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NISHAD MATAWLIE

Through Mind and Behaviour to Financial Decisions

$$\left(\frac{1}{q}\right)^q = \left[\psi\left(\frac{1}{q}\right)\right]^q \frac{1}{h} \frac{1}{h} \dots \frac{1}{h} \quad \left(1 + \frac{q}{n}\right)^{n+q} a = \psi\left(\frac{1}{q}\right) = \left[\psi\left(\frac{1}{q}\right)\right]^q$$

$$\sum_{k=0}^n a_k z^k \quad \left(\sum_{j=1}^n a_j y_j(x)\right)' = \sum_{j=1}^n a_j y_j'(x) \quad c = \lim_{x \rightarrow a} f(x), \quad d = \lim_{x \rightarrow a} g(x), \quad \left(\sum_{j=1}^n a_j y_j(x)\right)' = \sum_{j=1}^n a_j y_j'(x)$$

$$\lim_{x \rightarrow a} f(x), \quad d = \lim_{x \rightarrow a} g(x), \quad \left(\sum_{j=1}^n a_j y_j(x)\right)' = \sum_{j=1}^n a_j y_j'(x)$$

$$\lim_{n \rightarrow \infty} \left(\sqrt[n]{n+2} - \sqrt[n]{n}\right) = \frac{1}{e}$$

$$\left(\frac{1}{q}\right)^q = \left[\psi\left(\frac{1}{q}\right)\right]^q \frac{1}{h} \frac{1}{h} \dots \frac{1}{h}$$

$$\lim_{h \rightarrow 0} \log_n \left(\frac{x+h}{x}\right)^{1/h} = \lim_{h \rightarrow 0} \log_n \frac{x+h}{x} \frac{1}{h}$$



Through Mind and Behaviour to
Financial Decisions

Through Mind and Behaviour to Financial Decisions

Vanuit verstand en gedrag naar financiële beslissingen

Thesis

to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the
rector magnificus

Prof. dr. R.C.M.E. Engels

and in accordance with the decision of the Doctorate Board.

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by

NISHAD RADJ MATAWLIE
born in 's-Gravenhage, The Netherlands

Doctoral Committee:

Promotors:

Prof. dr. J.T.J. Smit

Prof. dr. P. Verwijmeren

Other members:

Prof. dr. S. Gryglewicz

Prof. dr. V. Henderson

Prof. dr. P. Wakker

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TO MY MOTHER AND MY GRANDMOTHER
VOOR MIJN MOEDER EN MIJN GROOTMOEDER
मातृ देवो भवः

I pay my respects to the power of wisdom and knowledge.

Knowledge destroys the darkness of ignorance,
knowledge leads to the path of growth and progress.

— Vedas

Acknowledgments

The PhD trajectory is a journey of learning, which only gets better, very quickly, along the way. I can sure say that it has been an awesome expedition. This journey taught me about research, several interesting topics, academia, people, life but also about myself. I would like to take this opportunity to sincerely thank some amazing people who played a significant (***) role in this wonderful journey.

I would like to start with thanking Sjoerd van Bekkum, of whom I was the research assistant (or 'data-detective' in his words) during the third year of my bachelor. I can still perfectly remember the day somewhere near the end of my master that I walked in his office and told him that I wanted to pursue a PhD, but that there was no open position left (I thought). He then put me in touch with professor Han Smit, who was looking for a PhD student, and shortly thereafter, my PhD position in Finance was a fact. Thank you Sjoerd, I wouldn't have made this journey if it was not for you.

Then, professor Han Smit, it took me almost two years to call you just 'Han' and not professor Smit - thank you for being an awesome promotor. I am extremely lucky to have such an amazing bond with my promotor. I will always think back to all the lunches (and the cakes of the month), barbecues, meetings, conference trips and to all the fun we had together. Thank you for your guidance, help and advice, not only about research but also about all kind of aspects in life. Thank you for creating such a relaxed learning environment, for teaching me a lot, including a whole new mindset, and for helping me to develop ideas. Also the memories of creating the MOOC together will always remain with me, and the MOOC itself will forever be our legacy, I am very proud to have been

part of this project. It was an utmost pleasure and honour to be your PhD student. I hope this bond will remain forever.

Next, I want to express my gratitude to all finance faculty members who have provided helpful comments and a pleasant working environment. Special mention goes out to Vadym Volosovych, our PhD coordinator and Patrick Verwijmeren, my other promotor, for their comments, help, and all the nice chats. Very special thanks goes out to Sebastian Gryglewicz, who taught me the art of dynamic corporate finance, provided me with comments, and with whom I had many fruitful discussions. Sebastian always motivated me to delve deeper to solve mathematical problems. I am proud to have worked closely together with you.

Outside the finance department, I am extremely grateful to Peter Wakker, whose invaluable help and comments have contributed to improving multiple papers enormously. With him being an absolute expert in decisions under uncertainty and prospect theory, I was a bit nervous to approach him with my own prospect theory research ideas. However, professor Wakker was very accessible, patient, helping and supportive, he always responded quickly, was available for meetings, and provided me with constructive feedback, explanations and tips which helped me to comprehend some matters better. I cannot say it often enough: Thank you so much.

Moreover, I want to thank the professors Peter Wakker, Sebastian Gryglewicz and Vicky Henderson for taking place in my doctoral subcommittee and assessing my thesis, also many thanks to professor Henderson for providing some useful comments. Furthermore I would like to thank professors Kuno Huisman and Enrico Pennings for completing my full doctoral committee. With my promotors included, these seven professors are some of the best experts in the field. I feel very thankful and absolutely honored that all of you have taken time out of your busy schedules to be part of my doctoral committee.

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in the preparation of the defense, printing of the dissertations, and all other administrative matters.

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This journey would not have been what it is without my last office mate, direct colleague, and brother for life, Dyaran. With Han being the promotor of both of us, we had a lot of (long) meetings and hilarious lunches, created review videos for the MOOC, and did teaching together. We went on multiple legendary conference trips, dragged each other to the gym, exchanged many interests from cycling to electronic music, and always tried to help each other out with research issues. Not to forget all the challenges we did of who could throw the most random objects in the bin ('ruimte van de bak') and the tower of 100 sparkling water bottles that we build. It was truly an unforgettable time. We developed so many useful and useless research ideas, often discussing these in the gym or on our way to the Spar - I am sure that at least one of these ideas will turn out to be great. Thank you for the absolutely amazing time together and for all your help. I am happy that we are graduating almost at the same time. Its a great honour that you are standing with me as paranymp and that you have asked me to be your paranymp as well.

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should really get a PhD.”). Looking back, I am certainly glad I listened to him.

Ashni and Chaimae, thank you for always checking on me, for showing interest in my work, and for all the awesome and cheerful times, you guys are truly special friends for life. Thank you dear Devika, for always caring, for your support and eternal patience, for being the distraction when needed the most, for always believing in me, for making me happy, and for designing the most-awesome cover for my dissertation, you make me proud.

Furthermore, I am grateful to have a wonderful family around me who are always there for me. I thank my late grandmother, my nani, for being an extremely loving additional mother to me, for always supporting me and encouraging me to learn more, and for all the lessons in life she taught me - among more, that you should always help people if you can, that knowledge is something that no one can take from you; and that you cannot accomplish anything without putting effort in. It is especially these life lessons that perfectly apply to a PhD. I wish you were here to see me defend my thesis, but I know that you would have been proud.

Finally, with all my heart, I thank my loving mother for her unconditional love, care, support, patience, guidance, and help, not only in the past few years but during my whole life. Without you I would not have been where I am today. You taught me to never give up, to believe in my own capabilities, to always be modest, to invest in life, that wisdom and knowledge are priceless, and so much more. Words are not enough to show my appreciation for you, I am truly proud to be your son. Thank you for being my guru, role-model and hero. Thank you for giving me all the tools and lessons to succeed in life. Thank you for always being there. Thank you for everything. Ma, je bent de beste, deze is voor jou.

As this chapter in life comes to peace, I humbly stand grateful to the supreme force controlling circumstances beyond our own control. I am thankful for waking up healthy every day and being able to keep going, whether that was during this PhD or is in life itself.

Nishad R. Matawlie

September, 2020

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1

Introduction

FINANCIAL DECISIONS ARE MADE BY MAXIMIZING VALUE, whether that is shareholder value, portfolio value, profits value, or personal value. In the process of financial decision making, one may follow economic theory, may apply a decision rule, or may determine value through financial modelling. These financial decision-making tools are built on rational theory. However, often enough we observe choices which are against the lines of rational theory. Then, behavioural decision theory may be able to explain these choices. With that thought, I investigate how *behavioural* traits affect the *mind* in financial decision making. This dissertation presents three theo-

retical essays, grounded in mathematical and financial foundations, and accompanied by some empirical evidence, which explain how behavioural traits cause particular (corporate) financial decisions to deviate from what rational theory dictates.

BACKGROUND

Many theories apply when modelling financial decisions. Traditional capital budgeting theory prescribes to invest in a project if it has a positive net present value (NPV). Real options theory incorporates a dynamic approach to investment opportunities and adds the value of flexibility to the static NPV. By considering the investment decision as analogous to the exercise of an option, the financial option pricing paradigm can be applied in valuing investment decisions (Dixit & Pindyck, 1994). Game theory studies the strategic interaction of multiple agents and is used to include strategic considerations in financial decision making. Hence, the combination of real options and game theory into real option games applies to investment decisions in competitive environments (Smit & Trigeorgis, 2004). Auction theory uses game theory to develop optimal equilibrium bidding strategies for bidders in auctions. All these mentioned theories and more assume rationality of decision-making agents.

Rationality of agents is since a long time described as maximizing expected value (the sum of probability weighted outcomes)¹. In that sense, an agent should be indifferent between (i) receiving €100,- with certainty and (ii) the 50:50-gamble of receiving €200,- or nothing; after all, the expected values in terms of money are equal. Empirical and experimental evidence, however, show that some agents prefer proposal (i) while others prefer

¹ *Pascal's wager*, a seventeenth-century philosophical and mathematical argument, even applies the concept of expected value maximisation to the question of believing or disbelieving in God.

proposal (ii) and that these preferences differ with the amounts of money involved and the level of wealth of the player. Expected utility theory is a decision theory capable of explaining these differences by positing that agents maximize expected utility (relative to current wealth) rather than expected value² (Von Neumann & Morgenstern, 1947). When probabilities are known, expected utility theory is often deemed the hallmark of rationality. According to the expected utility hypothesis, differences in preferences arise due to differences in risk attitudes, thereby distinguishing between risk-seeking, risk-averse, and risk-neutral attitudes. Expected value maximisation is then just a special case of expected utility maximisation, with utility being linear and risk attitude therefore being neutral.

However, there are many examples and observations where choices are in violation with utility theory³. This led to the rise of other descriptive rather than normative decision theories, thereby incorporating behavioural traits of agents stemming from psychological insights. Prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992) is a descriptive behavioural decision theory that mathematically formalizes several behavioural traits which affect decision making. Prospect theory encompasses several elements that are based on observed behaviour. First, individuals tend to be risk-averse towards gains but risk-seeking towards losses. Second, individuals evaluate these gains and losses relative to a certain reference point instead of current wealth. Third, individuals engage in probability weighting such that the objective probabilities are over- or underweighted and are also differently weighted dependent on whether these probabilities correspond to gains or losses. Finally, individuals suffer from loss aversion, which means that losses of the same magnitude ‘hurt’ more than gains are ‘enjoyed’. In this way, prospect theory is able to explain

²Discussion about expected value theory was triggered among more with Bernoulli’s *St. Petersburg’s paradox*

³*The Allais paradox* is a choice problem which shows the inconsistency of actual observed choices with the predictions of expected utility theory.

certain decisions which utility theory fails to capture.

Additional to behavioural traits, decision-making is also affected by cognitive biases of the decision maker. Behavioural biases such as overconfidence, can affect the rational process in such a way that decisions following from rationality are altered completely. Overconfidence manifests in several forms such as excessive confidence with regard to having accurate information (miscalibration); believing that one is better than the reference group (above-average effect); or overestimating the ability to control events over which one has limited influence (illusion of control) (Ben-David et al., 2013). The following chapters each investigate how either overconfidence affects rational financial decision making or how behavioural decision theory in the form of prospect theory is able to explain observed (corporate) financial decision-making anomalies.

OUTLINE

Chapter 2 investigates the effect of CEO overconfidence on the decision between acquisition strategies. The CEO of the acquiring company can choose to acquire a controlling stake in the target firm directly, or on the other hand, the CEO can choose to follow a toehold strategy. With a toehold strategy, a minority stake is acquired first, which is extended to a controlling stake only when circumstances develop favourably.

Many previous studies have showed the benefits of a toehold strategy. For instance, a toehold can help to overcome the free-rider problem or take-over defences such as fair price clauses in single bidder cases (Shleifer & Vishny, 1986; Tirole, 2010). Toeholds reduce competition and target resistance and are associated with lower bid premiums and lower target stock price run-ups (Betton & Eckbo, 2000). When rivals are involved, a toehold increases the likelihood of winning a bidding contest (Betton et al., 2009). Moreover, a

toehold allows for testing the waters instead of an immediate plunge in the deep of a full-scale acquisition. Given the myriad of benefits, the number of observed toehold strategies is however, remarkably low (Betton et al., 2009). I propose a behavioural explanation for the low usage of toeholds. I hypothesize that CEO overconfidence negatively affects the likelihood of employing a toehold strategy.

Extending the minority stake to a controlling stake resembles the exercise of a call option. Therefore, I model the toehold strategy with a continuous-time real options model and show that where moderate confidence increases the likelihood of a toehold strategy, overconfidence leads to choosing the direct acquisition over the toehold strategy. The finding that moderate confidence can be beneficial for the firm whereas overconfidence is not, is in line with multiple studies such as Goel & Thakor (2008); Campbell et al. (2011); Hirshleifer et al. (2012). I empirically investigate whether there are indications that confirm the prediction of my theory. Using empirical measures for overconfidence, I find a significant negative relation between the likelihood of a toehold strategy and CEO overconfidence, which thus supports the theory.

Chapter 3 investigates the matter of how objects are sold through auctions or negotiations. Classical economic theory (Bulow & Klemperer, 1996) dictates that the seller should opt for an auction since the bidding among competitors will drive bids up and therefore maximizes expected revenues for the seller. Still, we observe many sales through negotiations. Often these negotiations precede subsequent auctions, which only take place in case of a failed negotiation. I therefore compare a direct auction with a sequential selling mechanism, where a seller starts with a negotiation and proceeds to the auction only in case of a failed negotiation. Organizing an auction is costly under the title of *search costs*, which encompass all direct and indirect costs associated with the auction.

I use *auction theory* to model and compare the selling mechanisms. It just so happens that the Nobel prize in economic sciences of this year (2020) was awarded to Paul Milgrom and Robert Wilson (both from Stanford University), for their improvements to *auction theory* and inventions of new auction formats.

When choosing a selling mechanism, sellers may intuitively imagine that starting off with a negotiation seems as a free possibility of avoiding a costly auction. By modelling the sequential selling mechanism first in a rational framework through auction theory, I show that there exists a substantial difference between the expected pay-offs of the direct auction and the auction following upon a failed negotiation. This difference, which is named the '*negotiation penalty*', also exists between the direct auction and the complete sequential selling mechanism. The rational model therefore confirms that a rational seller should choose the direct auction rather than the sequential mechanism to maximize expected value. However, this does not explain why sellers still opt for the sequential mechanism. By integrating prospect theory (PT) in the auction theory models of the sequential mechanism and direct auction, I show that for a PT agent it is possible to prefer the sequential selling mechanism over a direct auction. By using a dataset on corporate transactions through any of the selling procedures, I find empirical indications for my theoretical claims on the negotiation penalty, preferences and the effects of search costs on preferences.

Chapter 4 develops a theory of real options (RO) integrated with prospect theory (PT): The PT-RO framework. Many investment decisions can be modelled with real options theory (Dixit & Pindyck, 1994). An intuitive and tractable framework to represent investment decisions as real options is the binomial tree, which is also widely used for pricing financial options (Cox & Ross, 1976). However, the valuation of real options through the financial options paradigm relies on the crucial assumption of complete markets: For

investment decisions, this means that the pay-offs should be replicable by traded assets. This strong assumption is not plausible in many cases. Investments in R&D or angel investments in start-ups are examples of incomplete markets settings where the replicability condition does not hold.

The dynamics of the investment outcomes, represented as a real option tree, resemble compound prospects of obtaining outcomes with certain probabilities. By integrating prospect theory and real option theory in a binomial tree framework, I can analyze investment behaviour in incomplete markets settings and explain investment behaviour. I analyze several investment settings represented through (compound) real options and examine the investment behaviour of PT agents. I find that anomalies regarding project investments, such as overinvestment and escalation of commitment, are explainable through the combination of real option theory and prospect theory. Furthermore I analyze how the PT components such as probability weighting and reference point dependence affect decision making. This hopefully encourages more future research on the integration of valuation theory with behavioural theory.

All in all, this dissertation examines the impact of behavioural traits and biases on financial decision making. It shows that behavioural biases such as overconfidence affect decision making such that it can alter choices. By considering behavioural traits through behavioural decision theory, it is possible to explain several anomalies in financial decisions. These findings do not only contribute to academic literature and our understanding of decision processes, but also have relevant implications for executives, policy makers, and all financial decision-making individuals. This dissertation contributes to the ongoing discussion of the plausibility of the rationality assumption of individuals and contributes to illustrate the relevance of the behavioural side of economics and management.

DECLARATION OF CONTRIBUTION

Chapter 2: This chapter is based on a joint work with Han Smit and has benefited from comments from Patrick Verwijmeren, Sebastian Gryglewicz, Sjoerd van Bakkum, Sebastian Pfeil and seminar participants at Erasmus Research Institute of Management, Tinbergen Institute, Behavioural Finance Conference (2016), Real Options Conference (2017), Portuguese Finance Network (2018) and European Financial Management Conference (2019). This paper has been awarded the *Real Options Conference 2017 best PhD student paper award*. The idea and concept are developed by my co-author. The mathematical modelling, literature review, data work and empirical analysis have been done by me and the writing is a joint work with my co-author.

Chapter 3: This chapter is based on a paper which started as a collaboration with Sebastian Gryglewicz and Han Smit, but which became an independent work after I had an idea for an alternative approach and worked this out. It has benefited from fruitful discussions with Sebastian Gryglewicz and Peter Wakker and has benefited from comments from Patrick Verwijmeren and other seminar participants at Erasmus Finance Day (2018). I am grateful to Peter Wakker, whose invaluable comments have helped to improve this paper significantly. All the work for this paper as it is now has been conducted independently.

Chapter 4: This chapter is based on joint work with Han Smit. The idea for this paper has been developed together with my co-author, the writing is joint work, and the mathematical modelling, programming, and analysis have been done by me. Again for this paper I am grateful to Peter Wakker, whose invaluable comments have helped to improve this paper enormously.

2

Summary

THIS DISSERTATION CONSISTS OF three (mainly) theoretical essays on the impact of behavioural traits on (corporate) financial decisions. Every essay presents a theory based on mathematical and financial foundations that combines rational theory with behavioural elements. Furthermore I present empirical evidence supporting the theories.

Chapter 2 investigates whether CEO overconfidence affects the choice of an acquisition strategy. Besides a direct control acquisition, a CEO of an acquiring firm can follow a toehold strategy. In a toehold strategy, a minority stake in the firm is acquired first

and only extended to a controlling stake if circumstances develop favourably. Previous research has expressed and illustrated the advantages associated with a toehold strategy. Despite these advantages, however, the toehold strategy is only rarely executed.

I develop a continuous time real options model, where I model the toehold strategy as a call option on the control acquisition. I show that overconfident CEOs have a higher likelihood of preferring the immediate control acquisitions over the toehold real option. I empirically investigate the claims of the theoretic model about the impact of CEO overconfidence on the use of toeholds in acquisition strategies. I find that, given an acquisition, overconfident CEOs are more likely to execute direct control acquisitions instead of minority stake acquisitions. The implications of this study for contracting and deal execution practices, is that CEOs should focus attention on toehold acquisition strategies as a potential way to improve acquisition performance. Acknowledging the existence of overconfidence in acquisition strategies can offer executives the insights and new organisational processes that could be helpful in efforts to de-bias acquisition strategies.

Chapter 3 investigates how behavioural theory can explain why sellers choose a particular selling mechanism. Classical economic theory dictates that a seller should always opt for an auction to sell an object, since the bidding among competitors will maximize expected revenues for the seller. Still, we observe many sales through negotiations. Often these negotiations precede subsequent auctions, which only take place in case of a failed negotiation. The choice for such a sequential selling mechanism, where the negotiation is first tried before an auction, is not explainable from a rational point of view.

I first model the choice between a direct auction and the sequential selling mechanism from a rational perspective with auction theory¹. In the model, it is costly to organize an

¹The Nobel prize in economic sciences of 2020 was awarded to P. Milgrom and R. Wilson, for their contributions to auction theory.

auction. I show that there exists a ‘negotiation penalty’, which means that the expected pay-offs for the seller from the sequential mechanism are always lower than the expected pay-offs from the direct auction. In addition, the expected pay-offs from a sequential auction are always (much) lower than its simultaneous counterpart. This confirms that sellers should opt for the direct auction in order to maximize expected value. Past research has shown, however, that agents do often not act as rational expected value maximizers. I show that the choice for a sequential selling mechanism can be explained with behavioural decision theory. I integrate prospect theory² with auction theory and show that for a prospect theory decision-maker it is possible to prefer the sequential mechanism.

By using a dataset of corporate acquisitions, I empirically confirm the existence of a negotiation penalty in takeover-premiums between direct and sequential auctions. Furthermore, I find that higher auction costs lead to a lower likelihood of choosing the sequential mechanism, which is not predicted by the rational model, but can be explained by the prospect theory model. These findings provide insights for sellers choosing between selling procedures and may have implications for deal and contracting procedures. All in all, this study shows that outcomes of selling mechanisms are in line with a rational model, but choice-making between selling mechanisms is in line with a behavioural model.

Chapter 4 develops a theory of real options integrated with prospect theory. Many investment opportunities can be modelled with real options theory. However, the valuation of real options through the financial options paradigm relies on the crucial assumption of complete financial markets. For investments or projects, this means that the pay-offs should be replicable by traded assets. This strong assumption is not plausible in many

²Prospect theory is a prominent behavioural decision theory which incorporates several behavioural elements such as reference dependence, loss aversion, probability weighting and risk seeking (averse) attitude over losses (gains).

cases. Investments in R&D or angel investments in start-ups are examples of incomplete markets settings.

The dynamics of the investment outcomes in discrete and finite contexts, represented as a real option tree, resemble compound prospects of obtaining outcomes with particular probabilities. By integrating prospect theory and real option theory in a binomial tree framework, I can analyze investment behaviour in incomplete markets settings and explain some anomalies. I analyze several discrete investment settings represented through (compound) real options and examine the investment behaviour of PT agents. I find that anomalies regarding project investments, such as overinvestment and escalation of commitment, are explainable through the combination of real option theory and prospect theory. In general, I find that behavioural traits as optimism or high reference points clearly affect the value of investments and investment decisions, such as timing of exit, within the real options context. This encourages more future research on the integration of valuation theory with behavioural theory.

All in all, this dissertation examines the impact of behavioural traits on financial decision making. It shows that behavioural biases such as overconfidence affect decision making such that it can alter choices. By considering behavioural traits through behavioural decision theory, it is possible to explain several anomalies in financial decisions. These findings do not only contribute to academic literature and our understanding of decision processes, but also have relevant implications for executives, policy makers, and all financial decision-making individuals. This dissertation contributes to the ongoing discussion of the plausibility of the rationality assumption of individuals and contributes to illustrate the relevance of the behavioural side of economics and management.

3

Samenvatting in het Nederlands

DIT PROEFSCHRIFT BEVAT drie (voornamelijk) theoretische essays over de impact van gedragskenmerken op financiële beslissingen. Elk essay presenteert een theorie die is gebaseerd op wiskundige en financiële grondslagen en die rationele theorie combineert met gedragselementen. Verder presenteer ik ook de resultaten uit het empirische onderzoek (d.w.z. met data en wiskundig-statistische analyses) dat ik uitgevoerd heb. Deze empirische resultaten leveren ondersteuning voor de theorieën die ik ontwikkeld heb. Hieronder beschrijf ik per hoofdstuk welke vraagstukken ik onderzocht heb en wat mijn bevindingen zijn.

Hoofdstuk 2 onderzoekt of overmoedigheid van CEO's invloed heeft op de keuze van een overnamestrategie. Naast een directe overname van de zeggenschap, kan de CEO van een overnemende onderneming een toehold-strategie volgen. In een toehold-strategie wordt eerst een minderheidsbelang in het doelwit bedrijf verworven en wordt dit minderheidsbelang pas uitgebreid naar een controlerend belang als de omstandigheden zich gunstig ontwikkelen. Eerder onderzoek heeft de voordelen van een toehold-strategie benoemd en aangetoond. Ondanks deze voordelen wordt de toehold-strategie echter maar weinig uitgevoerd, hetgeen puzzelend is. Ik stel de hypothese dat het lage gebruik van toehold-strategieën mogelijk deels te verklaren is door overmoedigheid van een CEO.

Om dit te onderzoeken, ontwikkel ik een wiskundig reële opties model in continue tijd, waarbij ik de toehold-strategie modelleer als een call-optie¹ op de controle-acquisitie. Ik laat zien dat overmoedige CEO's eerder geneigd zijn (dat er een grotere kans is) om de directe overname te verkiezen boven de toehold-strategie. Ik onderzoek daarnaast ook op empirische wijze of de beweringen kloppen die volgen uit mijn theoretische model over de impact van overmoedigheid van CEO's op het gebruik van toeholds in acquisitiestrategieën. Daarbij is het nodig om overmoedigheid van CEO's te meten.

Voor het kwantificeren van overmoedigheid bij CEO's gebruik ik een empirische maatstaf die gebaseerd is op het persoonlijke optie-uitoefen gedrag van CEO's. De CEO en andere leden van het (hogere) management ontvangen vaak opties op de aandelen van het bedrijf waar ze werkzaam zijn als onderdeel van hun compensatiepakket. De maatstaf voor CEO-overmoedigheid die ik gebruik is gebaseerd op de gedachte dat een CEO die niet overmoedig is, zijn/haar opties meteen zou uitoefenen wanneer de prijs van het aan-

¹Een call optie is een financieel instrument waarbij de houder het recht (niet de verplichting) heeft om een aandeel in de toekomst tegen een vastgestelde prijs te kopen. Een reële optie is vergelijkbaar met een financiële optie, alleen heeft de optie dan betrekking op een reële investering zoals bijvoorbeeld een nieuw project, nieuw gebouw of nieuw product.

deel hoger is dan de uitoefenprijs, aangezien de CEO met de opties op zijn/haar 'eigen aandelen' onder-gedifferentieerd is. Echter, CEO's die denken dat onder hun leiding het bedrijf zal floreren, houden hun opties langer aan, zelfs als de prijs van het aandeel al ver boven die uitoefenprijs ligt. Dergelijk gedrag wijst (gemiddeld genomen) op overmoedigheid. Als alternatieve maatstaf gebruik ik data van nieuwsartikelen in kwaliteitskranten om te bepalen of een CEO door de media als overmoedig gezien wordt. Tenslotte gebruik ik maatstaven die gebaseerd zijn op de salarissen van CEO's ten opzichte van andere leden van het management.

Met deze empirische maatstaven voor overmoedigheid en een dataset van ongeveer 10.000 overnames, constateer ik dat, gegeven een overname, overmoedige CEO's eerder geneigd zijn om directe acquisities van volledig zeggenschap te doen in plaats van een minderheidsbelang in te nemen. De implicaties van deze studie voor het doen van overnames, is dat CEO's toehoud acquisitiestrategieën serieuzer moeten overwegen als een mogelijke manier om de acquisitieprestaties te verbeteren. Het erkennen van het bestaan van overmoedigheid in acquisitiestrategieën kan leidinggevend de inzichten en nieuwe organisatieprocessen bieden die nuttig zouden kunnen zijn bij pogingen om gedragsafwijkingen in acquisitiestrategieën weg te nemen.

Hoofdstuk 3 onderzoekt hoe gedragstheorie kan verklaren waarom verkopers voor een bepaald verkoopmechanisme kiezen. De klassieke economische theorie schrijft voor dat een verkoper altijd moet kiezen voor een veiling om een object te verkopen, aangezien het opbieden tussen concurrenten de verkoopprijs zal opdrijven en daardoor de verwachte inkomsten voor de verkoper zal maximaliseren. Toch zien we veel verkopen via onderhandelingen. Vaak gaat zo een onderhandeling vooraf aan een opeenvolgende veiling, welke alleen plaatsvindt als de onderhandeling mislukt. De keuze voor een dergelijk sequentieel

verkoopmechanisme, waarbij de onderhandeling eerst wordt geprobeerd voordat er een veiling plaatsvindt, is vanuit rationeel oogpunt niet verklaarbaar.

Ik modelleer eerst de keuze tussen een directe veiling en het sequentiële verkoopmechanisme (onderhandeling met een daaropvolgende veiling in geval van mislukte onderhandeling) vanuit een rationeel perspectief met behulp van veilingtheorie. Toevalligerwijs werd de Nobel prijs voor de economie van dit jaar (2020) uitgereikt aan Paul Milgrom en Robert Wilson (beiden van Stanford University), voor hun verbeteringen in de veilingtheorie en uitvindingen van nieuwe veilingformats.

In het model dat ik ontwikkel is het organiseren van een veiling niet kosteloos. Ik laat zien dat er een ‘onderhandelingsboete’ bestaat, wat betekent dat de verwachte opbrengsten voor de verkoper uit het sequentiële mechanisme altijd lager zijn dan de verwachte opbrengsten uit de directe veiling. Bovendien zijn de verwachte opbrengsten van een opeenvolgende veiling altijd (veel) lager dan de directe veiling. Dit bevestigt dat verkopers eigenlijk moeten kiezen voor de directe veiling om hun verwachte waarde te maximaliseren. Uit eerder onderzoek is echter gebleken dat agenten vaak niet opereren als rationele verwachtingswaarde-maximaliseerders. Ik laat zien dat de keuze voor een sequentieel verkoopmechanisme wel verklaard kan worden met gedragstheorie en niet met rationele theorie. Ik integreer prospect theorie ² met veilingtheorie en laat zien dat het voor een prospect theorie beslisser wel mogelijk is om de voorkeur te geven aan het sequentiële mechanisme.

Met een dataset van bedrijfsovernames bevestig ik het bestaan van een onderhandelingsboete bij overname premies tussen directe en opeenvolgende veilingen. Verder vind ik dat hogere veilingkosten leiden tot een kleinere kans om het sequentiële mechanisme te

²Prospect theorie is een prominente gedragsbeslissingstheorie die verschillende gedrags-elementen zoals referentieafhankelijkheid, verliesaversie, kansweging en risicozoekende (afkerige) houding ten opzichte van verliezen (winsten) incorporeert. Prospect theorie verklaart bijvoorbeeld waarom over het algemeen verliezen meer pijn doen dan dat even grote winsten voldoening opleveren.

kiezen, wat niet voorspeld wordt door het rationele model, maar wel verklaard kan worden door het prospect theorie model. Het lijkt misschien voor de hand liggend om de gratis onderhandeling te ‘proberen’ wanneer de kosten voor een veiling hoog zijn, maar de verwachte opbrengst van het totale mechanisme is lager dan voor een directe veiling: mocht immers de onderhandeling mislukken, dan ben je veel slechter af met een opeenvolgende veiling dan met een directe veiling zonder onderhandeling. Deze bevindingen bieden inzichten voor verkopers die kiezen tussen verkoopprocedures en kunnen gevolgen hebben voor deal- en contractprocedures. Al met al laat dit onderzoek zien dat uitkomsten van verkoopmechanismen in lijn zijn met een rationeel model, maar dat het maken van keuzes tussen verkoopmechanismen in lijn is met een gedragsmodel.

Hoofdstuk 4 ontwikkelt een theorie van reële opties geïntegreerd met prospect theorie. Veel investeringsmogelijkheden kunnen worden gemodelleerd met de theorie van reële opties³. De waardering van reële opties door middel van het financiële optie-paradigma berust echter op de cruciale veronderstelling van complete financiële markten. Voor investeringen of projecten betekent dit dat de pay-offs (opbrengsten) replicerbaar moeten zijn door verhandelde financiële instrumenten. Deze sterke aanname is in veel gevallen niet plausibel. Investerings- en ontwikkelingsprojecten of investeringen van durfkapitaalverstrekkers in start-ups zijn voorbeelden van incomplete markt omstandigheden.

De dynamiek van de investeringsuitkomsten in discrete en eindige contexten, gepresenteerd als een reële optie boom, lijkt sterk op een samengestelde prospect met bepaalde kansen op resultaten. Door prospect theorie (PT) en reële optie theorie te integreren in een binominale boom model, kan ik investeringsgedrag in incomplete markten analyseren en

³Een investeringsbeslissing is te presenteren als een optie, de beslissing kan immers uitgesteld worden en later genomen worden wanneer onzekerheid opgehelderd is over de tijd. Deze flexibiliteit om later te beslissen heeft waarde die gekwantificeerd kan worden.

enkele anomalieën verklaren. Ik analyseer verschillende investeringsmogelijkheden in discrete contexten gerepresenteerd door (samengestelde) reële opties en onderzoek daarbij het investeringsgedrag van PT-agenten. Ik vind dat anomalieën met betrekking tot projectinvesteringen, zoals overinvesteringen en escalatie van toewijding⁴, verklaarbaar zijn door de combinatie van reële optie theorie en prospect theorie. In het algemeen, is mijn bevinding dat gedragskenmerken als optimisme of het hebben van hoge referentiepunten een duidelijke invloed hebben op de waarde die toegekend wordt aan investeringen en op investeringsbeslissingen, zoals het moment van uitstappen, binnen de context van reële opties. Deze bevindingen nodigen uit tot meer toekomstig onderzoek naar de integratie van waarderingstheorie met gedragstheorie.

Al met al onderzoekt dit proefschrift de impact van gedragskenmerken op financiële besluitvorming. Het laat zien dat gedragskenmerken, zoals overmoedigheid, de besluitvorming zodanig beïnvloeden dat het keuzes kan veranderen. Door gedragskenmerken te beschouwen door middel van gedragstheorie, is het mogelijk om verschillende anomalieën in financiële (bedrijfs)beslissingen te verklaren. Deze bevindingen dragen niet alleen bij aan de academische literatuur en ons begrip van besluitvormingsprocessen, maar hebben ook relevante implicaties voor leidinggevend, beleidsmakers en alle financiële besluitvormers. Dit proefschrift draagt bij aan de voortdurende discussie over de plausibiliteit van de aanname van rationaliteit bij individuen en illustreert de relevantie van de gedragsmatige kant binnen economie en management.

⁴De escalatie van toewijding (escalation of commitment) is een fenomeen waarbij iemand die geconfronteerd wordt met steeds negatiever wordende resultaten van een beslissing, actie of investering, toch het gedrag voortzet in plaats van de koers te wijzigen.

Bibliography

Ben-David, I., Graham, J. R., & Harvey, C. R. (2013). Managerial miscalibration. *The Quarterly Journal of Economics*, 128(4), 1547–1584.

Betton, S. & Eckbo, B. E. (2000). Toeholds, bid jumps, and expected payoffs in takeovers. *The Review of Financial Studies*, 13(4), 841–882.

Betton, S., Eckbo, B. E., & Thorburn, K. S. (2009). Merger negotiations and the toehold puzzle. *Journal of Financial Economics*, 91(2), 158–178.

Bulow, J. & Klemperer, P. (1996). Auctions versus negotiations. *The American Economic Review*.

Campbell, T. C., Gallmeyer, M., Johnson, S. A., Rutherford, J., & Stanley, B. W. (2011). CEO optimism and forced turnover. *Journal of Financial Economics*, 101(3), 695–712.

Cox, J. C. & Ross, S. A. (1976). The valuation of options for alternative stochastic processes. *Journal of Financial Economics*, 3(1-2), 145–166.

Dixit, A. K. & Pindyck, R. S. (1994). *Investment under Uncertainty*. Princeton university press.

Goel, A. M. & Thakor, A. V. (2008). Overconfidence, CEO selection, and corporate governance. *The Journal of Finance*, 63(6), 2737–2784.

Hirshleifer, D., Low, A., & Teoh, S. H. (2012). Are overconfident CEOs better innovators? *The Journal of Finance*, 67(4), 1457–1498.

Kahneman, D. & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 363–391.

Shleifer, A. & Vishny, R. W. (1986). Large shareholders and corporate control. *Journal of Political Economy*, 94(3, Part 1), 461–488.

Smit, H. T. & Trigeorgis, L. (2004). *Strategic Investment: Real options and Games*. Princeton University Press.

Tirole, J. (2010). *The Theory of Corporate Finance*. Princeton University Press.

Tversky, A. & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and uncertainty*, 5(4), 297–323.

Von Neumann, J. & Morgenstern, O. (1947). *Theory of games and economic behavior*, 2nd rev. Princeton University Press.

About the Author



Nishad Matawlie was born on April 4th, 1993 in The Hague, The Netherlands. After finishing the Gymnasium, cum laude, at Hofstad Lyceum in the Hague, he obtained his Bachelor's degree in Econometrics and Operations Research, cum laude, from the Erasmus University Rotterdam in 2014. In 2015, Nishad obtained his Master's degree in Econometrics and Management Science, with a specialisation in Quantitative Finance, cum laude, from the Erasmus University as well. During study, Nishad was a teaching assistant for sev-

eral mathematics and statistics courses, participated in the ESE Research Traineeship, and did a full-time summer internship at Barclays Investment Bank in London. For his Master's thesis, Nishad received the *Best Econometric Thesis Award* from the Econometric Institute and Veneficus. Nishad started his PhD in Finance in September 2015 at the Erasmus School of Economics and Erasmus Research Institute of Management. His research interests lie at the intersection of dynamic corporate finance, real options and behavioural decision theory. Nishad has presented his work on several international conferences, including the Real Options Conference 2017 in Boston, USA, where he received the *Best PhD Paper Award* for his working paper. At the Erasmus University, Nishad lectured many tutorial groups and supervised multiple master's theses. He is an instructor and co-developer of the massive online open course (MOOC) *Advanced Valuation and Strategy - M&A, Private Equity, and Venture Capital*, which has over 40.000 learners at the moment. Moreover he helped to intensify and digitize the Master's course *Advanced Corporate Finance and Strategy*, for which he received together with the team, the *Educational Innovation Award* of 2018 by the Erasmus School of Economics.

Portfolio

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- *Do Overconfident CEOs Ignore Toehold Strategies*, with J.T.J. Smit
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- 2018: Portuguese Finance Network Conference (Porto, Portugal)
- 2017: Real Options Conference (Boston, USA)
- 2016: Research in Behavioural Finance Conference (Amsterdam, The Netherlands)

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- **Advanced Corporate Finance and Strategy:**
Teaching multiple tutorial classes (~60 MSc. students each) per period, grading exams, co-composing the exam, organizing the exam review sessions. Conducting the digitization and intensification of the course with the team. This course is part of the Financial Economics program of the MSc. Economics and Business at Erasmus School of Economics.

- **Co-developer and instructor of Coursera MOOC - Advanced Valuation and Strategy - M&A, Private Equity, and Venture Capital:**
~40.000 learners (per September 2020). Co-created multiple review videos, 2D animated videos, reading material, quizzes, and cases.
- **Master's theses:**
Supervising multiple MSc. students in writing their thesis for graduation, leading the defense ceremonies, examining and grading the theses.

AWARDS

- **Best PhD Paper Award**, Real Options Conference 2017, Boston, USA
- **Educational Innovation Award 2018-2019**, Erasmus School of Economics
For the development of the MOOC and digitization and intensification of the course Advanced Corporate Finance and Strategy using the MOOC.

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This thesis contains three (mainly) theoretical essays on the impact of behavioural traits on (corporate) financial decisions. Every essay presents a theory based on mathematical and financial foundations that combines rational theory with behavioural elements. The first study investigates whether CEO overconfidence affects the choice of an acquisition strategy. I develop a continuous time real options model and show that an overconfident CEO is more likely to prefer a direct control acquisition over a toehold strategy; moreover, I find empirical support for the theoretical claims. The second study investigates how behavioural theory can explain why sellers choose a particular selling mechanism. I model the choice between a direct auction and a sequential selling mechanism from both a rational and behavioural perspective using auction theory integrated with prospect theory. I find that where rational theory cannot explain the choice for a sequential mechanism and the effect of auction costs, prospect theory can. Furthermore, I show theoretically, and confirm empirically, that the expected payoffs from a direct auction are higher than from an auction after a failed negotiation. The final essay integrates real option theory with prospect theory for discrete investment contexts, where the investment pay-offs are not replicable by traded assets. I find that behavioural traits as optimism or high reference points clearly affect the value of investments and investment decisions, such as timing of exit, within the (compound) real options context. These findings contribute to our understanding of decision processes and have relevant implications for all corporate financial decision-making individuals.

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Mandeville (T) Building
Burgemeester Oudlaan 50
3062 PA Rotterdam, The Netherlands

P.O. Box 1738
3000 DR Rotterdam, The Netherlands
T +31 10 408 1182
E info@erim.eur.nl
W www.erim.eur.nl