 2007, the 'Consultant' advised the 'Hotel' on buyer-seller negotiations. The main objective of the 'Consultant' was to present a fair opinion that would support the 'Seller' decision. As a finding, the 'Seller' and 'Buyer' parties knew each other, and the buyer placed its initial offer of BRL 27.50 million. The BRL/USD index ended in 2007 at 1.77, so the offer's value for the acquisition of the 'Hotel' was approximately USD15,54 million. The negotiation depended on the fairness opinion and earn-out clauses.

As illustrated in Table 15, in buyer-seller negotiations, the due diligence process provides parameters on contingencies of companies sold. These contingent values usually are deducted from the payment, and earn-out clauses compensate sellers in the future by foreseen and unrealized contingencies. To Dahlberg and Tonelid (2022), earn-out clauses are applied in the deal structure of the acquisition with valid rules for a period between two to five years.

The 'Hotel' due diligence process revealed tax contingencies of BRL 6.20 million (approximately USD 3.50 million), reducing the value of 'Hotel' to a net bid of BRL 21.3 million (approximately USD 12.03 million). As a finding, buyers signed their offer in the net bid of R\$ 21.3 million without the earn-out clause in the negotiations.

The fairness opinion value base scenery (Scenery 1) assumed occupancy rates of 50% for all years, in line with historical performance. Base scenery valuation finding (Figure 4) led to a fairness opinion value of BRL 8.34 million (approximately USD 4.71 million). If the fairness opinion value were correct, the buyer's initial offer and net bid would be overpriced by 330 percent and 255 percent. Then, the 'Hotel' should be sold, even without an earn-out clause.

The low value of base scenery concerning buyer offers brought low credibility to the fair opinion finding. This led to the projection of other ever optimist scenarios, predicting growth in occupancy rates until 2011, as shown in Figure 15. Note in Figure that only Scenario

3, under highly favorable conditions and a value of BRL 24.53 million (approximately USD 13.86 million), exceeds the net value bid of BRL 21.30 million (approximately USD 12.03 million).

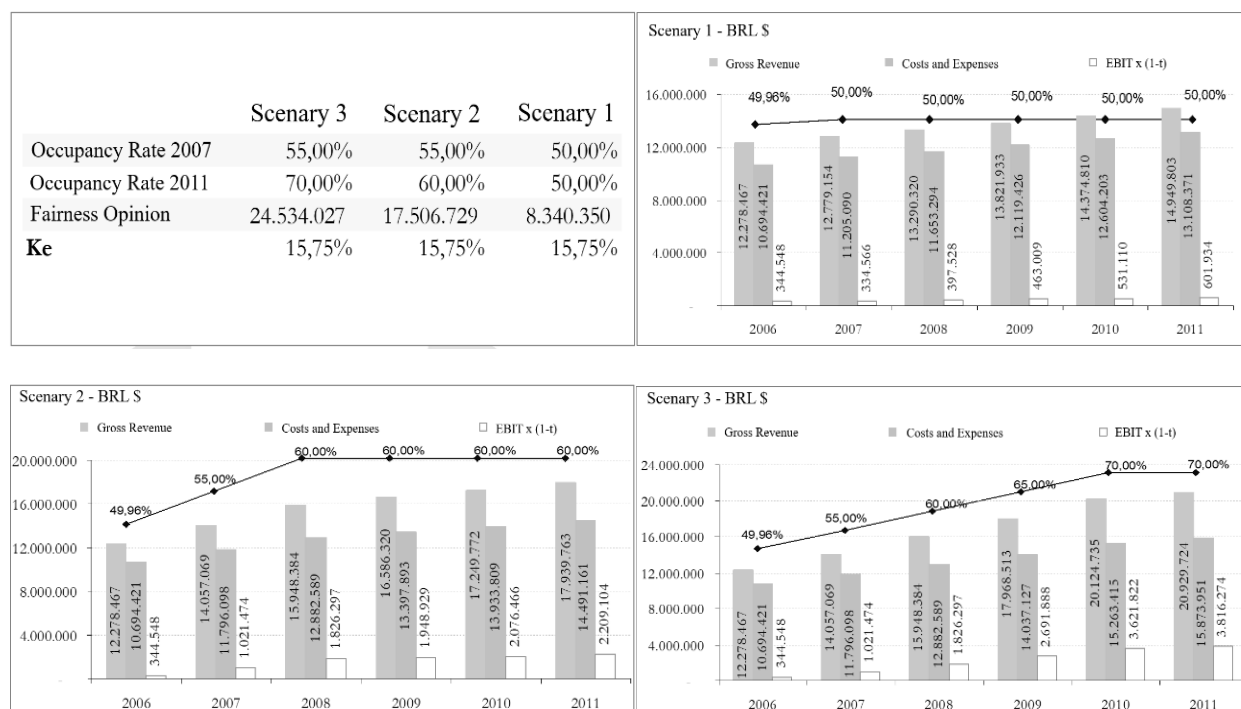


Figure 12 Scenario of 'Hotel' valuation

Source: 'Hotel' Valuation Report

Considering fairness opinion values, the sellers should have accepted the proposal and sold the 'Hotel.' However, the 'Hotel's' owners, irrationally anchored to the value of the original offer, did not accept the proposal. It also surprises the 'Hotel's' sales value to another economic group eleven years later. The sale of 'Hotel' became public in newspaper articles in 2019 (Table 16), suggesting the sale for the net bid of BRL 27.50 million. The BRL/USD index ended 2018 at 3.875, so the 'Hotel' sale value was a value of approximately US\$ 7.10 million.

The research on financial decisions in Type I buyer-seller negotiation (Dias, 2020), between two parties and one issue, negotiated, adopted an inductive, interpretive approach, combining multiple methods, including archival research and direct participation by one of the authors¹, to reveal anchoring effect in the 'Hotel' sale following the single-case method of Yin (2018), as described in Table 17. The descriptive research was triangulated by the main author's narratives ('Consulting'), literature review about finance, heuristics, and cognitive biases, 'Hotel' valuation data, and consulting contract excerpts, both from 2007, in addition to

information on 'Hotel' sale, published in newspapers in the year 2019. To clarify these points, the contract between consulting and 'Hotel' (see Table 18) and 'Hotel' valuation excerpt (see Table 19, Figures 16 and 17) from 2007, will be present.

Table 3 *Excerpts from the publications in newspapers reporting 'Hotel' sale in 2019*

Data	Textual description	Sources
March 8, 2019	"Historical 'Hotel' will close this month. After almost 7 decades of activities, one of the most traditional and symbolic hotels in the city, the 'Hotel', will close its activities on 03/23. debts 9.5 million with taxes in arrears. According to information from the real estate environment, the 'Hotel' was sold for 37 million."	Diário do Rio
March 11, 2019	"After 69 years, the traditional 'Hotel' will close its doors. Presidents and athletes stayed there...."	Agência Brasil
March 12, 2019	"It will close its doors. The traditional 'Hotel' will close its doors next week, after 69 years of activities..... Sources of real estate market informs that the "Hotel" has now been sold for R\$ 37 million. The sale would have occurred because of debts, including about R\$ 9.5 million with taxes..."	Folha1
March 14, 2019	"Icon of the city, 'Hotel' closes its doors after 69 years..."	Isto é Dinheiro
March 15, 2019	"'Hotel' will close on Wednesday (20). One of the most traditional hotels in the city, the 'Hotel' will end its operations on Wednesday (20). According to information from 'O Globo' newspaper, the 'Hotel' was sold by the "Family" to pay the debt. The 'Hotel', with 69 years of history, would be the seventeenth venture to close in the last 2 years."	Hotelier News
June 6, 2019	"The 'Hotel' was sold. The 'Hotel' did not remain idle for a long time, closed due to management problems."	Diário do Rio
December 8, 2019	"The 'Hotel' frequented by presidents will become student housing. The main structure was maintained, but there will be new features such as a coworking, a movie theater and a gym."	Veja

Source: adapted from Diário do Rio, Agência Brasil, Folha1, Isto é Dinheiro, Hotelier News and Veja (2019)

Table 4 *Stages of 'Hotel' sales case study*

Stages	Descriptions
Plan	<p>Literature review The process of reviewing the literature searched for publications on financial decisions by systems 1 and 2 of Kahneman, selecting more relevant for the study's purpose, appraise them and summarize the major themes identified.</p> <p>Research questions</p> <ol style="list-style-type: none"> 1. How can anchoring bias affect financial decisions? 2. How can anchoring bias affect the fairness opinion value? 3. How to avoid anchoring bias in financial decisions?
Design	<p>Research methods The authors conducted an embedded single case study, following Yin's (2018) typology. In holistic single case design, researchers examine a single problem as the sole unit of analysis.</p>
Prepare	<p>Research validations The case fits within its broader context, delineated by spatial and temporal boundaries, that allow the researchers ensure the coherence and consistency of the study. Main author's narratives were validated by data triangulation.</p> <p>Research limitations The case was bounded by examining the relevant activities of the 'Hotel' valuation and sale negotiation processes. Conclusions drawn from samples has limited extrapolation to analogous situations.</p>
Collect	<p>Data collects The case narratives were triangulation with fairness opinion report, 'Consultancy' contract excerpts, and newspapers reports about the 'Hotel' sale. Following Yin (2018), case study protocol included data collection came from three Sources in the years 2007 and 2019.</p> <p>Data organization The researchers implemented three collection arms:</p> <ol style="list-style-type: none"> 1. contract for the provision of services between 'Consulting' and 'Hotel'; 2. valuation report used to determine the fairness opinion; 3. newspaper reports about the sale of the 'Hotel'.
Analyze	<p>Data analysis When conducting a single case study, the researchers an in depth, thick description of the case. To analysis the effects of anchor on the decision to sell the 'Hotel', compared finance returns (in BRL and US) over the period 2007 (firsts negotiations year) and 2018 (effective date) sale of 'Hotel'.</p> <p>Findings report To prove financial mistakes in decision-making process, in findings report, the researchers compared data from 'Hotel' sales negotiations over two moments:</p> <ul style="list-style-type: none"> - in deal break of 2007, and - success at the end of 2018. <p>Researchers performed additional quantitative analysis, comparing findings 'Hotel' net bid 2007 corrected until December 2018, by:</p> <ul style="list-style-type: none"> - BRL inflation Index; - Brazilian government treasury bonds Index (IMA-S Index). - Brazilian Stock Exchange Index (IBV Index); - USD inflation Index; - US treasury bonds Index (US T. Bond5 Index); - US Stock Exchange Index (S&P 500 Index).
Share	<p>Appraising quality The single case study on Anchor bias in decision 'Hotel' sale, had validity and reliability of yours findings and conclusions based three elements:</p> <ul style="list-style-type: none"> - bibliography on investment valuation and decision-making in finance, - bibliography on the interference of cognitive biases in the decision-making process, - data on returns (BRL and US) on alternative investments with less risk, in period between sale first offer and the 'Hotel' liquidation.

Source: adapted from Yin (2018)

Table 5 Excerpts from the contract between consulting and 'Hotel' of 2007

Contract topics	Textual description
"Summary"	"The 'Consulting' appreciates the opportunity granted and is pleased to forward this proposal for the provision of Economic and Financial Assessment ("Assessment") services to the owners of 'Hotel', with a view to financial and business advice for the sale of shares representing the company's capital."
"Team Consulting"	"The 'Consulting' was created in 2001 by financial market executives, with extensive experience in Investment Banking and experienced in organizational restructuring processes, mergers and acquisitions, private equity, project finance and fundraising."
"Objective"	"The objective of our work will be to advise the controllers and main executives of the Company, during the entire negotiation process of the company."
"Preparation and Valuation" (task E)	<p>"In order to achieve the main objective of the Preparation and Adding Value phase for the Sale, the following questions will be understood:</p> <ul style="list-style-type: none"> - task E – Business Valuation – defining the value of the business, taking into account its growth potential.... The value found will serve as a basis for determining the best sales model, and will assist in the evaluation of possible competing proposals, in the negotiation process with investors and buyers..."
"Strategies" (task D)	<p>"During the execution of this stage of the project, ... we will work together with the company's top management in order to carry out the following tasks:</p> <ul style="list-style-type: none"> - task D - Initial Offer – the offer presented by the buyer will be analyzed and evaluated."
"Negotiation" (tasks A-F)	<p>"This stepwe define the model according to the previous steps. We can divide this step into the following tasks:</p> <ul style="list-style-type: none"> - task A – Preliminary Assessment of the Framework – based on our buyer characteristics and objectives, such as market conditions and financial findings for the determination of the sale, anticipate a preliminary framework of objectives... - task B – Memorandum of Understanding – will be a preliminary structure defined as parts, which will be made in agreement with the buyer, for the same compliance. - task C – Transaction Structure – we prepare the final version of the transaction structure, based on all buyer conditions and specific requirements... - task D – Due diligence support – acts as coordinators and intermediaries by the buyer of the information requested during the Company's due diligence... - task E – Negotiation – we participate in commercial negotiations with the buyer... - task F – Contract Preparation – although we actively, actively participate in order to secure the contract, the spirit of the negotiation structure of the contracts keeps it intact."
"Consulting fee"	"Consulting will be entitled to a success rate equivalent to 4% (four percent) of the amount effectively paid by investors in the purchase of the stake."
Date	March 28, 2007.

Source: prepared by Authors based on the contract between consultancy and 'Hotel.'

In Table 18, the "Preparation and Valuation" stage, where we highlight the business's value, supports the sales process. Finally, in Table 19, we will see parts of the valuation report, your stages, and the 'Hotel' fairness opinion value findings.

Table 19 'Hotel' valuation excerpt (2007)

Valuation topics	Textual description
"Objective"	<p>"This Document was prepared by 'Consulting' based on information provided by 'Hotel'. This document is being made available exclusively for the purposes of discussion regarding a possible transaction involving the parties."</p> <p>"The information contained in this Document has been prepared with the objective of assisting the interested party in the development of its own evaluations regarding the Company and does not intend to cover all the information that may be necessary for the decision making in relation to the transaction in question."</p>
"The Hotel"	<p>"The 'Hotel' has 231 apartments, distributed in Executive or Economy Floors, available in three accommodation categories: Standard, Superior and Luxury..... The guest also has: Room Service, Fitness Rooms, Internet and TV, boutique, garage, laundry, tours, currency exchange and convenience store, in addition to the renowned cuisine of the Hotel.... the Events department has 18 halls, with a total capacity for 1,150 participants, in addition to two coffee-break areas, infrastructure, support team, internet access and modern audiovisual equipment."</p>
"Corporate structures"	<p>"The company is divided between two CNPJ's, where the property is housed in 'Hotel Administration and Participations' S.A and the Operating Asset, in the Legal Entity 'Hotel' LTDA. Transfers of funds between companies take place through the mobile vehicle, with the Operating Asset paying rent to 'Hotel Administration and Participations' S.A.... The organizational charts below show the corporate structures of the two companies (Figure 15)."</p>
"Operational performance"	<p>"Given the small variation in the occupancy rate, we noticed that the growth in gross revenue was due to the increases in the price list per apartment and the average customer consumption ticket (Figure 14)."</p>
"Base assumptions"	<p>"In preparing the Future Cash Flow projection, from 2007 to 2011, to calculate the Economic Value of the Hotel, the following assumptions were used:</p> <ul style="list-style-type: none"> - expenses – These were readjusted with an inflation of 4% per year. - costs – As they are variable, a historical average correlation of 46% was found in relation to revenue. - revenue – Average Tickets were readjusted with inflation of 4% per year. - cap ex – The investment levels of 2006 were maintained. - cost of equity - 15.75%
"Scenarios analysis"	<p>"The scenarios considered variations in occupancy rate, where:</p> <ul style="list-style-type: none"> • scenery 1 considered occupancy of 50% for all years, following in line with history, • scenery 2 considered occupancy of 55% in 2007, 60% (market average) in 2008 following this rate for later years, and, • scenery 3 considered occupancy of 55% in 2007, 60%, in 2008, 65% in 2009, 65% in 2009, 70% in 2010 following this rate for later years."

Source: 'Hotel' valuation report (2007)

Note in Table 19, "Scenarios analysis" topic, where it should be highlight the occupancy rate assumptions used to determine the fairness opinion (Scenery 1) and other optimistic projections (Scenery 2 e 3). Figure 17 presents the historical gross revenue and

occupancy rate (2003 – 2006), which served as the basis for defining the occupancy rates of base scenery (Scenario 1).

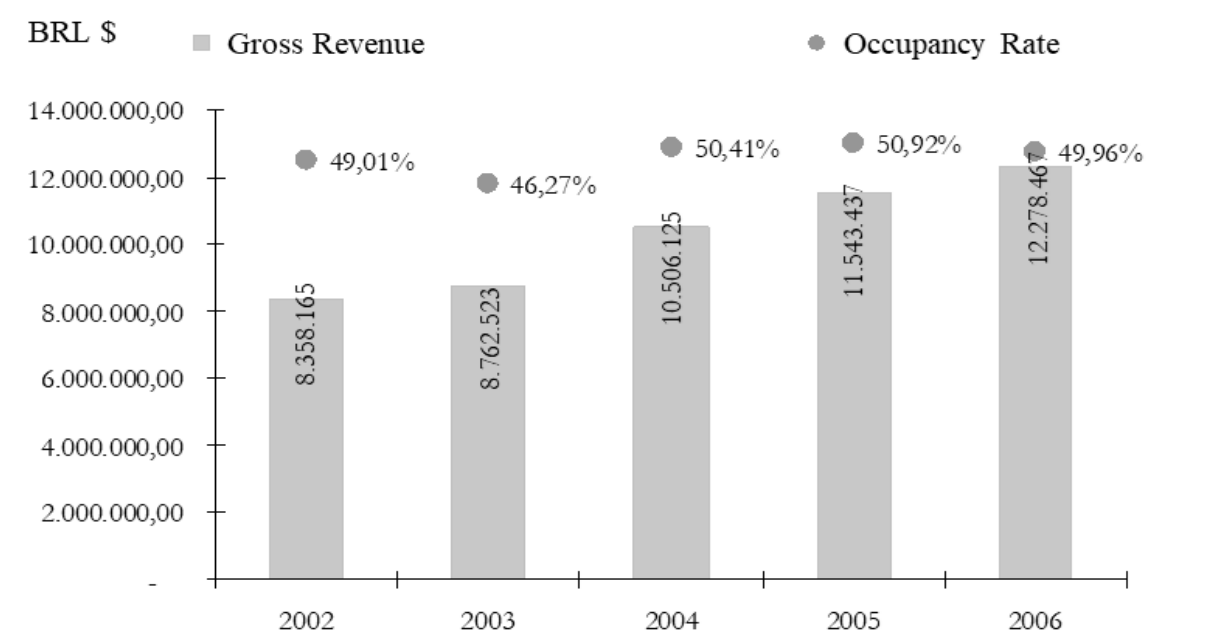


Figure 13 ‘Hotel’ historical gross revenue and occupancy rate (2003 – 2006)
Source: ‘Hotel’ Valuation Report

Figure 16 presents the data used to substantiate the fairness opinion valuation base scenery, which assumed occupancy rates in line with historical performance (50%) for all years. Figure 17 shows the corporate structure of 'Hotel' as part of the valuation report.

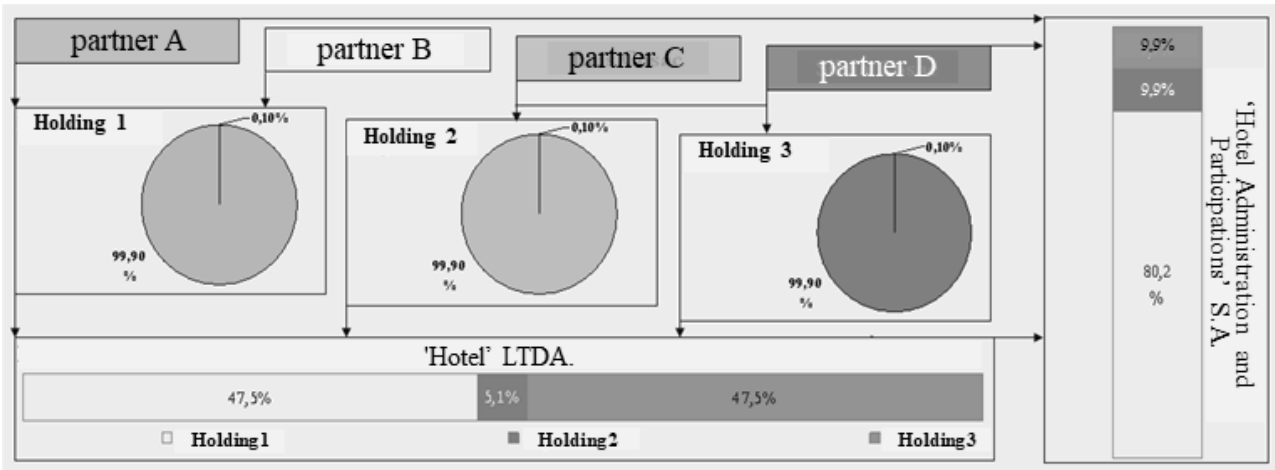


Figure 17 Corporate structure: ‘Hotel’ Administration and Participations and ‘Hotel’ LTDA.
Source: ‘Hotel’ Valuation Report

Note in Figure 17 that the corporate structures of 'Hotel' is divided into two corporations, 'Hotel' Administration and Participations S.A (holding) and 'Hotel' LTDA (operational assets), and that the limited companies of the partners, participation in both corporations. This is because these assets are the object of buyer-seller negotiation.

4.3. 'Hotel' Buyer-Seller Negotiation: Implications and Discussion

The research approached a descriptive single case study to suggest finance loss caused by the anchoring effect in 'Hotel' buy-offer with 330 percent overprice of base scenery valuation (first fairness opinion), answering the two research questions:

RQ #1. How do anchoring heuristics and biases work in investment valuation and decision?

Following financial theories, investments should maximize Expected Utility (E.U.) for the investor (Fisher, 1930, Neumann and Morgenstern, 1944). Table 20 compares 'Hotel' net sale 2018 with findings of 'Hotel' net bid 2007 corrected by inflation BRL, inflation USD, Bonds index, and Stocks index, until December 2018. The simulated findings reinforce the owners' financial error by not selling the 'Hotel' in 2007.

Table 20 *Simulations findings to 'Hotel' net bid 2007 adjusted to 2018.*

Hotel' sale value x alternatives investments	BRL (millions)	USD (millions)	ReSource
'Hotel' sale 18	27.50	7.10	newspapers (2019)
Net Bid BRL inflation adjusted	39.77	10.26	IBGE (2022)
LFT (BR Bond)	71.12	18.35	AMBIMA (2022)
IBOVESPA Index	29.30	7.56	<u>B3 (2022)</u>
Net Bid USD inflation adjusted	32.94	8.50	Usinflationcalculator (2022)
T-Bond (US Bond)	54.92	14.17	Damodaran (2022)
S&P 500 Index	80.86	20.87	Damodaran (2022)

Source: 'Hotel' Valuation Report, Newspapers 2019, IBGE 2022, Ambima 2022, Usinflationcalculator 2022, Damodaran 2022

Table 20 shows that the sale of the 'Hotel' at the end of 2018, compared to the correction of the net bid value in 2007, was the worst alternative among all the options analyzed, losing even to the inflation rates. Cause surprise, the 'Hotel' sale net value (BRL 27.50 million) the year 2018, which seems to reinforce seller anchoring in the 2007 purchase offer (also of BRL 27.50). Neumann and Morgenstern (1944) and Damodaran (2012) highlighted the fragility of the concept of rationality in investment decisions. Ahmad and Shah (2020) reveal how overconfidence influences investment decisions, investor behavior, and the returns obtained. To Bazerman (2012), overconfidence can make deals impossible despite a positive bargaining range. The findings suggest that overconfidence in the initial buyer offer may have impaired the 'Hotel' owner's decision.

The descriptive single case study also suggests an anchoring effect in the 'Hotel' valuation process, where pessimistic scenarios were not considered in the valuation, which would be the most correct. Figure 18 highlights the effect of anchor bias on the cash flow projections of the 'Hotel' valuation.

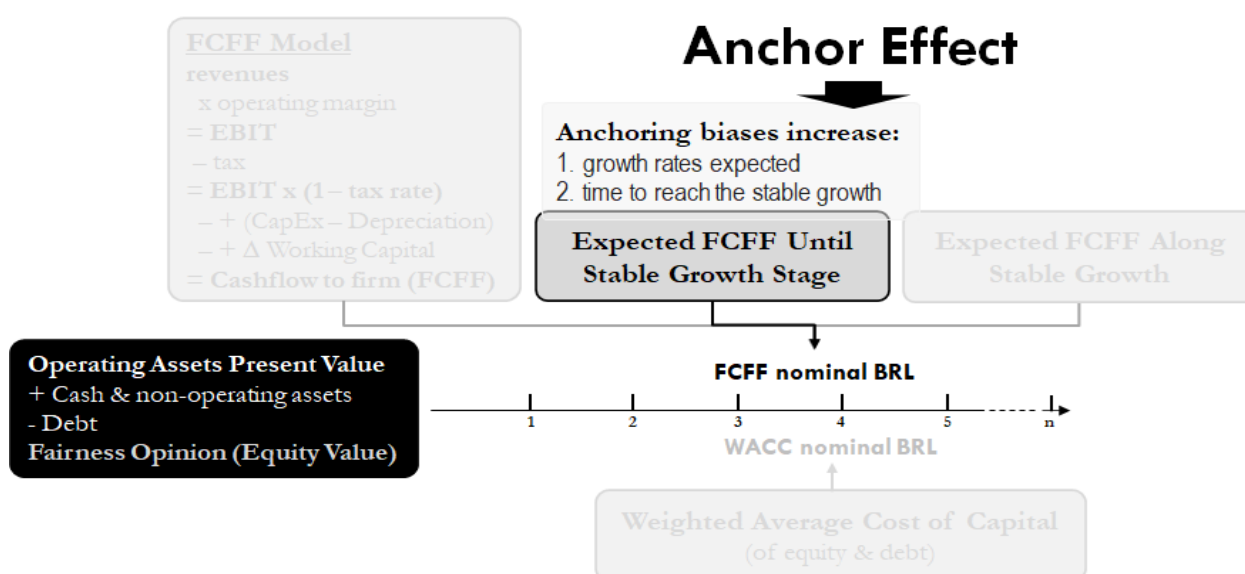


Figure 18 'Hotel' valuations and effect of anchor bias

Source: adapted from Damodaran (2019)

Figure 18 shows that the anchoring bias interfered with the cash flows growth forecasts throughout the growth stage, suggesting immaterial occupancy rates for scenarios 2 and 3. Decisions framed by Kahneman's System 1 (2017) are more exposed to heuristics and cognitive

biases than those based on System 2, suggested by the same author. As highlighted in Figure 19, the low value of base scenery (BRL 8.34 million or USD 4.71 million) concerning buyer offer (BRL 27.50 million or USD 15.54 million) led to the projection of other scenarios predicting growth in occupancy rates until 2011.

RQ #2. How to use ANCHORING heuristics and biases to improve investment valuation and decision?

False cognitive based in Anchoring extends single event properties to your population. Tom Peters reinforces the cognitive installation of first impression: "you will never get a second chance to make a good first impression." This is because cognition values primitive data. Anchoring biases are born of overconfidence in the first impression, which leads to the focal of having a single, definitive opinion. Judgments based exclusively on primitive data cover evidence of data received later. In the 'Hotel' case, the anchor of the first offer interfered with the valuation and the sale decision. Diligent is the virtue of being zealous! Directors and counselors judge the investments in the Brazilian Closed Complimentary Pension Entities (EFPC). Anxieties can make bad judgments about investments! The Previc Guide to Best Investment Practices (2022) states that: "the duty of diligence requires directors and advisors to seek out the relevant information needed to support their decisions." Anchoring effect can be avoided with due diligence from first impressions received about targets in judgment, which the 'Hotel' owners didn't do in 2007, not even by expert fairness. The conclusions drawn from the 'Hotel' buyer-seller case study were the basis for the construction of the Delphi research that presented in Chapter Five.

4.4. Summary

In Chapter Four Anchoring On 'Hotel' Buyer-Seller Negotiations was composed of sections 4.1. Introduction, 4.2. 'Hotel' Buyer-Seller Negotiation: Context, Findings and Analysis, 4.3. 'Hotel' Buyer-Seller Negotiation: Implications and Discussion, and 4.4. Summary, as we will see below.

Chapter 5

How Biases Affect Investment Valuation

5.1. Introduction

The investment valuation assumptions (IVA) forecast is the most thought-out part of the valuation, and Kahneman's System 2 (2017) suggests that it should follow a slow, complex, and logical process. Following the rules of Kahneman's System 1 (2017), however, heuristics and investment biases lead to quick, easy, and natural responses to valuation assumptions (IVA) forecasts. Whether due to the absence or deficiency of past and future data, the cognitive mechanisms of heuristics and biases are often used to forecast IVA and, consequently, to define fair value (fairness opinion). Even technical valuation decisions, such as historical data analysis, employ cognitive time rules (10 years, five years, three years, one year, no data history; “we are a startup Company”).

Bazerman (2012) states that rational models of decision are based on how a decision "should be" made and not how it "is" made. If we need data to analyze, how startups have fair value (fairness opinion), if we have no historical-data? Even so, startups sometimes, they are excellent investments, being preferred targets of private equity funds, for example.

To Kahneman, Sinoby, and Sunstein (2022), Daniel Kahneman, and Amos Tversky, both Nobel Prize laureates, "exposed the workings of human judgment in a way that should make every decision-maker stop and think." With the same relevance, it should be highlight Simon. Also, he was a Nobel Prize laureate for his theoretical contributions to economics and human judgment. Simon's bounded rationality (1946) conclusions, for example, make up the structure of major modern decision-making theories.

Simon's Assumptions (1946, 1955, 1957, and 1966), heuristics and cognitive biases (Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986), and Prospect Theory (Kahneman, 1979), brought principles and foundations for studies on decision-making processes.

The research recognizes that there is controversy in the psychology literature regarding heuristics and biases. Here, refer to heuristics and biases as a mental shortcut, as Gigerenzer (1996 and 1997) and Gigerenzer and Goldstein (1996), and heuristics and biases as intuitive processes, as Kahneman and Tversky (1974). For this paper, heuristics and biases represent a

shorter, more intuitive, and faster approach to making decisions that follow the logical process that conforms to statistical inference rules and agrees with Kahneman's System 1 processes (2017).

Interest in decision-making has increased recently because many different biases and heuristics affect people's decisions. Academic works seek to suggest new biases and cognitive heuristics. Highlight Baron (2009), where more than 50 biases are listed. In "Behavioral finance and investor types: managing behavior to make better investment decisions" by Pompian (2012), more than 20 biases are listed that can influence investment decisions. In Table 21, some examples are illustrated:

Table 21 *Heuristic and biases list*

Heuristic and bias	Definition
<i>Affect heuristic</i>	<i>occurs when decision-made basing on emotional reactions, rather than a calculation of risks and benefits.</i>
<i>Affinity bias</i>	<i>or tendency to be favorably biased toward people most like ourselves.</i>
<i>Anchoring</i>	<i>bias and heuristic or primitive data overvalue, which may inability of make adjustments after first impression.</i>
<i>Availability heuristic</i>	<i>estimate what is more likely by what is more available in memory, which may lead biases when the emotions are charged.</i>
<i>Belief bias</i>	<i>it is tendency to evaluate the logical of an argument based in current belief and perceived plausibility.</i>
<i>Confirmation bias</i>	<i>which follows the tendency to confirm a certain opinion (or view), and or, to discredit others' opinions.</i>
<i>Embodied cognition</i>	<i>or tendency to have selective perception.</i>
<i>Framing</i>	<i>that is human tendency to problem frame according to your vision.</i>
<i>Fundamental attribution error</i>	<i>is a bias that over or under-emphasize the role and power of interpersonal influences.</i>
<i>Implicit bias</i>	<i>(aka implicit stereotype, unconscious bias) is tendency to attribute positive or negative qualities to a group.</i>
<i>Hindsight bias</i>	<i>or tendency to view past events as being predictable ("I-knew-it-all-along" effect).</i>
<i>Illusion of control</i>	<i>is cognitive bias in overestimating one's own qualities and abilities, in relation to the same qualities and abilities of other people.</i>
<i>Inattentive blindness</i>	<i>or selective attention, is a form of bias that highlights events that stand out visually, interpreting information in a way that is congruent with an individual's existing values and beliefs.</i>

Heuristic and bias	Definition
<i>Overconfidence effect</i>	<i>or tendency to overly trust one's own capability to make correct decisions.</i>
<i>Priming bias</i>	<i>that is tendency to be over-influenced by the first presentation.</i>
<i>Representativeness</i>	<i>heuristics and biases, judge base probabilities on resemblance.</i>
<i>Self-serving bias</i>	<i>tendency to claim more responsibility for successes than for failures.</i>
<i>Status quo bias</i>	<i>that follow tendency to hold to the current situation rather than an alternative situation, to avoid risk and loss (loss aversion).</i>

Sources: adapted from Baron (2009) and Pompian (2012)

This survey's purpose is not to update or expand the biases and heuristics list. Instead, the goal is to understand how cognitive processes affect the value of investments so that people can make better financial decisions. Para Schubert, Ferreira, Mata and Riemenschneider (2021) improve decision-making's relevance by "explaining how cognitive abilities and thinking styles contribute to conflict resolution in reasoning."

In judgment support, heuristics and bias use cognitive processes (data - information - knowledge). However, false cognitive can lead to poor judgment. To Bazerman (2012), overconfidence can make deals impossible despite a positive bargaining range. Ahmad and Shah (2020) reveal how overconfidence influences investment decisions, investor behavior, and the returns obtained.

The following topic shows the Free Cash Flow to Firm (FCFF) method and investment valuation assumptions (IVA) that are influenced by cognitive mechanisms.

The Chapter Five How Biases Affect Investment Valuation is divided into the following sections: 5.1. Introduction, 5.2. Effect of Kahneman's Systems on Investment Valuation Assumptions (IVA), 5.3. Overview of the Outputs from the First and Second Round, 5.4. Overview of the Outputs from the Third Round (final), 5.5. Delphi Research: Discussion, Implications, and Conclusions, 5.6. Summary.

5.2. Effect of Kahneman's Systems on Investment Valuation Assumptions (IVA)

The projection of free cash flows to fairness opinion valuation follows a rational, slow, conscious, effort, implicit and logical process in line with Kahneman's System 2 (2017).

Following financial theory principles, investments should maximize the Expected Utility (E.U.) for the investor, and its value (fairness opinion) is rationally defined by the discounted cash flow method, as illustrated:

$$\text{Fairness Opinion} = \sum \{FCF_t / (1+k)^t\}$$

The discounted cash flow (DCF) method is the most used in investment decisions. To Ozorio and Ozorio (2009), the companies' value fairness opinion is associated with the cash-generating capacity for investors and risk rates of investments.

Free cash flows are forecasts, not promises, of future findings. The variability of expected free cash flows (FCF), the higher the discount rates and the lower the fairness value. Risk rates (k) are determined follow the theories of Markowitz portfolio (1952), Capital Asset Pricing Model (CAPM) by Sharpe (1964), and Arbitrage Pricing Theory of (APM) by Cox and Ross (1976), among others.

There are some ways to projecting cash flows and obtain a value fairness opinion. It should be highlights to free cash flow to firm (FCFF) method, where asset fairness opinion is define discounting the forecast cash flow to investors (debt and equity) by the weighted average cost of capital (WACC), as the model shown in Figure 19, as follows:

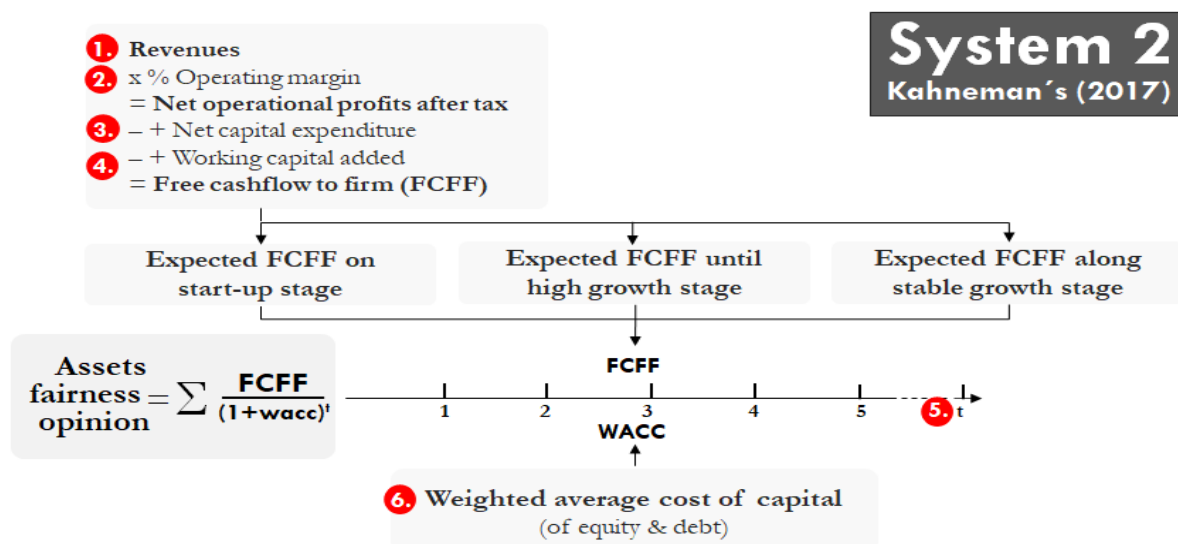


Figure 19 Free cash flow to firm (FCFF) model and six IVA Forecast

Source: the Author

Figure 19 depicts the six investment valuation assumptions (IVA) used to determine the fair market value of assets, where:

1. Revenues are invoiced sales expected on dates t .
2. % Operating margins are net operating profit after tax/revenues at dates t .
3. Net capital expenditures are net long-term assets investment at dates t .
4. Working capital added is a net investment in working capital at dates t .
5. Duration time (t) is the lifetime of the investment.
6. Cost of capital which brings cash flows to present value, is the weighted average cost of capital (WACC) of debts and equity.

The six numerical investment valuations assumptions (IVA) forecast of the FCFF model follows a rational, slow, and complex decision-making process. The investment valuations process, however, can use heuristics and biases to create intuitive, quick, and straightforward responses to IVAs. Therefore, these cognitive mechanisms are most often used with FCF model IVAs: (a) aren't supported by research (e.g., start-up markets without historical data), (b) are obtained only at high cost (e.g., acquisition of third-party reports), or (c) do not have good relations forecast findings (e.g., changes in the industry).

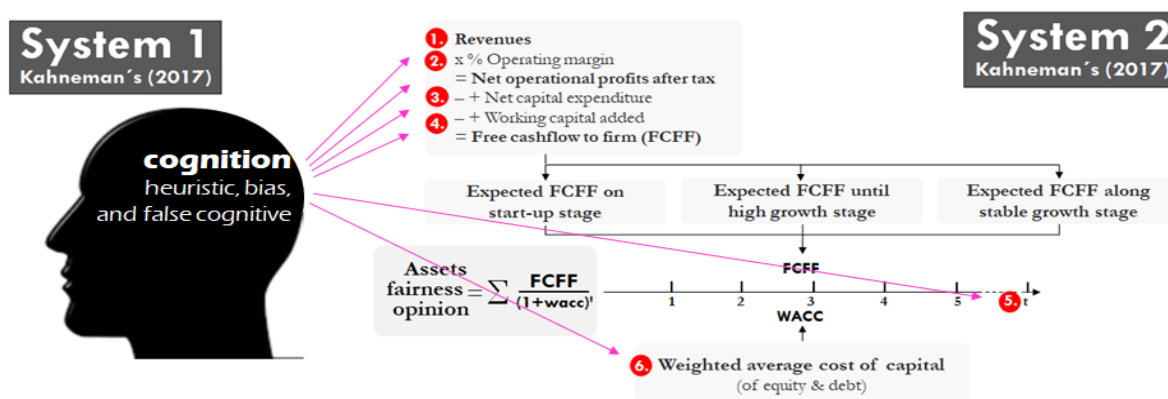


Figure 20 Cognition and the investment valuation assumptions (IVA)

Source: the Author

Carelessness with false cognitive can lead to the definition of wrong IVAs, distorting the fairness opinion value. For example, Damodaran (2012) argues that analysts form an opinion about a particular investment even before starting its evaluation, and consequently, the final finding of the study reflects this false cognitive. Avoiding false cognitive is thus one analytical thinking skill that is not assessed by intelligence tests or even indirectly indexed through its correlation with cognitive ability measures.” Figure 20 shows the effects of

heuristics and biases, and yours in investment valuation assumptions (IVA) forecast.

To reduce the false cognitive in IVA Forecast, financial analysts use historical financial data and multidisciplinary theoretical models of firm and market analysis. The financial analysis, life cycle Assumptions, Porter's five competitive forces, and SWOT matrix, among other economic models, are tools used to build cognitive mechanisms of the IVA Forecast and, consequently, fairness opinion investment value define.

Therefore, investments have their fair value defined cognitively, which is why they are loaded with subjectivities. According to Schubert, Ferreira, Mata and Riemenschneider (2021), the diffusion of biases and heuristics models has led to the search for different cognitive mechanisms in decision-making. Heimer and Imas (2022) replicate their findings on cognitive bias isolating the mechanism and demonstrating generality of the findings, and concluded that the interaction between constraints and behavioral biases has implications for policy and choices architecture.

The next topic presents the application of the Delphi method. The objective is to reveal expert cognitive mechanisms used in the investment valuation process (IVA) forecast. For such, some discoveries and convergences of vision due to the 11 specialists' active participation were gathered in the preliminary investigation. The subsequent procedures brought all specialists to an agreement. The method fulfils the objective, validating the understanding of the academic community that the Delphi Technique has as a leading application in the development of concepts/frameworks on studies that traditionally entail a two-step approach starting with the identification of a group of constructs followed by classification/taxonomy development (Okoli and Pawlowski, 2004). The following topics will describe from a high-level point of view the main outputs from of research methodology applied.

5.3. Overview of the Outputs from the First and Second Round

At the end first phase, the constructs on the influence of cognition in forecasts investment valuation assumptions (IVA) forecast were resent to the no11 participants; thus, formalizing of the second phase started.

After receiving the additions made by participants in the second phase, the inputs were separated into two groups of cognitive mechanisms to:

1. improve the six IVA Forecast, and
2. prevent false cognitive from distorting their (IVA) forecasts.

The answers were merged and clustered into the concepts and shared in this chapter. All participants shared several inputs on cognitive mechanisms - techniques, analyses, activities, practices, or processes - that could improve valuation reports findings.

Figure 21 shows the summary of cognitive mechanisms - techniques, analyses, activities, practices, or processes - suggested by experts. In addition, the cognitive mechanisms were grouped by type of investment valuation assumptions (IVA) forecast:

IVA Cognitive Mechanisms	techniques, analyses, activities, practices, or process of experts
	forecast
Revenues	based on historical data
	based on similar business
	corrections by life cycle stages
	corrections on economic cycles
%Operating margins	based on average last 3 years results
	based on similar business
	corrections by life cycle stages
	corrections on economic cycles
Net CapEx	based on average last 3 years results
	based on net capex/total long-term assets ratio
	based on depreciation/long-term assets ratio
	based on revenue/capex ratio
	corrections by life cycle stages
	with based on similar business
Working capital added	based on average last 3 years results
	based on working capital/revenue ratio
	corrections based on changes market forces
	corrections by life cycle stages
	with based on similar business
Duration period	known lifetime of the investment
	until stable growth phase and perpetuity
	cutoff date to investments higher risk
Cost of capital	flat rates over time
	corrections by life cycle stages
	with based on similar business
	add discount rates for smaller businesses

Figure 14 Cognitive mechanisms to forecast IVA definition

Source: the Author

The below list details each of the concepts that were collected, ensuring the right understanding of each of them:

1. IVA Forecast based on **historical data** (revenues): considers past performance for IVA Forecast. There were recurrent responses suggesting that past findings are base for future forecast IVA.
2. IVA Forecast based on **similar business** (revenues, %operating margin, net capex, working capital added, cost of capital): considers similar businesses performance for IVA Forecast. Also, there were recurrent responses on IVA Forecast based on similar business.
3. IVA Forecast corrections by **life cycle stages** (revenues, %operating margin, net capex, working capital added, duration period, cost of capital): considers adjustments for IVA Forecast by expects behaviors over-time life cycle stages. e.g., adjust discount rates, from higher to lower, over time, which “start-ups” business.
4. IVA Forecast corrections based on **economic cycles** (revenues, %operating margin): considers adjustments for IVA Forecast based on recession and growth economics cycles.
5. IVA Forecast based on **average last 3 years findings** (%operating margin, net capex, working capital added): considers the average performance of the last 3 years for IVA Forecasts.
6. IVA Forecast based on **net capex/total long-term assets ratio** (net capex): considers net capex/long-term assets ratio will be constant for IVA Forecasts.
7. IVA Forecast based on **depreciation/long-term assets ratio** (net capex): considers depreciation/long-term assets ratio will be constant for IVA Forecasts.
8. IVA Forecast based on **revenue/capex ratio** (net capex): considers that the revenue/long-term assets ratio will be constant for IVA Forecasts.
9. IVA Forecast based on **working capital/revenue ratio** (working capital): considers that the working capital/revenue ratio will be constant for IVA Forecasts.
10. IVA Forecast corrections based on **changes market forces** (working capital): considering that changes in market trade policies may be affect for IVA Forecasts.
11. IVA Forecast known **lifetime of the investment** (duration period): considers known lifetime of the investment as cutoff IVA Forecasts.
12. IVA Forecast **until Table growth phase and perpetuity** (duration period): reconsiders projections up to the Table growth phase, perpetuity with constant growth, and zero net

capex, on IVA Forecasts.

13. IVA Forecast **cutoff date to investments higher risk** (duration period): set a cutoff date in projection of investment of high risk, for IVA Forecasts.
14. IVA Forecast **flat discount rates over time** (cost of capital): considers flat rates for all years, for IVA Forecast.
15. IVA Forecast **adds discount rates for smaller businesses** (cost of capital): pays off risk liquidity, adding premium in discount rates to smaller businesses, for IVA Forecast.

The answers (inputs) on cognitive mechanisms that can reduce the effects of false cognitive in IVA Forecasts, were merged, clustered into by type and shown in Figure 22:

IVA Cognitive Mechanisms	techniques, analyses, activities, practices, or process of experts
	prevent false cognitive
Revenues	life cycle over-time IVA behavior analysis
	self-analysis
	criticize stakeholders' assumptions
	benchmark analysis
	competitor commercial analysis
%Operating margins	market share analysis
	life cycle over-time IVA behavior analysis
	perpetuated IVA forecast analysis
	IVA simulation
	competitive market forces
Net CapEx	cost structures analysis
	perpetuated IVA forecast analysis
	competitive market forces
	interviewing experts
	installed capacity analysis
Working capital added	cost structures analysis
	IVA simulation
	competitor commercial analysis
Duration period	analyzing working capital/revenue relationship
	perpetuated IVA forecast analysis
	interviewing experts
Cost of capital	cutoff date to FCFF forecast
	IVA simulation
	relative valuation method

Figure 15 Cognitive mechanisms to reduce false cognitive in IVA Forecasts

Source: the Author

Below are listed list each of the concepts that were collected, ensuring the right understanding of each of them:

1. Prevent false cognitive with **life cycle over-time IVA behavior analysis** (revenue, operation margin): analyse of behavior IVA Forecast over-time stages of the life cycle. The financial theories suggest, well defined IVA Forecasts behavior, to each life cycle stage.
2. Prevent false cognitive with **perpetuated IVA Forecast analysis** (operation margin, net capex, duration time): be conservative and cautious with IVA Forecast on perpetuity (Gordon and Shapiro, 1956). Perpetual cash flows have, in most valuations, a large impact on fair value.
3. Prevent false cognitive with **IVA simulation** (operating margin, working capital added, cost of capital): to do risk analyses, measuring impacts on fairness opinion, simulating changes in investment valuation assumptions operating (IVA). To Li and Feng (2021), "Risk assessment on a stochastic basis has become prevalent in financial reporting due to increasingly sophisticated regulatory requirements."
4. Prevent false cognitive with **relative valuation method** (cost of capital): use of the relative valuation methodology (sectoral multiples) to compare the Value (fairness opinion) found by the FCFF method. So, the financial analyst has two valuations a same investment, by methods different which use same fundamentals. By financial theory, fair values (fairness opinion) should be similar, if not, someone method has failed. To our interviewees, mistrust usually falls on the discounted cash flow method.
5. Prevent false cognitive with **competitive market forces analysis** (operation margin, net capex): analyze the structure of the industry/value chain (suppliers, competitors and customers), identifying where the bottlenecks and biggest bargains forces are.
6. Prevent false cognitive with **self-analysis** (revenue): perform a self-assessment of your beliefs. Often, the financial analysts become emotionally involved such on investments being evaluated, which can lead to immaterial IVA Forecast.
7. Prevent false cognitive with **criticize stakeholders' assumptions** (revenue): "start-up" valuation reports is much used to obtain funding to investment realize. Normally, the reports are contracts by "start-up" owners. As a "start-up", the company does not have data history, business planning, among others. Stakeholders may influence on valuation assumptions. It is the job of financial analysts to be rigorous of IVA Forecast proposed by chief officers, owners, and other stakeholders.

8. Prevent false cognitive with **interviewing experts** (net capex, duration time): interview industry experts on market trends, technological degree, and investments. Recommendations such as conversations with investor relations of valued company, among others, were suggested by interviewees.
9. Prevent false cognitive with **benchmark analysis** (revenue): compare forecast revenues with observed behavior in other markets, can avoid immaterial IVA Forecast caused by false cognitive.
10. Prevent false cognitive with **competitor commercial analysis** (revenue, working capital added): comparative analysis of competitors' commercial policies, considering the prices, payment terms, quality, products, services, etc.. may reveal inconsistencies in IVA Forecasts.
11. Prevent false cognitive with **installed capacity analysis** (net capex): the objective is ensured consistency between investment and revenue projections. The to analyze compare installed capacity, with sales potential, and investments.
12. Prevent false cognitive with **market share analysis** (revenue): comparative analysis between forecast revenues to business and total market, can avoid immaterial IVA Forecast caused by false cognitive.
13. Prevent false cognitive with **cost structures analysis** (operating margin): complementary analyzes of cost structures: fixed and variable, taxes, inputs price volatility, etc, can avoid immaterial IVA Forecast caused by false cognitive.
14. Prevent false cognitive **analyzing working capital/revenue relationship** (working capital added): assess the relationship between working capital/revenue over-time may reveal false cognitive by forecast IVA immaterial, or forecast errors by financial modelling failure.
15. Prevent false cognitive with **cutoff date to FCFF forecast** (duration time): create scenarios with fair value (fairness opinion) defined in forecast limited time, when evaluate high-risk investment. Heimer and Imas (2022) demonstrate that restrictions improve performance of commercial negotiations by disciplining behavioral biases.

5.4. Overview of the Outputs from the Third Round (final)

Research using the Delphi method proved very collaborative, allowing participants to share different things without restrictions. During the third phase, the findings of the first and second rounds were shared.

Only then were the participants invited to validate the conclusions and/or to share new opinions or reflections. All agreed with the findings, contrary to what happened in the second round. Notably, these same descriptions, responses, and deliveries were shared with the participants, ensuring that everyone had the same understanding of the collected inputs. The research finding also produced a list of first-order finds, with 15 mechanisms to reduce false cognitive in IVA Forecast.

The research finding produced a list of first-order findings, with 15 cognitive mechanisms to improve IVA Forecasts. All cognitive mechanisms suggested by the interviewed experts are supported by heuristics or cognitive biases described in the literature, shown in Table 22.

Table 22 *Cognitive mechanisms, IVA Forecasts, heuristics and biases*

IVA Forecast	Heuristic and Bias
based on historical data	reveal the representativeness heuristics principles, status quo bias and believe bias.
based on similar business	suggests use the Implicit bias, anchoring bias and confirmation bias principles.
corrections by life cycle stages	reveals presence of anchoring bias, framing bias and confirmation.
corrections based on economic cycles	reveals presence of the availability heuristic and framing bias.
based on average last 3 years findings	reveals presence of the availability heuristic, framing bias, and status quo bias.
based on net capex/total long-term assets ratio	reveals use of representativeness, status quo, framing bias, and anchoring (biases and heuristics).
based on depreciation/long-term assets ratio (net capex)	considers depreciation/long-term assets ratio will be constant for IVA Forecasts. Revealing use of representativeness, anchoring, status quo bias, and framing bias.

Table 22 *Cognitive mechanisms, IVA Forecasts, heuristics and biases*

IVA Forecast	Heuristic and Bias
revenue/capex ratio (net capex)	revealing of representativeness, anchoring, framing and status quo bias.
working capital/revenue ratio	using representativeness, status quo bias, framing bias, and anchoring (biases and heuristics).
corrections based on changes market forces	revealing use of anchoring, and framing bias
known lifetime of the investment	revealing use of anchoring, and framing bias.
until Table growth phase and perpetuity	using of representativeness and anchoring.
cutoff date to investments higher risk	using availability, and framing bias.
flat discount rates over time	use of representativeness, and framing bias.
add discount rates for smaller businesses	using framing bias.

Source: the Author

The research finding also produced a list of first order findings, with 15 mechanisms to reduce false cognitive in IVA Forecast. The pooled compilation of responses, or conclusions at this stage, suggest 4 general groups of mechanisms:

1. validations of beliefs and views of those responsible (self-analysis),
2. validations business strategies,
3. validations of financial forecast, and
4. validations of stakeholder IVA Forecasts.

These are the mechanisms groups corroborated by the interviewees to reduce the false cognitive in the IVA Forecast. In its two phases application of the Conceptual Model, this step would be more rational, slow and complex, in line with the principles of Kahneman (2017). The data collected in the survey were incorporated into IVA Forecasts Conceptual Model, as we will see in: discussion, implications, and key conclusions.

5.5. Delphi Research: Discussion, Implications, and Conclusions

Firstly, our research findings provide valuable evidence on several previously identified gaps in the academic literature, supporting practitioners and academics in preventing false cognitive in investment valuation assumptions (IVA) forecasts. The findings of study of Charles and Kasilingam (2016) reveal that heuristics bias factor act as a partial mediator of defining the relationship path between emotions and personality of investors. Raheja and Dhiman (2020), explore the impact of behavioral factors and investors psychology on their investment decision-making. The authors found that the enthusiastic insight better foresees the venture choices of the financial specialists than the conduct predispositions of the speculators. Findings of Pradhan (2021), showed that the investors are influenced by emotional and cognitive biases.

Secondly, the Conceptual Model IVA Forecast understands the influence of heuristics and biases in the 6 IVA Forecasts used in the FCFF method. While scientifically adding cognitive mechanisms, the model aims to improve the IVA Forecasts and of fair value (fairness opinion). The fairness opinion value definition, in the application of the IVA Forecast Conceptual Model, recommend use in two-stages:

1. first, using "more" cognitive mechanisms (Kahneman's System 1)
2. second, using "more" rational mechanisms (Kahneman's System 2).

The first stage creates intuitive, fast, and straightforward responses to the forecasts, using cognitive mechanisms and following Kahneman's System 1 (2017) principles. Figure 23 refers to the first application stage of the IVA Forecast Conceptual Model.

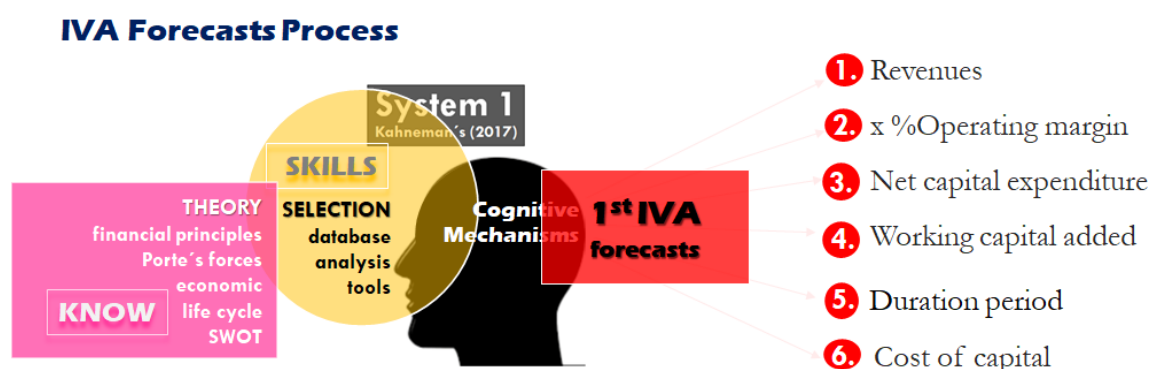


Figure 16 IVA Forecast process – stage 1

Source: the Author

Based on the answers obtained in the questionnaires, the first stage of the IVA Forecast Conceptual Model (Figure 23) suggests that cognitive mechanisms are built with specific knowledge and skills. Specific knowledge can be obtained from financial theories (Fisher, 1930; Markovitz, 1952; Gordon and Shapiro, 1956; Sharpe, 1964; Fama, 1970; Cox Ross, 1976; Markov, 1884; Merton, 1976; Pindyck, 1999; Schwartz and Smith, 2000); and microeconomic models (life cycle theory, Porter forces, business cycles, SWOT matrix, and other) for market analysis. Specific skills are associated with the analyst's ability to select the best database, analysis techniques, and other tools, using them for IVA Forecasts. These skills are available in academic programs for executives or can be obtained through professional experiences in investment analysis.

Anxieties can make bad judgments about investments, and biases can be avoided with due diligence. The Previc Guide to Best Investment Practices (2022) states that: "the duty of diligence requires directors and advisors to seek out the relevant information needed to support their decisions."

Thirdly, the Conceptual Model IVA Forecast understands the phenomena of false cognitive in fair value (fairness opinion) while adding "more" rational mechanisms to improve the IVA Forecasts used in the FCFF method. Figure 24 shows an overview of the definition of fairness opinion value by applying the IVA Forecast Conceptual Model Added the four steps of validations (Figure 24) corroborated by research:

1. self-analysis,
2. business strategies,
3. financial forecast, and
4. stakeholder IVA Forecasts

IVA Forecasts Process

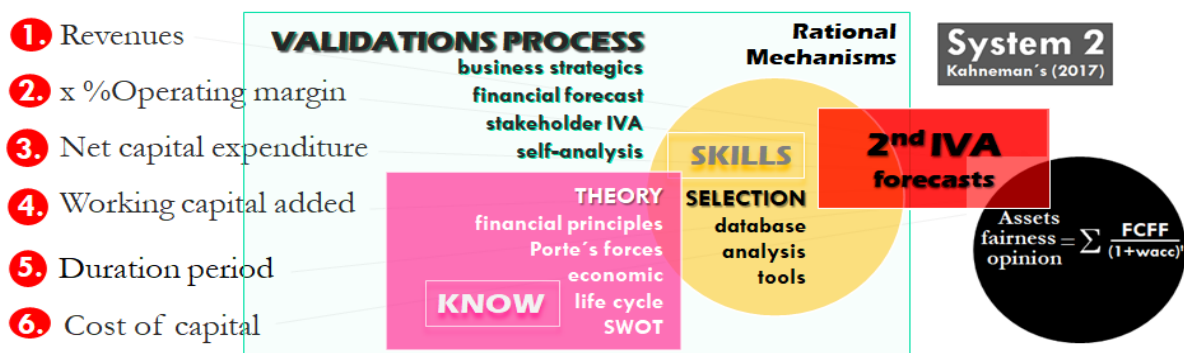


Figure 17 IVA Forecast process – stage 2

Source: the Author

The Conceptual Model aims to reduce the false cognitive in the IVA Forecast. According to Schubert, Ferreira, Mata and Riemenschneider (2021), the diffusion of biases and heuristics models has led to the search for different cognitive mechanisms in decision-making.

Finally, combining the Kahneman's Systems, the application of the IVA Forecast Conceptual Model, can:

1. generate investment valuations reports agile,
2. improve investment decisions,
3. contribute to “start-ups” valuation,
4. simplify the investment valuation process,
5. improve of academic programs aimed at executives,

among others. The Conceptual Model suggests combining the best cognitive and rational practices, creating intelligent mechanisms to improve IVA and reduce false cognitive in forecasts. The Figure 25 presents an overview of the fairness opinion value, in application of IVA Forecasts Conceptual Model.

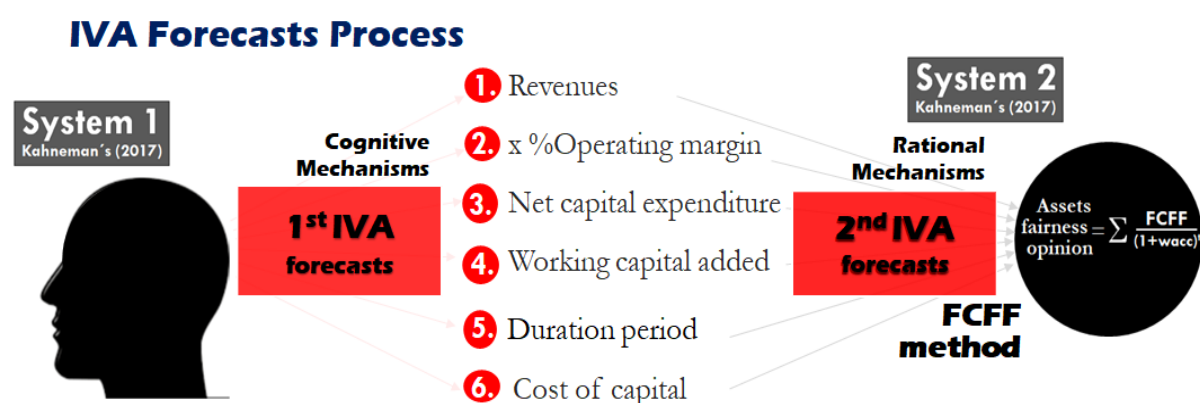


Figure 18 IVA Forecast process – stages 1 and 2

Source: the Author

Finally, it is essential to understand whether research objective was achieved. After the final round of the Delphi method, leading to the findings discussed previously, and having all of the above in mind, it is the authors' opinion that the objective of developing a Conceptual Model (first version) that can improve the investment valuation assumptions (IVA) forecast was concluded. The constructs found can also serve as a basis for further research.

5.6. Summary

The Chapter Five How Biases Affect Investment Valuation, it will be present the following sections: 5.1. Introduction, 5.2. Effect of Kahneman's Systems on Investment Valuation Assumptions (IVA), 5.3. Overview of the Outputs from the First and Second Round, 5.4. Overview of the Outputs from the Third Round (final), 5.5. Delphi Research: Discussion, Implications, and Conclusions, 5.6. Summary. In the next chapter, it will be present our suggestions for implantation the investment valuation assumptions (IVA) model in two steps, applying the findings of the Delphi survey.

Chapter 6

IVA Model Application and Discussion

6.1. Introduction

Briefly, this research studied the influence of cognition on financial decisions, using multiple methods. The objective was found out the influence of mental shortcuts (heuristics and cognitive biases) on investment valuations and decisions. The contribution to the epistemology of investment decisions by updating the existing traditional financial literature, by including evidence of financial losses caused by cognitive failures, and recommending use mental shortcuts in define the investment valuation assumptions (IVA). The Thesis design work suggests a new valuation investment Conceptual Model and two steps, the first based in cognitive mechanism to define a preliminary IVA, and second making validation of investments valuation assumptions (IVA) forecasts. To this, started from the generalization and delimit it to a specific scenario, and then divide the study into three Chapters that complement each one of them.

The first topic (present in Chapter Two) makes literature review on finance, investment decisions, cognition, and decision-making processes, based on two assumptions (A):

A#1: Heuristics and biases affect investment valuations and decisions.

A#2: Heuristics and biases can improve investment valuations and decisions.

The research addressed the main rational and cognitive theories on investment judgment in order to answer the three proposed research questions (Table 6), posing the following research questions (RQ):

RQ#1: How do heuristics and biases work in investment valuation and decision?

RQ#2: How to use heuristics and biases to improve investment valuation and decision?

The answers were given in thesis sections 2.4. and 2.5., broken down by class of heuristics and biases of judgmental (Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986). The findings of Chapter Four and Five suggest that mental shortcuts (heuristics and biases of judgmental) influence investment valuations and decisions, as well ways to avoid investment losses caused by false cognitive.

Field literature findings on anchoring, first topic (Chapter Two) were use in descriptive single case study (Yin 2018) of Chapter Four, to seek answers to the following questions:

RQ#1: How do ANCHORING heuristics and biases work in investment valuation and decision?

RQ#2: How to use ANCHORING heuristics and biases to improve investment valuation and decision?

Thus, the research tried to clarify how error caused by cognitive failure by anchoring affected the decision to sell a 'Hotel', causing financial losses. The objective of the case study was to highlight of cognition affects in investment decisions. However, were the findings on effects of mental shortcuts (judgmental heuristics and biases) in the process of investment valuation, the most important contribution to the structuring of the Conceptual Model presented in Chapter Four.

The survey presented in the Chapter Five used the findings of Chapter Four to revealed the interference of cognitive mechanisms (heuristics and biases) on the six investments valuation assumptions (IVA) of free cash flow to firm (FCFF) model. These principles guided the structuring of the questionnaire with questions about:

- which cognitive mechanisms improve the Six IVA Forecasts, and
- how to prevent false cognitive from distorting the Six IVA Forecasts.

The method was used Delphi applying interviews and sharing answers with N=11 experts in the field. The findings served for construction of Conceptual Model to investment valuation assumptions (IVA) forecasts in two steps:

- a first step using cognitive mechanisms to produce an initial fair value, and
- a second step of validation IVA Forecasts.

Thus, the IVA Forecast model incorporates elements intelligent to improve the valuation processes, and fair value definition of the investment. The values and originalities of each research stage (Chapters Two, Four and Five) this thesis is shown in Table 23:

Table 6 *Originality/value of research*

Chapters	Values/Originalities of the Researches
Chapter Two	the literature review of the subject comprising the investment valuations and decisions gave a new updated perspective. It also generated a theoretical framework.
Chapter Four	the research revealed as the mental shortcuts influence the investment decisions, highlight the affects in investment valuation assumptions (IVA) forecasts.
Chapter Five	this research suggests the new conceptual investment valuation model (IVA Forecasts) that incorporates cognitive elements into the assessment.

Source: the Author

As a whole, this doctoral thesis seeks to contribute to theory on investments decisions through knowledge of issues hitherto unexplored in the literature. After completing the three Chapters, we could conclude that the main objectives mentioned were achieved satisfactorily. However, our study also had limitations that will be explored in the next topic.

Using the findings from Chapters Two, Four and Five of the thesis to present a Conceptual Model of investment valuation assumptions (IVA) forecast, Chapter Six is divided into eight sections and described as follow: 6.1. Introduction, 6.2. Lessons learned, and 6.3. IVA Forecast Conceptual Model: Application Steps, 6.4. Summary.

6.2. Lessons Learned

Whether in the companies or business schools, the search for of the investment decisions-making right tools is recurring question. The research findings revealed is that cognition has great interference in evaluations and investment decisions. The research finds suggests that these interferences materialize when the financial analyst define the IVA Forecasts, making the economic value of the investment greater or less than the fair value. The research evidences also demonstrates that this difference can be very relevant, and make excellent deals unfeasible, as concluded in the case of the purchase-sale of the 'Hotel' (see 4.3. 'Hotel' Buyer-Seller Negotiation: Implications and Discussion).

To fix these possible problems, it is suggested construction of a investment valuation Hybrid Conceptual Model, combining rational and cognitive principles. The IVA Forecasts definition using the recommended model, suggest a investment valuation process apparently more agile and secure.

For a financial analyst, improving the ability to value investments would be, by itself, an excellent reason to learn about cognitive influence on investment valuations and decisions. However, Specifically, the research has transformed the way I make valuations report. The changes in technologies and social behavior have heated up start-up's investment, where the biggest challenges are definition of investment valuation assumptions (IVA) forecasts. In the start-up valuation reports recently carried out by me, used principles of IVA Forecasts Conceptual Model, and the findings were quite satisfactory.

Topic 6.3. below, it reveals our suggestions for the implantation of the IVA Forecasts Conceptual Model composed of 8 activities distributed in two steps.

6.3. IVA Forecast Conceptual Model: Application Steps

After the research was concluded, it became clear that there are crucial cognitive mechanisms (mental shortcuts) that directly the investment valuations and decisions. These mechanisms are directly influenced by principle of heuristics and biases (see topic 2.4.1) following their principles and standards. The mechanisms consist of the resources suggests by experts to improve the investments valuations models and processes. The recommend practices to improve investment valuations and decisions, when sequenced in activities, correspond to the investment valuation assumptions (IVA) forecasts model applied, as show in Figure 26.

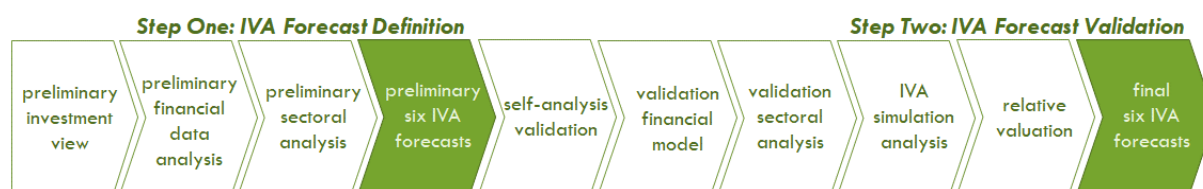


Figure 19 IVA Forecast Conceptual Model applied

Source: the Authors

In Figure 26 observed the two steps of IVA Forecasts definition, divided into eight activities. The first step called “preliminary six IVA Forecasts” (section 6.3.1. Step One - IVA Forecast Definition) structured three groups of activities until find a initial fair value. The second step called "final six IVA Forecasts" (section 6.3.2. Step Two - IVA Forecast Validation) was defined with five groups of activities, which aim to validate or correct initial fair value findings. The next topics it will be detail the two steps in eight activities that make up the IVA Forecasts Hybrid Model.

6.3.1. Step One - IVA Forecast Definition

This step aims get the preliminary six IVA Forecasts through of secondary activities presented in topics 6.3.1.1. Preliminary Investment View, 6.3.1.2 Preliminary Financial Data Analysis, 6.3.1.3. Preliminary Sectoral Analysis, and 6.3.1.4. Preliminary Six IVA Forecasts as we will see below.

6.3.1.1. Preliminary Investment View

In this phase, the financial analyst seeks to acquire a first overview of the investment. This can happen with physical inspections of assets when available, conversations with stakeholders and experts, document analysis, reports and presentations on the investment. The objective is to define which valuation model to apply, and which key performance indicators (KPI) should be used.

6.3.1.2 Preliminary Financial Data Analysis

Analyzing the historical key performance indicators (KPI) of the asset, and/or of similar investments, in this phase the financial analyst defines his first versions for the investment valuation assumptions (IVA) forecasts. To do so, follow the principles of availability heuristic by giving greater relevance to the most recent findings, and more live in the memory of market. Rules like using the average of the last 3 or 5 years, are recommended. These rules apply in NOPAT/revenues (operating margin), net capex/long-term assets, depreciation/long-term assets, revenue/capex, working capital/revenue ratios. These key performance indicators (KPI) served as the basis for defining the first IVA Forecasts.

6.3.1.3. Preliminary Sectoral Analysis

The objective of the phase is to make adjustments of the preliminary IVA. For such we use strategic, financial, and economic principles to adjust expected performance for revenues, operating margins, investment levels (capex and working capital), discount rates over the forecasts periods.

The corrections in IVA Forecasts are supported by strategic analyzes of the asset, and or similar investments, analyzes of market and economic trends, analysis of life cycle stages, of market forces, models developing business, aspects on financial fundamentals, and all applicable tools with analogous purpose of: understand the future behavior of IVA Forecasts. Will not be necessary to use all the tools, particularly at this stage. In subsequent phases, the same tools may be applied associated with more in-depth research.

6.3.1.4. Preliminary Six IVA Forecasts

Figure 27 presents summaries of the construction six IVA first step, distributed in three groups of activities, as well as the desired objective in each one of them.

Steps	Objective	Activities
preliminary investment view	get first impressions on investment, defining which better valuation financial model, and which key performance indicators (KPI) should be used.	self-analysis, criticize stakeholders' opinion and valuation assumptions, interviewing experts.
preliminary financial data analysis	find a preliminary version of the IVA Forecasts.	analysis of key performance indicators (KPY) and definition of the six IVA Forecasts.
preliminary sectoral analysis	to correct the IVA preliminary comparing the investment performance forecasts, and results expected to similar assets over life-cycle phases.	strategic analysis of investment and similar assets, using tools such as: Porter, SWOT, and BCG matrices, analysis of the life cycle phases, Canvas models, among others economic analyses.

Figure 21 Preliminary IVA Forecast construct activities.

Source: the Authors

As depicted in Figure 27, the three activities groups contribute to the formation of Preliminary six IVA Forecasts that will be applied in the Free Cash Flow to Firm (FCFF) model, obtaining a first and provisional fair investment value. The finding will be improved later, as we will see in topic 6.3.2.2. Step Two - Validation of VAT Forecast.

6.3.2. Step Two - IVA Forecast Validation

The objective of this step is the validation of six IVA Forecasts. This step of IVA Forecast Hybrid Model provides the secondary actions 6.3.2.1. Self-analysis Validation, 6.3.2.2. Validation Financial Model, 6.3.2.3. Validation Sectoral Analysis, 6.3.2.4. IVA Simulation

Analysis, 6.3.2.5. Relative Valuation, and 6.3.2.6. Final Six IVA Forecasts, with your objectives and applied tools, presented below.

6.3.2.1. Self-analysis Validation

The objective here is validation, or redefinition of IVA preliminaries. In this phase, we must avoid that euphoria or discouragement with the investment produce false cognitive, and affect the better forecasts. The financial analyst must use cognitive mechanisms that reveal the consistency and/or inconsistencies of the preliminary IVA Forecasts. This cognitive validation can be done associations by projected findings with prospects for the market and/or resources needed to obtain these findings. The financial analyst's questions should be asked for themselves, and/or for third parties, whether they are interested in the investment (stakeholders) or business experts. Questions such as:

- 1) is there demand to justify projected revenues?
- 2) are the operational expenditure projections consistent with the resources (wages, raw materials, management systems, logistical resources, tax rates) required?
- 3) does the installed capacity, and/or investments in expansion, support the revenue projections?
- 4) are working capital investment levels in line with suggested business policies?
- 5) is the projection time compatible with the type of investment?
- 6) is the cost of capital in line with what investors expect to get from similar investments?

6.3.2.2. Validation Financial Model

The objective is validation, or redefinition of preliminary IVA Forecasts by searching for inconsistencies in investment key performance indicators (KPI). The planned activities involve the search, analysis and comparing projected financial data for the investment and data of similar assets. Emphasizes to tools how cost analysis, IVA Forecast behaviors in perpetuity, consistency between revenues versus installed capacity, operational earnings versus revenues, NETCAPEX/revenues ratios, working capital/revenue ratios. When there is material misstatement, the financial analyst should investigate the reason. This consistency should also be considered for similar investments surveyed.

6.3.2.3. Validation Sectoral Analysis

The objective is validation, or redefinition of six IVA Forecasts revalidating inconsistencies (if any) between forecasts, and economics and finance theoretical principles, previously observed. Among the various analyzes suggested, in this phase emphasizes to the economic principles of the life cycle of investments. The Table 24 present expect behaviors of the IVA during life cycle phases.

Table 24 *Life cycle over-time IVA behavior analysis: What to expect?*

Six IVA Forecasts	Life Cycle Phases		
	start-up	accelerated growth	table growth
Revenues	low revenues, with small volumes and high prices	growing revenue, with growing volume and falling prices	table revenues, with table volumes and low prices
operating margins	negative margins, with opex > revenue, low volume with no allow dilution of fixed costs	growing margins, with growth in sales volume, and scale about fixed costs	positive margins, with larger scale about the fixed costs
net capex	high, with large capex and low depreciation	high, with capex > depreciation.	low, with capex close to depreciation
working capital added	high, following revenue growth	high, following revenue growth	low or zero, with constant revenues
during time	10 years forecasts, until the mature stage	5 years forecasts, until the mature stage	forecasts until useful life, or perpetuity to long-lived investments
cost of capital	high, with due to great risks at this stage	falling, with reduced risks	low and linear

Source: the Author

In addition to life cycle analysis, tools with SWOT matrix, Canvas model, or other analysis techniques can help validate the six IVA Forecasts of the model free cash flow to firm (FCFF). However, the use of life cycle analysis for the definition and validation of IVA Forecasts (Table 24) was the most frequent recommendation observed in the responses of the N=11 experts who participated in the application of the Delphi Technique (see section 4.5.1), impacting accordingly on all IVA Forecasts. If an IVA finding is far from the proposed in Table 20, and is still correct, the financial analyst can conclude that the investment will be very good, or very bad, at least in this specific IVA Forecast.

In investment valuation, even the number of competitors (players) is estimated with basis of the life cycle phases. What to expect? High concentration of players (e.g. three companies) in the start-up and Table growth phases, and greater dispersion of players (e.g. eighty companies) in the growth phase.

The concentration of players in the start-up phase is due to several factors, of which Emphasizes to the incipience market and business model, which keep entrepreneurs away. In the accelerated growth phase, both the market and business models are better defined, which added to the revenue growth forecast, attract entrepreneurs who create new companies. In the Table growth phase, the biggest players change their strategies from organic growth to through acquisition growth, reducing the number of competitors, and concentrating the sector's revenues. The reason for the concentration would be the economic value added by the synergies between investments. This is true that value creation is not always achieved. Business Week research published in October 2002 shows that 61 percent of companies that buy others have destroyed shareholder value (Week, B., 2002).

6.3.2.4. IVA Simulation Analysis

The objective this phase is validation of IVA, analyzing how changes in six assumptions (IVA Forecasts) impact the cash flows and investment value. Sensibility, scenarios, and Monte Carlo, are some of the analyses used in this phase. Among the experts' suggestions (see section 5.5.) it should be highlight the simulate scenarios shortening the forecast period of high-risk investment.

Simulation analysis provides the financial analyst with, among other things, insight into key performance indicators (KPI) behavior, and on investment valuation assumptions (IVA) bring greater impact for investment fair value.

6.3.2.5. Relative Valuation

The objective now is validation, or redefinition the six IVA Forecasts by comparing the finding obtained (fair value) with the get by other valuation methodology.

Relative valuation is methodology that estimates the investment value by looking for pricing of comparable assets. Using relations as 'enterprise value' versus 'EBITDA' (multiple EV/EBITDA), 'stock price' versus 'earning per stock' (multiple P/E), 'stock price' versus 'stock book value' (multiple P/BV), 'stock price' versus 'sales per stocks' (multiple P/S), the financial analysts have a second valuation of the same investment, just using a different methodology.

To validate investment fair value using relative valuation is necessary:

1. identify comparable investments and obtain the market value of these assets;
2. convert these market values into standardized measures (multiples);
3. compare market multiples with analyzed investment multiples, to judge whether fair value found is under or overvalued; and
4. when fair value is very different from get by relative valuation, the financial analysts must review IVA Forecasts to see if there are any inconsistencies. Highlight to cost of capital forecast, which tend have a large impact on the investment fair value.

This phase should be the last one, as it corroborates all the previous validation steps. It is suggesting that the relative valuation, when performed, be incorporated into the investment valuation report.

6.3.2.6. Final Six IVA Forecasts

Figure 28 presents summaries of the construction six IVA second step, distributed in five groups of activities, as well as the desired objective in each one of them.

Steps	Objective	Activities
self-analysis validation	prevent that false cognitive affect the better by IVA forecasts.	self-analysis, criticize stakeholders' opinion and valuation assumptions, interviewing experts.
validation financial model	searching for inconsistencies in investment key performance indicators (KPI).	analysis of financial performance indicators (KPI) projected from the FCFF model and comparison with KPI of similar investments.
validation sectoral analysis	validation, or redefinition of six IVA Forecasts looking inconsistencies between forecasts, and economics and finance theoretical principles.	life cycle analysis, tools with SWOT matrix, Canvas model, and other analysis techniques.
IVA simulation analysis	validation of IVA, analyzing how changes in six assumptions (IVA Forecasts) impact the cash flows and investment value.	Monte Carlo, sensibility, and scenarios analyses.
relative valuation	compare the result obtained (fair value) with the get by other valuation methodology.	relative valuation using multiples such as: EV/EBITDA, P/E, P/BV, and P/S.

Figure 22 Final IVA Forecast construct activities.

Source: the Authors

As we see in Figure 28, the five validation steps contribute to the formation of six IVA Forecasts used in the Free Cash Flow to Firm (FCFF) model, obtaining a final investment value fairness opinion.

6.4. Summary

To presenting our recommendations of implantation the investment valuation assumptions (IVA) forecast model, Chapter Six presented sections 6.1. Introduction, 6.2. Lessons Learned, 6.3. Managerial Recommendations, and 6.4. Summary.

Chapter 7

Conclusions, Future Research and Limitations

7.1. Introduction

In order to bring clarity to the thesis conclusions, recommendations for future research and work limitations, Chapter Seven begins with brief summaries of Chapters Two, Four and Five. Our initial conclusions come from the discussion of the subthemes presented throughout the study, bringing a new approach to the subjects addressed in the thesis. We continue with our recommendations for future research. Finally, the Chapter present the natural limitations of the research methods used and the specific limitations of the thesis. Thus, this Chapter presents the sections 7.2. Overview, 7.3. Discussion and Interpretation of Findings, 7.4. Academic and Managerial Contributions, 7.5. Research Implications, 7.6. Research Limitations, 7.7. Future Research, 7.8. Conclusion, and 7.9. Summary.

7.2. Overview

This section present the subsection 7.2.1 Chapter Two: Research Summary, 7.2.2 Chapter Four: Research Summary, 7.2.3. Chapter Five: Research Summary. The proposal further to better understanding of our conclusions, the limitations of research and recommendations for future academic work.

7.2.1. Chapter Two: Research Summary

The Chapter Two presented a literature review in relevant topics of 188 documents scientific and reports on the theme behavior finance, decision-make process, risk decisions, investments, cognition, heuristics and biases.

The Chapter Two studies a subject that is extraordinarily relevant to investment valuations and decisions, but still unexplored subject in the traditional finance literature. The literature review plan present Chapter Two developed the two research questions:

RQ#1: How do heuristics and biases work in investment valuation and decision?

RQ#2: How to use heuristics and biases to improve investment valuation and decision?

To answer this question, the work defined the main keywords that target articles related to the subject. They were heuristics, bias, judgment, risks and investments. Synonyms were used to broaden the search. After the planning part, the review began. First, the keywords were used to search articles on Google Scholar and EBSCO (a research database).

The first objective was to present traditional finance literature on risk investment, in its economic foundations, applications and trends. The literature reviews presented in this phase, contain principles widely disseminated by the academy and applied in the investment valuations and decisions of large companies and financial markets.

Then, an exhaustive search was carried out in the financial and economic literature on the influence of cognition on investment valuations, and decisions. In this phase, the literature review on cognition influence in risk investment decisions processes, it should be highlight the judgment heuristics and biases of Tversky and Kahneman (1971, 1973, 1974, 1979 e 1986), the Prospect Theory of Kahneman (1979), and Systems 1 and 2 of Kahneman (2017).

The second objective was to identify and create a theoretical framework that relates heuristics and judgmental biases to success in investment selection. Therefore, the second objective addressed this other issue to complement the body of knowledge in the literature, by trying to associate cognitive mechanisms with successes and failures in investments. Initially, the idea of the research was search for traits and patterns of intelligence in investment decisions. (2) As the literature has no conclusive content, the first search would be to identify the typical patterns of cognitive failures in decisions, what was accomplished in Chapter Four. (3) Quantifying any losses finding from these failures would be more complex, but was done in Chapter Four. (4) The research did not find framework that objectively explained how the cognitive factors affect investment decisions, not even any hybrid (rational and cognitive) model to investment valuation. The Chapter Two ends its conclusions by presenting a Table of answers to the research questions (see section 2.4), which can serve as a recommendation to improve investment decisions, as well avoid losses in investments caused by false cognitive.

In this way, the work added the interference of mental shortcuts to traditional financial literature. Suggestions have been also added to avoid investment losses associated with false cognitive interference.

After defining the research topic and finding a concise research gap, the work answered research questions. Furthermore, with all the theoretical parts accomplished, in work created a knowledge base for conducting targeted field research. This research was conducted in Chapter Three, and its summary can be seen in the following subsection.

7.2.2. Chapter Four: Research Summary

This doctoral thesis comprises three qualitative research methods that complement each other in a single project exploring the cognitive factors that affect the investments. The Chapter Four found how the anchoring heuristics and biases influencing the investment valuations and decisions. For this, a literature review on finance theories was carried out, highlighting anchoring biases affects in investment decisions. Initially, It should be highlight that rational investment decisions are made using the discounted cash flow (DCF). By method, the investment fairness opinion, keep the relationship to projected free cash flows (FCF) and discount rates (k), and follows a rational, slow, conscious, effort, implicit and logical valuation process in line with Kahneman's System 2 (2017). The Chapter detailed the free cash flow to firm (FCFF) method, used 'Hotel' fair value determine. The section of the literature review present the influence of Kahneman and Tversky's (1971, 1973, 1979, and 1986) heuristics and biases, on the investments valuation assumptions (IVA) forecasts, used in free cash flow to firm (FCFF) method. These were the theoretical bases used to support the analyzes and conclusions obtained in the 'Hotel' case study.

Given the subjective nature of the phenomenon studied, it was chosen for a qualitative research design, using a descriptive single case study on a buyer-seller negotiation transaction, considering Prospect Theory on a buyer-seller negotiation of 'Hotel'. The single case study involving financial decisions about Type I buyer-seller negotiation (Dias, 2020) between two parties and one issue negotiated. The case analysis unit is the 'Hotel' buyer-seller negotiation, involving the parties: 'Consultant,' 'Seller' and 'Buyer' using Yin (2018). Thus, an inductive and interpretive approach, combining multiple methods, including archival research and direct participation of the thesis author. The survey searches three survey answers (S.A.) for research questions (R.Q.):

RQ #1. How do ANCHORING heuristics and biases work in investment valuation and decision?

S.A. #1. The findings suggest that ANCHORING in the initial offer prejudiced the seller's decision on 'Hotel' by hiding from the said decision maker the evidences received after the buyer's initial offer of BRL 27.50 million, or USD 15.54 million. It was proven that the anchor also affected the 'Hotel' valuation process, leading the responsible analyst forecast growth of "unattainable" occupancy rates (one of the IVA), trying to find the value of buyer's offer.

RQ #2. How to use ANCHORING heuristics and biases to improve investment valuation and decision?

S.A. #2. According conclusions of Chapter Two (section 2.5.), the false cognitive caused by ANCHORING heuristics and biases are avoided with due diligence about first impressions, something that was not done by 'Hotel' owners, despite having hired an valuation service.

Thus, the research revealed relevant error in the decision to sell a 'Hotel' caused by cognitive failure motivated by anchoring bias. The aim of the survey was to highlight of cognition affects in investment decisions. Key findings of research pointed out an overprice in the buy-offer of 330 percent, causing anchoring bias, severely interfering in the valuation and decision sell processes of 'Hotel.' Among the findings of the case study, the most relevant for the conclusion of the thesis was the influence exerted by cognition on the investment valuation assumptions (IVA) forecasts. The survey find provides scholars, decision-makers, and practitioners with a new perspective on financial decisions influenced by the anchoring effect. The effects of cognitive shortcuts (judgmental heuristics and biases) in the process of investment valuation, it is the most important contribution to the structuring of the Conceptual Model presented in Delphi Technique applied in Chapter Four.

7.2.3. Chapter Five: Research Summary

As previously mentioned, the qualitative research presented in Chapter Five was prepared to complement the knowledge acquired so far and to conclude the doctoral thesis by connecting with previous survey. In summary, when advancing in the field of research, the Chapter Four "Anchoring on 'Hotel' Buyer-Seller Negotiation" revealed the effects of heuristics, biases and false cognitive on the six IVA used in forecast of free cash flow to firm (FCFF).

The Chapter start with theories on finance, decision-making, and affects of heuristics and biases in the investment valuations and decisions. It should be highlight the free cash flow to firm (FCFF) method, as well the effect of cognitive mechanisms on investment valuation

assumptions (IVA) forecast. The survey finds makes clear that, even though investments valuations are based on mathematical assumptions, their fair value is determined based in investment valuation assumptions (IVA) forecasts, where, IVA definitions it is the most cognitive part of an valuation report. In investments, heuristics and biases are cognitive mechanisms that bring intuitive, fast, and straightforward answers to valuation assumptions (IVA) forecasts, following Kahneman's System 1 (2017). The ultimate goal is to develop a Hybrid Conceptual Model (rational and cognitive) for investment valuations. Thus, the literature review of Chapter Four builds the basic framework of initial questionnaire applied in the Delphi survey, with questions about:

- which cognitive mechanisms improve the six IVA Forecasts, and
- how to prevent false cognitive from distorting the six IVA Forecasts.

Given the subjective nature of the phenomenon studied, it was chosen for a qualitative research design, using interviews for data collection with an interpretive approach. Our sampling strategy was a purposive sample combined with a criterion sample. The survey used Delphi method, following the principle of Linstone and Turoff (1975), Okoli and Pawlowski (2004), Bhattacharya (2011), Winkler, Kuklinski, and Moser (2015), and Yıldırım and Büyüköztürk (2018), Kaartemo and Nyström (2021). The Delphi method is particularly useful when very little data is available in the literature, but experts have relevant and valid inputs about the focus of the research (Bhattacharya et al., 2011).

It was chosen employed the Delphi method with interviewing and sharing answers of N=11 experts in the field. Candidates were chosen based on three main selection criteria:

- 1) Minimum of ten years of experience delivering investment valuations report;
- 2) Minimum of ten years of academic experience in financial theories;
- 3) Minimum of ten years of academic decision-making experience.

It should be highlight the candidate's profile with a high-level academic degree and extensive experience in consulting services. A total of 11 participants from different backgrounds, all based in Brazil and with at least 15 years of professional experience, were selected. All these experts were invited to participate in the Delphi study performed online between September 2022 and December 2022, with some sessions taking place over Zoom and others via phone. In all, the Delphi research had three rounds until the experts could reach a consensus. The experts brought desired diversity to the study, given your different roles and backgrounds.

Conceptually, it was defined of cognitive mechanisms with techniques, analyses, activities, practices, processes or events mental that can be used to support choices and

decisions. The research extract revealed 15 cognitive mechanisms used by experts to "improve the quality of six IVA Forecasts", and other 15 mechanisms used by them to "prevent distorting the six IVA Forecasts" as false cognitive results.

In the conclusions of the topic dedicated to Delphi research, a summary Table was presented associating the cognitive mechanisms found in the survey with the six investment valuation assumptions (IVA) forecasts. The findings served for construction of Conceptual Model to investment valuation assumptions (IVA) forecasts in two steps:

- a first step using cognitive mechanisms to produce an initial fair value, and
- a second step of validation IVA Forecasts.

The research findings provided valuable evidence on several previously identified gaps in the academic literature, supporting practitioners and academics in preventing false cognitive in investment valuation assumptions (IVA) forecasts. The Conceptual Model IVA Forecast understands the influence of heuristics and biases in the six IVA Forecasts used in the FCFF method, and add cognitive mechanisms to improve the IVA Forecasts and of fair value (fairness opinion). The fairness opinion value definition, in the application of the IVA Forecast Conceptual Model, recommend use in two-stages. The first stage creates intuitive, fast, and straightforward responses to the forecasts, using cognitive mechanisms and following Kahneman's System 1 (2017) principles, maximize specific knowledge and skills of financial analysts. The Conceptual Model IVA Forecast understands, also, the phenomena of false cognitive in fair value (fairness opinion), add rational validations mechanisms to improve the IVA Forecasts used in the FCFF method.

7.3. Discussion and Interpretation of Findings

This section presents the emerging themes, compiling the following divisions: section 7.3.1. Theme One: Risk Investment Decisions; section 7.3.2. Theme Two: How Anchor Affects Investments; Section 7.3.3. Theme Three: Kahneman's Systems and Investment Valuation Assumptions (IVA); and finally, Section 7.5.4. Theme Six: Hybrid Conceptual Model for IVA Forecast.

Each theme also provided subthemes secondary, namely in topics 7.3.1.1. Risk Decisions, 7.3.1.2. Financial Theories on Investments Decisions, 7.3.1.3. Cognition, Heuristics, Biases, and Judgment Theories, 7.5.2.1. Rational Investment Decisions and Kahneman's System 2, 7.3.2.2. Anchor Effect on Investment Valuations and Decisions, 7.3.3.1. How Cognition Affect Investments Valuation Assumptions (IVA), 7.3.3.2. IVA fs and Cognitive

Mechanisms, 7.3.4.1. Six IVA Forecasts: Definition and Validation, and 7.3.4.2. Investment Valuation (IVA Forecasts) Conceptual Hybrid Model, as we will see below.

7.3.1. Theme One: Risk Investment Decisions

This theme compiling the following divisions: 7.3.1.1. subtheme - Risk Decisions, 7.3.1.2. subtheme - Financial Theories on Investments Decisions, and 7.3.1.3. subtheme - Cognition, Heuristics, Biases, and Judgment Theories.

7.3.1.1. Subtheme Risk Decisions

The theme combines the risk decisions and the relevance on decision systems theories. According to the literature, risk decisions are those with unknown findings and must be makes rationally based on principles of expected findings (Bernoulli 1713) and Utility axioms (Neumann and Morgenstern, 1944). The literature also highlights that, scientifically, these decisions can be makes, into extremes, as follows: (a) in a more intuitive, fast, informal way, without efforts, following the Kahneman's System 1 (2017), or (b) in a rational, slow, formal, with efforts, thus following the proposition of Kahneman's System 2 (2017).

Such conclusions were reached by analysis of concepts presented in relevant topics of 94 scientific texts on decision-making, risk decisions, investments, cognition, heuristics and bias. These principles will guide the investment valuations and decisions.

7.3.1.2. Subtheme Financial Theories on Investments Decisions

Risk Investments Theories follow UE principles by Bernoulli (1713), Neumann and Morgenstern (1944), Markovitz diversification (1952), Sharpe's asset pricing (1964), and Fama's efficient markets (1970), to determine with the investment's selection should be done, in the light of traditional finance theory.

By financial traditional theories, the rational choice of investments is made analyzing mathematical parameters such as: payback time, internal rate of return (IRR), and net present value (NPV). The research give highlight also, to Fama's (1970) efficient markets Assumption, were the economic values (EV) of investments should be related to future expectations of return. Following Fama's principles, decisions about investments must be related utility produced for their owners - measured by value - and not by market prices. Adding the postulates of Bernoulli (1713), Neumann and Morgenstern (1944) and Fama (1970), investment decisions

should maximize the Expected Utility for the investor, where EU is the present value of the free cash flows (FCF_t) expected for investors over time, known for terms like economic value (EV), fair value, or fairness opinion value, as presented in formula 6, below.

$$EV = \sum \{FCF_t / (1+k)^t\} \quad (6)$$

In subtheme (see section 2.3.2 Weaknesses of Risk Investment Theories), it should be highlight the fragility of the concept of rationality in investment decisions, confronting the rationality of economic agents, implicit in Fama (1970), and cites example, with Mason, Botelho, and Harrison (2016) about sophisticated models that failed when they tried to assess the potential fair value of venture capital investments.

The subtheme ends citing Bazerman (2012), who reveals cognitive shortcuts that our brains use to make decision, as well they point to common mistakes that even brilliant people make on a regular basis. As cognition arises even imperceptibly, the best would be then use of hybrid descriptive models combining: (a) the reasoning of the prescriptive models, and (b) the cognitive experiences obtained from previously lived events.

Thus, in the subtheme 7.3.1.2. on Cognition, Heuristics, Bias, and Judgment, dealt with the psychological function of seeking for evolution of knowledge through experiences, creating mental shortcuts used investment valuation and decisions.

7.3.1.3. Subtheme Cognition, Heuristics, Biases, and Judgment Theories

The subtheme Cognition, Heuristics, Bias, and Judgment starts with the cognitive processes' definition, describe as psychological function search by knowledge in senses, and experiences. The section further clarifies that heuristics and biases are cognition-based simplifying rules used to support judgment and choice, and that choices are the finding of mental processes of judgment and selection by preferences. Thus, the human judgment makes cognitive evaluation of elements that support the selection of the "best choice". However, inconsistencies in mental databases can lead to inappropriate decisions.

Next, the subtheme presents the principles theories on cognitive decision-making process, highlight Simon's Assumptions (1946, 1955, 1957, and 1966), heuristics and cognitive biases (Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986), and Prospect Theory (Kahneman, 1979). Finally, the mental shortcuts (heuristics and biases) used in the judgment that were revealed by Tversky and Kahneman are described, as well as the influences of these heuristics and cognitive biases on investment decisions.

With this, the work compiles the literature on rational and cognitive decision-making investment processes. The objective was answering the research questions about investment valuations, and decisions, to proposing lines for future studies, and criteria for the analysis and filtering of findings. The evidence suggests, therefore, that this thesis is contributing with field literature to improve the judgment of corporate investments.

7.3.2. Theme Two: How Cognition Affect Investments

This theme compiling the following divisions in topics: 7.3.2.1. subtheme - Rational Investment Decisions and Kahneman's System 2, and 7.3.2.2. subtheme - Anchor Effect on Investment Valuations and Decisions.

7.3.2.1. Subtheme Rational Investment Decisions and Kahneman's System 2

The section start presenting the economic principles that support the method most used in investment valuations: discounted cash flow (DCF). The topic also clarifies that the investment decisions support each other in cash flows forecasts, and the discount rates that supply models DFC. And that, the investments valuation assumptions (IVA) that support the DFC models are obtained more often through processes rational, slow, following the proposition of Kahneman's System 2 (2017).

The section highlighted the influence of cognition in definition six IVA Forecasts, used in Free cash flow to firm (FCFF). The FCFF model was used to define fairness opinion in 'Hotel' case, as we saw in Chapter Three, of this Thesis. The association in between the traditional investment valuations processes (DFC Models), and the cognitive influence in the six IVA Forecasts definition used in 'Hotel' fairness opinion definition, was determining to conceptual Hybrid Model development, basis for this Thesis, and reveal in Chapter Four.

7.3.2.2. Subtheme Anchor Effect on Investment Valuations and Decisions

The subtheme was present along of Chapter Four, and aim demonstrate the relevance of theme: How Anchoring Affects Investment. The topic did descriptions on the heuristics and judgment biases of Tversky and Kahneman (1971, 1973, 1974, 1979, and 1986), highlighting the Anchoring effect in the investment decisions.

Through of a descriptive single case study on 'Hotel' buyer-seller negotiation, we witness a real situation where a Anchoring severely interfered on the investment valuation and

decision. In the subtheme the dilemmas and behaviors of owners and consultants were described during of valuation and sale negotiation a 'Hotel'. One of the authors ('Consultant') participated directly of process.

In 2007, the 'Consultant' presented the fair opinion of 'Hotel' that would support the 'Seller' decision. The initial buyer offer was of BRL 27.50 million (approximately USD 15.54 million), but the due diligence process revealed tax contingencies reducing the bid to BRL 21.3 million (approximately USD 12.03 million). The of the valuation made by 'Consultant' led to a fairness opinion value of BRL 8.34 million (approximately USD 4.71 million), then the 'Hotel' should be sold. However, the difference between the buyer's initial bid amount and the net bid amount caused the seller to walk away from the deal, although there was a large margin on top 'Hotel' fair opinion value.

Additionally, the difference between values, made that the 'Consultant' redid the valuation many times, trying to find the initial buyer offer value (27.50 million, approximately USD15.54 million). In this search by the value of the purchase offer, the 'Consultant' simulated Scenarios with increases in the occupancy rates of the 'Hotel', that can be considered immaterial. In just one Scenario with a high growth, and very unlikely to be achieved, the fairness opinion (BRL 24.53 million, approximately USD 13.86 million) surpassed the net bid of BRL 21.30 million (approximately USD 12.03 million). Thus, demonstrating how analysts' cognition lead to the manipulation of Investments Valuation Assumptions (IVA) forecasts, the subtopic presented fundamental elements to construction the investment valuation Hybrid Conceptual Model.

The "anchor weight" also impressed when the 'Hotel' was sold in 2018 per BRL 27.5 million (approximately US\$ 7.10 million), the same value in BRL of 2007. If the liquid offer to purchase the Hotel in 2007 had been accepted, the sellers would have had, in 2018, approximately BRD 71.12 million, or USD 18.35 million, invested the BRL 21.30 million in 2007 in public bonds issued by the Brazilian government. The decision error committed by owners of the 'Hotel' consider only financial theories.

7.3.3. Theme Three: Kahneman's Systems and Investment Valuation Assumptions (IVA)

This theme compiling the following divisions: 7.3.3.1. subtheme - How Cognition Affect Investments Valuation Assumptions (IVA), and 7.3.3.2. subtheme - IVA Forecasts and Cognitive Mechanisms.

7.3.3.1. Subtheme How Cognition Affect Investments Valuation Assumptions (IVA)

This subtheme was developed in topics 4.2. 'Hotel' Buyer-Seller Negotiation: Context, Findings and Analysis, and 4.3. 'Hotel' Buyer-Seller Negotiation: Implications and Discussion of Chapter Four, and in topics 5.1. Chapter Introduction and 5.2. Effect of Kahneman's Systems on Investment Valuation Assumptions (IVA) Chapter Four this the thesis.

The subtheme describes how rational mathematical investment decisions models are based on assumptions defined by analysts naturally influenced by their cognitions. The investment valuation assumptions (IVA) forecasts are the part more cognitive of investments decision processes.

The theme clarifies that cash flows forecast are defined in rational, slow, and complex processes. However, heuristics and biases can create intuitive, fast, and direct to cash flows forecast. These cognitive mechanisms (heuristics and biases) are often used in start-up valuations, or when on investment information are expensive, or even, do not have a good relationship with expected future findings. False cognitive are found when failures in cognitive mechanisms lead to poor investment valuation assumptions (IVA) forecasts. These conclusions are used in the subthemes six IVA Forecasts and Cognitive Mechanisms.

7.3.3.2. Subtheme IVA Forecasts and Cognitive Mechanisms

The finds of before subtheme led to recommending the construction a theoretical model to improve IVA Forecasts and reducing false cognitive. In the Chapter 4 of thesis, as was presented questionnaire with six questions on: (1) "Which cognitive mechanisms can be to improve the six IVA Forecasts?", and other six questions on (2) "How to prevent false cognitive from distorting the six IVA Forecasts?"

The survey by Delphi method interviewed N=11 experts in investments and decision-making. Answers from N=11 experts were shared among respondents over two rounds until consensus was reached. Summarized, according experts the cognition interferes in IVA Forecasts when: (a) restricts, or expands, the historical data analysis period, (b) accept, or reject, opinions by third parties, (c) apply, or not, specific techniques to validation of IVA Forecasts.

In total, the experts suggested by consensus 15 cognitive mechanisms (1) "to improve the six IVA Forecasts", and other 15 cognitive mechanisms (2) "to prevent false cognitive from distorting the six IVA Forecasts". These lists were the basis for building the IVA Forecast

Conceptual Model, as we will see in Theme Four: "The Revised Investment Valuation Hybrid Model."

7.3.4. Theme Four: Hybrid Conceptual Model for IVA Forecast

This theme compiling the following divisions in topics: 7.3.4.1. subtheme - Six IVA Forecasts - Definition and Validation, and 7.3.4.2. subtheme - Investment Valuation Assumptions (IVA Forecasts) Conceptual Hybrid Model.

7.3.4.1. Subtheme Definition and Validation of Six IVA Forecasts

The subtheme starts with the finds present in section 5.5. Delphi Research: Discussion, Implications, and Conclusions, basis of Conceptual Model development presented in this Thesis, comes of inputs extract produced by the N=11 experts' participants of Delphi. The initial questionnaire had twelve questions on the six IVA Forecasts. The questions were divided into two groups of cognitive mechanisms for: (a) improve the six IVA Forecast, and (b) to prevent false cognitive from distorting six IVA Forecasts.

Were three rounds, with answers merged and clustered, until obtained consensus. The cognitive mechanisms - techniques, analyses, activities, practices, or processes - produced a list of first-order finds with 15 mechanisms to improve the six IVA Forecast, and other 15 mechanisms that reduce false cognitive in IVA Forecast. All cognitive mechanisms suggested by the interviewed experts are supported by mental shortcuts (heuristics or biases).

Adding cognitive mechanisms, the model improved the IVA Forecasts and of fair value (fairness opinion). However, in certain cases, such as start-ups valuations where obtaining investment data proves to be impossible, these benefits should be bigger.

The cognitive step of the IVA definition provides a provisional fair value, produced in an intuitive, fast, and simple process, following principles of Kahneman's System 1 (2017). However, the pooled compilation of responses about as "prevent false cognitive", suggest the use of tests (mechanisms) of validation to create, finally, value fairness opinion. The validation step of the Conceptual Model, would be more rational, slow and complex, in line with the principles of Kahneman (2017). The subtheme 7.3.4.2. follows, describes the step-by-step application of the IVA Forecast Conceptual Model.

7.3.4.2. Subtheme Investment Valuation Assumptions (IVA Forecasts) Conceptual Hybrid Model

In section 5.3. Overview of the Outputs from the First and Second Round, Chapter Four of Thesis, presents the mechanisms list that can improve investment valuation assumptions (IVA) forecast (see 6.3. Managerial Recommendations). The Conceptual Model suggests application of these support mechanisms in two steps: (a) in first IVA Forecasts definition to create provisional fair value, and (b) in IVA Forecasts validation to create, finally, value fairness opinion. Table 25 reveals the mechanisms suggest by experts in defining six IVA Forecasts, equivalent to the first step application of Conceptual Model, to create provisional fair value.

Table 7 IVA Forecasts Definition - Step One

IVA Forecast definition	Revenues	operating margin	net capex	working capital	Period	cost of capital
based on historical data	X					
based on similar business	X	X	X	X		X
corrections by life cycle stages	X	X	X	X	X	X
corrections by economic cycles	X	X				
based on average last 3 years		X	X	X		
based on net capex/long-term assets			X			
based on depreciation/long-term assets			X			
based on revenue/capex			X			
based on working capital/revenue				X		
based on changes market forces				X		
lifetime of the investment					X	
limiting growth in perpetuity					X	
cutoff date to investments higher risk					X	
flat discount rates over time						X
adds rates for smaller businesses						X

Source: the Author

Table 26 reveal the mechanisms suggest by experts in validation six IVA Forecasts, equivalent to the second step application of Conceptual Model, to create, finally, value fairness opinion.

Table 26 IVA Forecasts Validation - Step Two

IVA Forecast validation	revenues	operating margin	net capex	working capital	Period	cost of capital
life cycle over-time IVA behavior analysis	X	X				
perpetuated IVA Forecast analysis		X	X		X	
IVA simulation		X		X		X
relative valuation method						X
competitive market forces analysis		X	X			
self-analysis	X					
criticize stakeholders' assumptions	X					
interviewing experts			X		X	
benchmark analysis	X					
competitor commercial analysis	X			X		
installed capacity analysis			X			
market share analysis	X					
cost structures analysis		X	X			
working capital/revenue analysis				X		
cutoff date to FCFF forecast					X	

Source: the Author

7.3.5. The Revised Conceptual Framework

The section revised the initial framework of topic "Discussion and interpretation of findings". After exhaustive analysis of Chapters Two, Four, and Five, the section 7.3. presented the themes, and subthemes reveals throughout the Thesis, and basis for building of Conceptual Model IVA Forecasts. This revised conceptual framework shows how the independent theories were interconnected to develop the conceptual IVA Forecast model.

The section 7.3.1. presented the field literature review on economic theories applied to risk decisions, adding cognitive aspects to the financial principles that support investment decisions. Finally, the section incorporated theories about decision-making processes. With the theoretical basis provided by the previous phase, the section 7.3.2. used qualitative method of case study, to assess the influence of cognition on investment valuations and decisions. Considers findings obtained by the case method, the section 7.3.3. presented the findings of the

Delphi research on the cognitive mechanisms used in the projection of IVA Forecasts. Using the list of findings from the previous sections the section 7.3.4. revealed the application of the IVA Forecast Conceptual Model, which proposes the investments valuation in two steps: the first, finding a preliminary fair value, and second with validation of the six IVA Forecasts to finally find the Fairness Opinion value.

7.4. Academic and Managerial Contributions

The contributions of this thesis partially fulfill the DBA standards, as illustrated in Figure 1 and section 1.10, whereas the contribution, according to the Gioia methodology, was considered to be (a) incremental and (b) practical, regarding originality and utility, respectively (Gioia, D. and Pitre, 1990).

Our study sought to complement the body of knowledge in the literature by answering previously unexplored questions of extreme relevance to academia and business. As mentioned previously in section 1.5.2, the thesis identified research gaps in the literature related to the cognition influence on investment valuations and decisions. This paper contributed to filling that gap by addressing three main points through the research questions and answering them.

The first point of contribution was directed at academia. The Chapter Two updated the literature review of risk investment decisions since the Economic Utility until their axioms, presenting traditional investment valuations techniques based on discounted cash flow method, and conclude with the influence of cognitive mental short-cuts on investment decisions.

The second contribution was intended for both academia and business. A descriptive single case study was carried out, where the findings showed that the anchoring bias severely interfered in the valuation and sale of 'Hotel.' The study provided scholars, decision-makers, and practitioners with a new perspective on financial decisions influenced by the anchoring effect. The survey also highlighted the influence of cognition in defining the six IVA Forecasts used in investment valuations by Free Cash Flow to Firm (FCFF) model.

The third contribution is also intended for academia, and comes from the contributions of N=11 experts on mechanisms to improve the six IVA Forecasts and avoid errors in valuations and investment decisions caused by false cognitions. In total, were 15 mechanisms for improve the IVA Forecasts definition, and other 15 mechanisms for avoid error induced by false cognitive.

The identification of these practices filled a previously unaddressed theoretical gap. Through this identification, it was possible to suggest practices for the generation of tools for improve the investment valuations and decisions. This practical knowledge is helpful for organizations to set up strategies to optimize their investments findings, in start-ups investments decisions.

Given the information previously mentioned, this doctoral thesis contributes to academia, filling gaps in theory. It also contributes to the business segment by providing critical information that allows greater accuracy in investment valuation reports and optimizing the efforts of financial analysts.

7.5. Research Implications

This study was designed to highlight the influences of cognition in investment valuations and decisions through a qualitative multiple-Methods approach as previously described (see section 1.8). This design was conceived in three qualitative research methods that (1) reviewed the field literature on finance and decision-making processes (see section 7.2.1), (2) allowed to visualize the anchorage in the purchase and sale of the Hotel (see section 7.2.2), to (3) structure the research questionnaire (see Section 7.2.3) that finally led to building the IVA Forecast Conceptual Model (see sections 6.3.).

The literature review contributed to giving visibility to the influence of mental shortcuts on investments. From a theoretical point of view, Chapter Two, showed aspects of human behavior in financial valuations and investment decisions. Emphasizes to the theories about heuristics and biases (Gigerenzer 1996 and 1997, Gigerenzer and Goldstein 1996; Kahneman and Tversky, 1974), decision-make (Kahneman's 2017), and finance and economics (Bernoulli, 1713; Fisher, 1930; Neumann and Morgenstern 1944; Markovitz, 1952, Gordon and Shapiro 1956, Sharpe 1964, Fama, 1970, Cox and Ross 1976, Markov 1884, Merton 1976, Pindyck 1999, and Schwartz and Smith 2000).

Individually, the literature review recommended actions to minimize the adverse effects of judgmental heuristics and biases (see section 2.4.), providing support for improving investment decisions. One must highlight the extrapolations based on market efficiency theory Fama's (1970) and bounded rationality Simon's (1946 and 1955), which lead to reaffirm that there are no legal implications to the judge for investments losses caused by information ignored until the "moment of decision" (see sections 2.4. and 2.5.).

Thus, the literature review connected mental shortcuts and investments. The approach enabled first-order findings on the anchoring effect in 'Hotel' buyer-seller negotiations giving space to observe the behaviors of investment judges and even verify economic losses caused by anchoring (see sections 4.2. and 4.3). However, the most relevant finding from the 'Hotel' case was the clues to how the ix IVA Forecasts used in valuations by free cash flow to the firm (FCFF) are affected by the cognition of financial analysts. In section 4.4, we show that cognition anchor suggesting immaterial assumptions (IVA) for occupancy rates for scenarios 2 and 3 of the 'Hotel' valuation, as a way of seeking the buyer's value offer. This foundation supports the IVA Forecasts Conceptual Model.

Finally, the conclusion of Delphi research applied in Chapter Five, proposes the use of cognitive mechanisms suggested by N=11 experts on financial and decision-making. The purpose of the Conceptual Model is to shape investment valuation assumptions (IVA), creating an agile and reliable investment valuation process (see sections 5.5. and 6.3.). The Conceptual Model IVA Forecasts brought a new perspective by demonstrating directly how false cognition interferes with the valuation and fair value definition of investment. These observations have several implications for research into different fields, such as (i) valuation of start-ups, (ii) projects valuation, (iii) stock pricing, (iv) private company valuations, (v) new business budgeting models, (vi) new perspectives on the legal liability of financial analysts and investment decision makers. The Table 27 present the thesis contributions.

Table 27 Thesis Contributions

Theme	Author	Description	Thesis Contributions
Bounded rationality and Efficient-market hypothesis	Simon et al. (1946, 1955 and 1987) and Fama (1970)	Bounded rationality suggest that individuals make decisions under partial information conditions. The efficient-market hypothesis states that asset prices reflect all available information.	considers the theories and case study finds, it is stated that decision-makers are not legally responsible for losses caused by ignored information until the investment decision moment.
Prospect Theory, Heuristics and biases of judgment	Tversky and Kahneman, 1971, 1973, 1974, 1979 and 1986	mental shortcuts find by authors form the basis of theories on behavioral economics	case study findings that link mental shortcuts effects in investment valuation and decision
Decision models	Kahneman 2017	two decision models: "System 1" fast, instinctive and emotional; "System 2" slower, deliberative and logical	Conceptual Model of Investment Valuation Assumptions (IVA) Forecasts with two steps, combining Kahneman's Systems 1 and 2

Source: the Author

7.6. Research Limitations

This section presents the research design and methodological limitations summary. Firstly, this work is limited to the inductive rationale and interpretive approach, restricted to multiple qualitative methods, such as direct observation and participation, qualitative interviews, and archival research, as outlined in Chapter One (see sections 1.8 and 1.11).

This study is compiled of three qualitative research methods. The first method (see section 1.9.1) is limited to archival research on finance and decision-making process. Literature reviews only offer support for the collection and structuring of forgotten data, and or, support for future research, in this case, that seek validation for the preliminary conclusions obtained (research responses) in this study. Literature reviews collect data in order to identify, select and critically evaluate relevant aspects of research questions. Based on the principles of Cooper (2003), six elementary taxonomies of a literature review, as Table 28, are identified.

Table 28 *Taxonomies of literature review*

Characteristic	Category
Directions	search of findings
	research methods
	theories, practices and their applications
Objective	integration (generalization of concepts; conflict resolution; building of a linguistic bridge)
	criticism
	pointing out central issues
Perspective	neutral representation
	union of views and position
Coverage	wide
	wide with selective citation
	representative
	central or fundamental
Organization	Historic
	conceptual
	methodological
Target	scholars specialized
	general scholars
	practitioners or policymakers
	general public

Source: adapted from Cooper 2003.

The Literature Review of the field presented, brings visibility to the current academic literature on economic principles applied in risky investment decisions, heuristics and judgment bias. The objective was to identify gaps in the traditional methodologies used in the choice of corporate investments. However, the publication has natural limitations, some of which have already been identified.

It should be also highlight that the research prioritized electronic searches of articles, most of them in the public domain, thus excluding other important Sources of consultation, whether public or private. It is, therefore, a conceptual theoretical survey of review and analysis of the literature with wide coverage of selective citations, and not of full coverage of the bibliography of the field.

The literature review was limited to heuristics and judgment bias presented by Tversky and Kahneman (Representativeness, Availability and Anchoring) and Kahneman (Framework). Recent research has revealed evidence of the presence of other heuristics and judgment bias, disregarded in these studies because they are not clearly associated with the principles of Bernoulli's EU (1713), Neumann and Morgenstern's axioms (1944). Thus, the conclusions of literature review presented in Chapter Two is limited to the current epistemology on the financial literature, decisions-making theories, heuristics, and cognitive biases of Tversky and Kahneman (1971, 1973, 1974, 1979 e 1986), Prospect Theory of Kahneman (1979), and System 1 and 2 of Kahneman (2017). Finally, the bibliographical research prioritized electronic searches by articles public Sources mostly from, thus excluding other vital bases of consultation, whether public or private.

The second method (see section 1.9.2.) is restricted to qualitative case study method, with direct participation, and observation approaches, limited to restrictions derived from these qualitative method, some highlighted bellow. In case study of Chapter Four, the unit of analysis and the case of sale of the Hotel in 2007 and 2018 are limited to this work. Case studies have specific conclusions for the analyzed context. So, the major limitation of the work conducted isn't in the methods employed but in extrapolating the findings obtained for the universes of decisions, even for similar units in object and period. Furthermore, the alleged decision mistakes had support restricted in financial Theory, thus disregarding other potentially relevant aspects to business, society, and others. Moreover, the research justified supposed financial error only due to Kahneman and Tversky's anchoring bias effect, disregarding other potentially

relevant aspects. This research is also limited to (a) Investment in Brazil, and (b) Cognition influence in investment valuation e decisions. Other on Investment valuations and decisions constructs are not part of this research and should be investigated in separate, as mentioned in Chapter One (see section 1.11).

The specific conclusions getting on case study of sale of the Hotel (Chapter Four) are limited for the context analyzed in this work. Extrapolating on the findings obtained for the universes of decisions, even for similar units in object and period, should not be considered. Highlight to alleged decision mistakes had support restricted in financial Theory, thus disregarding other potentially relevant aspects to business, society, and others. Moreover, the research justified supposed financial error only due to Kahneman and Tversky's anchoring bias effect, disregarding other potentially relevant aspects.

The conclusions obtained in the Chapter Four are limited to applying the Delphi Technique, and other types of research are not part of your scope. The work is restricted to the raw data of the N=11 interviewees, and the findings are limited to topics of investment decision-making. Other topics are separate from the object of this work.

The third method (see section 1.9.3.) applied Delphi Technique. In this sense, the interviews were also limited to a semi-structured interview construct. The invitations are limited to e-mail submissions. Finally, the findings and conclusions are limited to the primary data collected from the qualitative interviews (see section 3.4.). The work is limited to the economic environment of Brazil, and the same research in other regions is separate from the object of this work. The qualitative in-depth interviews of Chapter Five, were limited to questionnaires, and to the availability of the interviewees in participating the research. 100 percent of the interviews were dispensed, coded and further analyzed in Brazilian Portuguese. The work is limited to the raw data of the N=11 interviewees, their skills, backgrounds and knowledge areas, and other databases are not part of the scope. The findings of the survey are limited to topics investments decision making. Other topics are not the object of this work. The work is limited to the economic environment of Brazil, and same research in other regions are not the object of this work.

The conclusions obtained in the survey are limited to the application of the Delphi Technique, and other types of research are not part of the scope of this work. The Chapter does qualitative research with inductive logic. Studies using quantitative methods and deductive logic, are not part of the scope of this work.

Table 29 illustrates aspects of the researches applied in Chapter Two, Four and Five, with findings and conclusions are limited to the primary data collected from the qualitative interviews (see Chapter Three).

Table 8 *Limitations of research*

Chapters	Limitations
Chapter Two	the research is limited available databases. The investment valuations and decisions are only supported by finance theories, heuristics and biases (Tversky and Kahneman, 1971, 1973, 1974, 1979, and 1986) and Prospect Theory (Kahneman, 1979).
Chapter Four	The case study was limited to analysing the database provided by the consulting firm and other data available in newspapers. Other factors and databases on case, were disregarded. The data of this research is limited to the Brazilian investment scenario. Also, the data is limited to the observations of one single case.
Chapter Five	The Delphi survey data collection was conducted until September at December 2022. Therefore, new factors can appear after this period of time. The data of this survey is limited to the Brazilian investment scenario, as well as being limited to the experiences, knowledge, and interactions between the N=11 experts.

Source: the Author

7.7. Future Research

The section addresses some guidelines for future research, based in the findings presents in Chapters Two, Four, and Five. As Chapter Two reviews the theoretical literature review with analysis of concepts, it leaves us several gaps for future lines of research. From the particularly visible gaps in literature review of Chapter Two, to emerge 4 opportunities interconnected lines of research and 1 independent line of research, as described in Table 30.

Table 30 *Lines of future research based in literature review*

Kinds	Future research
Interconnected	research on the behavior of investment judges, construction of Hybrid Models to support investment decisions, measurement of the economic impact (EV) of the good use of judgmental heuristics, economic evaluation of losses (EV) caused by judgment bias.
Independent	extrapolations on the principles of “moment of decision”.

Source: the Author

Connected lines include: (1) application of survey to identify and measure cognitive traits of the judges' behavior; (2) construction of Hybrid Conceptual Models (RATIONAL and COGNITIVE) for the judgment of corporate investments; (3) structuring financial models for measuring economic gains (+EV) obtained by the use of cognitive intelligence in the trial of investments; (4) structuring financial models for measuring economic losses (-EV) caused by judgment bias. Connected research lines seek to identify, apply and measure the benefits of cognitive intelligence in investment judgments, bringing significant contribution to corporate decision makers.

The independent research line (5) would explore the principles, applications and legal implications of the moment of decision in investment judgments. Following Bernoulli's EU principles (1713), Neumann and Morgenstern (1944) axioms, diversification by Markovitz (1952), Allais risk aversion (1953), Gordon and Shapiro's perpetual horizon (1956), pricing Sharpe's assets (1964) and efficient markets of Fama (1970), it can affirm that there are no legal implications to the judge, for losses finding from information ignored until the moment of decision for an investment. Research lines seek to identify, apply and measure the benefits of cognitive intelligence in investment judgments, bringing a significant contribution to decision-makers.

Research lines of case study present in Chapter Four seek to identify, apply and measure the cognition effects in investment judgments, bringing a significant contribution to decision-makers. Finance decisions and business negotiations attract the attention of scholars, investors, directors, executives, and managers, in a practical sense of relevance. The descriptive single case study of Yin (2018) bridged visibility to the current academic literature on economic

principles applied in risky investment decisions, heuristics, and judgment bias. The objective was to identify gaps in the traditional methodologies in choosing corporate investments. This publication opens new ways for future research, highlight the surveys which associations cognition process in the investment valuation assumptions (IVA) forecasts definitions. This topic was developed in Chapter Five.

From a methodological point of view, although the objective of Chapter Five of create a Conceptual Model has been achieved, expanding the Delphi study to have further interactions with experts from different backgrounds and regions would be exciting avenue for future research, and would positively impact the internal and external validity of the researches, further building on the value of the model.

However, with the findings revealed in the researches, the surveys most obvious would be the quantitative researches to the validate constructs of:

- 15 types, that improve IVA Forecasts, and
- 15 types, that prevent false cognitive in IVA Forecasts.

In quantitative research application, interest conclusions, can be obtain, grouping the constructs raised in Delphi by types and classes:

- type 1 - (1st class) know and (2nd class) skills, and
- type 2 - (1st class) business strategies, (2nd class) financial forecast, (3rd class) stakeholder IVA, and (4th) self-analysis.

The Figure 29 alludes to process IVA Forecast construct validation – stages 1 and 2.

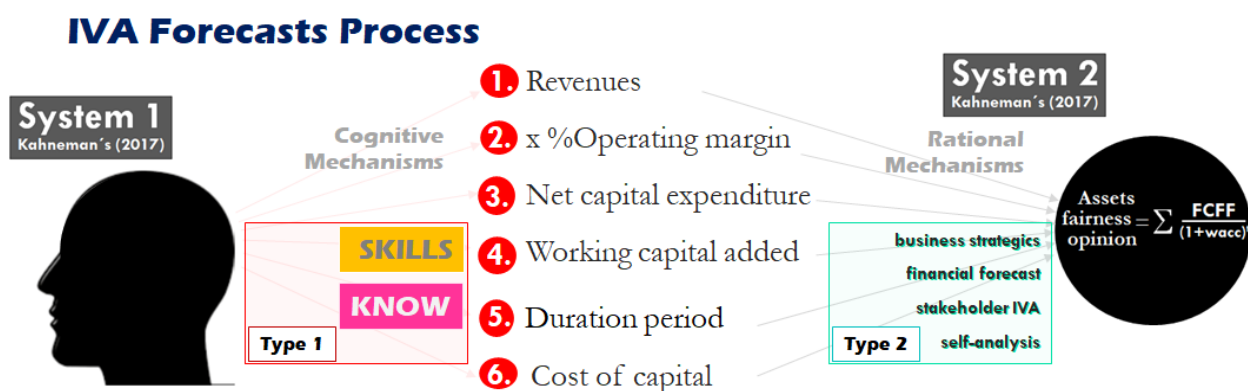


Figure 29 IVA Forecast construct validation – stages 1 and 2

Source: the Author

Whatever the path of research, there are many opportunities to develop smart cognitive mechanisms of investment valuation assumptions (IVA) forecast in future research. In spite of the qualitative methods applied to this work, there is possibly a statistically significant relationship between the cognitive mechanisms and investment valuation assumptions (dependent variable). Thus, it is recommended to test Assumptions quantitatively and applied to a random sample. Possibly there are more relevant influencing factors to be investigated, and our conceptual framework may be improved through these methods. Thus, it is encouraged the quantitative study of this phenomenon from the cognitive mechanisms' framework found in section 5.5. In addition, the investments valuation assumptions (IVA) can be tested through Exploratory or Confirmatory Factor Analysis, or through Structural Equations Modelling (SEM), or other quantitative methods, combined or not, to test the conceptual framework.

Qualitative surveys on other cognitive mechanisms (mental shortcuts) that help in investment valuations are also good lines of investigation. Others investigations of the cognitive mechanisms through mixed methods approach in different countries may contribute to improving the IVA Forecasts Conceptual Model or even recommend the development de other tools of investment valuation support. Perhaps in other scenarios or circumstances, the financial analysis and investment decision-makers behave differently. Therefore, further research is recommended on distinct scenarios, driving forces, and their implications.

The conceptual framework should also be investigated following longitudinal approaches rather than cross-sectional studies to understand the cognitive influence regarding investment valuations and decisions throughout time. Considering that this study was limited to the N=11 Brazilian experts, it is strongly encouraged verify to check the conditions of this study in others countries to see if there are similarities or divergences between the findings.

The IVA Forecast model covers the cognitive mechanisms used for investment valuation by the free cash flow to the firm (FCFF) method. Other cognitive mechanisms may help build investment valuation assumptions into other models, such as the free cash flow do equity (FCFE) model or the dividend discount model. The conceptual framework IVA Forecast should also be tested in different scenarios, such as (i) start-up valuation; (ii) project valuation; (iii) stock pricing, to name a few.

7.8. Conclusion

The objectives of this study were accomplished as outlined in section 1.4. filling gaps of literature, and improved the current epistemology on cognitive factors influencing investment valuations and decisions.

The research revealed four themes (see section 7.3.), deriving four work Assumptions to be investigated in future studies. In section 7.3.1 on the theme "Risk Investment Decisions" (see Chapter Two) found evidence that mental shortcuts influence in investment valuations and decisions. The section 7.3.2. "How Anchor Affect Investments" show that such influence can cause great damage to investments (see section 4.3. 'Hotel' Buyer-Seller Negotiation: Implications and Discussion). In section 7.3.3. the relationship between cognition and investment valuation found in 'Hotel' case, was the base of questionnaire applied in the Delphi survey (see Chapter Five) which suggest use of cognition mechanisms along investment valuations. In section 7.3.4. these cognitive mechanisms structured in the steps definition and validation of IVA Forecasts, which in theory improve investment valuations and decisions.

Thus, the two research questions posed in sections 1.7.1., and 1.7.2., were answered in sections 7.3.1, 7.3.2, 7.3.3, and 7.3.4. They are summarized as follows:

(RQ1) How do heuristics and biases work in investment valuation and decision?

The answer to RQ1 supported the current epistemology on cognitive influence in the investment, revealing that mental shortcuts affect valuations and decisions. The answer is supported by the evidence from 'Hotel' case study showed evidence of financial losses caused by anchoring.

(RQ2) How to use heuristics and biases to improve investment valuation and decision?

The answer to RQ2 was answered by pointing at fifteen cognitive mechanisms to definition and fifteen cognitive mechanisms to validation IVA Forecasts used in investment valuation by free cash flow to firm (FCFF) model.

Knowing better the interferences of cognition in the definition of the fair value of investments, we can develop more agile and reliable investment valuation models, whatever the type of asset analyzed. In section 6.3. it is detail the application of IVA Forecasts model. The conceptual framework of model was designed to incorporate the cognitive mechanisms and construct IVA Forecasts in two steps, the first fast get a preliminary fair value, followed the

second to validation and/or adjustment the fair value, in line with the systems 1 and 2 of Kahneman (2017).

This thesis conclusions recommends the use financial analyzes with greater intuitive interference, such as start-ups for example, the current conclusions and future findings on cognitive influence in investment valuations and decisions, can bring many benefits in the theoretical and practical fields of investment decisions. And, it is hope in the future this research should be replicated in different countries and scenarios, as discussed in section 7.7.

7.9. Summary

Section 7.2. Overview, section 7.3. Discussion and Interpretation of Findings, section 7.4. Academic and Managerial Contributions, section 7.5. Research Implications, section 7.6. Research Limitations, section 7.7. Future Research, section 7.8. Conclusion, and section 7.9. Summary.

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