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A game-theoretic approach to real estate investment negotiations

Final Bachelor's Thesis

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Abstract

This paper attempts to fill the research gap in the literature on the application of game theory to real estate negotiations. It focuses on a practical approach to reaching mutually beneficial agreements by applying game theory principles. The study uses a literature review, sequential game trees analysis, as well as an expert interview to compare the theoretical perspective with real-life scenarios. It studies concepts such as asymmetric information, rationality, uncertainty, and bias. As such, it proves that a combination of game theory knowledge and negotiation skills can result in a better payoff for players involved in a real estate negotiation process. However, it also concludes that due to some variables, game theory can be insufficient to solve disputes that arise in negotiation. These include personal preferences, relationships between the negotiators, bias, or risk aversion. Thus, to address these limitations, the study proposes various negotiation strategies that have the power to enhance the real estate negotiation process.

Keywords

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I would also like to honour my former boss, Álvaro García de Castro, who was the first one to introduce me to real estate and who inspired me to write this thesis. Additionally, his contribution helped me shed a light on a practical point of view of game theory and real estate negotiations.

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Objectives

The application of game theory to real estate bargaining has recently become a popular area of research. The purpose of this thesis is to further contribute to the subject by investigating how game theory can be practically used in real-life settings. In particular, I will provide a comprehensive analysis of the effectiveness of the theory's application in this context and contrast the theoretical approach provided in the literature review with practice. The results obtained will help to explore the potential benefits of using game theory in these negotiations and hopefully develop more effective negotiation strategies. This is a significant advancement in our comprehension of how game theory might be applied to real estate negotiations to settle disputes and come to mutually beneficial solutions. Additionally, the thesis can also indicate topics for more study and improvement and give light on the limitations of game theory in certain situations.

Significance of the thesis

The topic of game theory and how it can be applied in real estate negotiations has drawn the attention of many scholars. Nonetheless, the complexity of this topic generates a necessity for more thorough and comprehensive studies. Some scholars argue that game theory models are oversimplified and capture the complexities of human behaviour and decision-making in negotiations inadequately (Mnookin, 2010). Additionally, Daniel Kahneman (2017) highlights the limitations of rational decision-making assumptions and argues that biases play a significant role in negotiation outcomes. These and other scholars have raised important critiques of game theory in negotiations, highlighting the need for further research and analysis to address these concerns.

The gap in the research is mainly attributed to the difficulty in quantifying the variables that impact the negotiation process. Among such variables, we can list personal preferences, emotions, or cultural differences. Apart from the social aspects, there are also economic and governmental factors, such as local regulations, current market conditions and availability of financing opportunities. These require the development of more complex models that can effectively account for all of these variables. For that reason, more research and analysis are needed to fully understand how game theory can be applied to real estate negotiations.

Moreover, the current research does not always effectively apply the concept of game theory. The scholars often provide explanations and research that are too theoretical to be practically used by average negotiators. Although it covers the topic of both decision-making as well as negotiations under various conditions it is rarely accurate as it lacks a practical point of view. Therefore, this study can be useful to fill in this important gap by providing an examination of the strategic behaviours of buyers and sellers in a simple manner.

To fill this gap, there is a need for more empirical studies that examine the practical application of game theory in real estate negotiations. This can be done through interviews and experiments that compare the results of real-life negotiations with those predicted by game theory, which is attempted in this thesis.

Additionally, the current research is often unavailable to the majority, as it is published on websites and portals requiring a paid subscription or an institution login to access the content. Considering this, I have taken the initiative to make this research highly accessible. This thesis will be announced on my LinkedIn profile and provided free of charge to anyone interested in studying it. This can be beneficial for anyone from practitioners, researchers or simply enthusiasts of game theory or the real estate industry.

Moreover, the findings of this thesis can potentially help the parties involved in the market to make better-informed decisions, which can further support market efficiency in real estate negotiations. These benefits are especially crucial in a rapidly changing and dynamic industry.

Introduction

Negotiating the conditions of a real estate transaction between buyers and sellers is known as real estate bargaining. This is a complex and dynamic process that requires both buyers and sellers to make well-informed decisions. Both parties must clearly understand the market conditions, the value of the property, and their own needs to reach a mutually beneficial agreement, however, the information that the sides have access to during the negotiation is one of the most significant variables that might affect the process. Information asymmetry, where one party has more knowledge or information than the other makes negotiations challenging.

In order to overcome this information imbalance, it is crucial to understand the strategic behaviour of both buyers and sellers and use game theory to help take into account the key factors that influence the negotiation process. This includes understanding the motivations and interests of each party, as well as the strengths and weaknesses of their bargaining positions. Effective negotiation skills, including active listening, clear communication, and the ability to compromise, can also greatly impact the outcome of a real estate transaction.

Additionally, both buyers and sellers must be prepared to adapt and adjust their strategies throughout the negotiation process. This means being open to alternative solutions and willing to make compromises to reach a mutually acceptable agreement. In some cases, bringing in a third-party mediator can also help to facilitate negotiations and reach a fair outcome.

Overall, real estate negotiation requires careful consideration and a thorough understanding of many factors that influence it. However, by using game theory, it is possible to achieve a mutually beneficial agreement which is discussed in this thesis.

Literature Review

a) Game theory

- *Introduction and definitions*

Game theory studies how people make strategic choices when the outcome of one person's choice depends on the actions of others. It allows us to understand how different approaches used by rational decision-makers can result in different outcomes. By using such models game theorists can observe patterns and predict what we cannot at first see (Tadelis, 2013). This branch of mathematics is used to model and analyze decision-making processes in a wide range of fields, including economics, political science, biology and psychology (Osborne, 2004).

Game theory aims to understand and explain decision problems that we encounter regularly. These problems can be trivial yet ubiquitous like trying to decide what to have for breakfast. However, they can also be more serious, for example when you are a team leader trying to decide whether or not to start a new research and development project, when you are an undergraduate student who is choosing a major that will determine their future or when you are a lost group of hikers in the woods disputing about which direction to follow. All of these are examples of decision dilemmas (Tadelis, 2013). This thesis covers the topic of decision dilemmas in real estate negotiation processes. It answers the question of how to bargain, what to take into account and how to achieve the most beneficial agreement by analysing game theoretical scenarios and providing practical solutions.

In short, "a game" is a mathematical model that consists of at least two players, each of them choosing from a range of alternative actions that will result in different outcomes. Additionally, each player has their own preferences that determine how they rank these outcomes from the most to the least desirable. To further explain the concept and introduce the study, it is crucial to define some vocabulary used throughout the thesis and any game theory-related work: players, strategy, and payoff.

A player can be any agent (an individual, a firm, a nation, a household, etc.) that participates in a game. They are an important component of game theory as they are the

ones who directly contribute to the outcome of the game by making rational decisions and seeking to maximize their growth (Tadelis, 2013).

A strategy, on the other hand, is defined as a plan developed consciously and purposefully prior to actions to which it applies (Mintzberg, 1987). Strategies can be developed over a wide range of fields from business to military operations, sports and more. In terms of an investment strategy, as the name itself suggests, it is used to help achieve one's financial goals. This kind of plan helps to clarify objectives and allocate all the resources the most efficiently (Whittington et al., 2003). Different strategies are further discussed in section "b) Real estate bargaining".

Finally, a payoff is a reward or benefit that a player obtains from participating in a game (Tadelis, 2013). Payoffs are significant in any decision-making process as they explain the incentives that motivate the players to follow certain strategies. Payoff usually appears as a numerical value, though can be positive, negative or zero. As mentioned earlier, payoffs are preference functions, therefore they are often subjective. They were specifically studied by John Nash, the Nobel laureate mathematician that developed the theory of a Nash equilibrium (1950), a situation where no player is incentivized to change their strategy, because that would result in a lower payoff.

- *History of game theory at a glance*

Although, his enormous contribution to the advancements in the knowledge of game theory, Nash wasn't the first scholar to study it. The history of game theory dates to the beginning of the 20th century. The following section introduces the work of the most important economists and mathematicians in this field.

One of the first ones to study game theory was Ernst Zermelo (1913), who proposed Zermelo's theorem. This theory studies the game of chess and states that in every game one player can always either force a win against another one or have a strategy that guarantees at least a draw, assuming they both play optimally. The theory has been later further developed by many mathematicians and economists including John von Neumann, who is considered to be one of the fathers of game theory. Additionally, the theory is popular amongst the chess players community and has been widely commented

on and analysed on chess community online forums, where it has been proven that Zermelo's theorem is only a theoretical instrument and cannot be used in real-world games as human players are very unlikely to play perfectly (Lamond, 2018).

Following Zermelo's theorem, another advancement in studying game theory was proposed by John von Neumann and Oskar Morgenstern. In their book "Theory of Games and Economic Behavior" (1944), they introduced the concept of mixed strategy. It describes a combination of strategies in which each player randomly selects one of the possible moves and strategies with each strategy having a certain probability of being chosen. An example of such game can be the game of matching pennies. In this game, the players simultaneously choose their strategy by showing either heads or tails of a coin with the objective to guess what the other player chooses. If player one chooses tails, player two must choose heads to win. Similarly, if player one shows heads, player two must show tails to win. However, both tails and heads have an equal possibility of being chosen by the players. Strategies that are not mixed are called pure (Rapoport, 2012). This introduces the concept of analysing the behaviour of the players in situations of uncertainty and incomplete information (see later). This implication was a significant contribution to the field of game theory, as it was later incorporated into the earlier mentioned Nash equilibrium and helped individuals further expand the scope of game theory and deepen our understanding of decision–making in strategic situations.

The 1950s were ground-breaking thanks to the introduction of one of the most classical game theory scenarios by Merrill Flood and Melvin Dresher. The game, later studied and nicknamed the Prisoner's Dilemma by Albert Tucker, was revolutionary as it proved that individuals do not always act towards reaching their own self-interest, but also, they may act towards a mutual utility. The scenario includes two criminals caught and suspected of crime with not enough evidence to convict them. They are both brought to a police investigation and are asked to confess. If they both admit having committed the crime, they will be sent to two years in prison. If none of them admits, they will serve the lesser charge of six months. However, if only one of them confesses, he will be released and the other one will be sent to the most severe sentence (five years). The prisoners are not allowed to discuss their decisions beforehand with each other. A game-theoretical analysis proves that the optimal situation is for both of them to confess. This division

between individual and collective rationality was later studied and applied to many real–life scenarios and remains one of the most popular game theory models (Rapoport, 1989).

Throughout the 1950s and 1960s, the game theory continued to advance with the creation of fresh notions of solutions like the "dominant strategy equilibrium", "subgame perfect Nash equilibrium" or the "ultimatum game". The last one was an experiment proposed by Nobel laureate John Harsanyi (1967), whose work was later further developed by other economists. The ultimatum game involves only two players of out which one is given an amount of money and must decide how to divide that amount between them. If "the responder" accepts the split offered by "the proposer" they both get the money. However, if he rejects the offer, they are both left with nothing. Traditional economic theory would suggest that the proposer should follow an idea of rational maximization, which is simply keeping most of the money for himself. This way, both players benefit since they have more money at the conclusion of the game than they had before (0). Yet, the respondent would often consider this division unjust and would much rather prefer to get nothing than a very modest sum. This demonstrates that the participants are economically prejudiced and illogical due to human nature.

In recent years, game theory has been used in a number of disciplines, including political science, biology, computer science, economics, psychology and engineering. It has been used to model and examine choices made in contexts like social networks, negotiations, auctions, and mechanism design.

- *Sequential vs Static games*

Game theory classifies games by the order in which each player takes their turn. The concept introduced by the aforementioned John von Neumann and Oskar Morgenstern (1944) is one of the key contributions in their book "Theory of Games and Economic Behaviour". A sequential game, as the name suggests, is a model in which the players move in a predetermined sequence, or order. Each player takes a turn after another one has completed their action. An advantage of this structure is that the players can make better-informed movements, as they already know all the previous ones before making their own. An example of this game can be the game of chess.

On the other hand, a static game is characterized by the players making their moves simultaneously. An example of this game can "rock, paper, scissors". In this type of scenario, the players take decisions about their moves at the same time.

- *Imperfect vs perfect information*

Another classification of game theory models, that is crucial for the purpose of this thesis, is the distinguishment between two types of information: perfect and imperfect information. One of the first mathematicians to introduce this concept was an aforementioned Hungarian – American economist, John Harsanyi (1967).

He was one of the first ones to recognize that the uncertainty involved in some games has a significant impact on the behaviour of the players. Therefore, he classified the games into two categories based on the uncertainty level: games with perfect information, where all the players know all the relevant information about each other and about the game itself, and games with imperfect information, where some information is unknown.

In a scenario with perfect information, players are able to make informed decisions and accurately predict their payoff from the game. However, it is an ideal scenario that rarely appears in real–world games. Imperfect information is very common, which leads to a variety of outcomes and is recognized as a type of market failure that prevents a perfectly competitive market to occur.

- *Asymmetric information*

A special type of game with imperfect information is a game with asymmetric information, which assumes that the players involved have different levels of information available to them, i.e., one party has more or better information than another party. George A. Akerlof (1970) proposes a phenomenal example of how this asymmetry contributes to market failure. In his paper "Market for Lemons" he shows the information asymmetry that arises between car buyers and sellers. He argues that car buyers can never be sure about the quality of the vehicle as only the sellers have that information. The sellers can differentiate between high–quality and low–quality cars, but the buyers cannot. Therefore, the buyer will assume all the cars have average quality and will be only willing to pay the price that reflects the average quality of the product. This is obviously lower

that the price of a high-quality car. Thus, as high-quality cars will not be able to get full price for them, offering high-quality cars will stop being profitable. This will cause the market to be dominated by low-quality products. As a result, the product's average quality will decrease which will be followed by a drop in the price that consumers are ready to pay. This is known to be a type of market failure that occurs, because the market cannot efficiently allocate high-quality cars to buyers that are able to pay a premium price for them. It is also an example of the economic cost of dishonesty.

This can be applied not only to car sales, but also to insurance. Akerlof explains why elderly people have great difficulty buying medical insurance. He answers the question "why doesn't the price increase to reflect the risk" by providing an analogy to the cars example. According to the paper, the people who insure themselves will be those who are increasingly certain that they will need the insurance. This is because applicants are better able to evaluate the risks involved than insurance companies due to mistakes made during medical examinations, doctors' sympathy for older patients, and other factors. As a result, the average medical condition of insurance applicants declines as the price level increases, making it impossible to sell insurance at any price. Statistics prove that the demand for insurance increases with age, while insurance coverage declines significantly.

The relevance of asymmetric knowledge and how it affects market outcomes highlighted in Akerlof's article have had a major influence on the subject of economics and stimulated a huge amount of additional study, as it reflects very well a real-life scenario.

b) Real estate bargaining

Bargaining is an essential part of every property transaction. It allows the parties involved to reach a price that ensures a mutually beneficial agreement. In each and every real estate negotiation, the seller needs to come up with a way to sell their property while trying to satisfy the other side. Successful bargaining requires negotiation skills and knowledge of the relevant market, as well as regional laws. Additionally, it is crucial as it can result in significant financial gains (Cadella & Seiler, 2016). Therefore, to be able to fully understand and successfully conduct bargaining, it is important to be aware of its complexity.

The process involves negotiating various elements of the sale, including the price, closing date, financing or appraisal contingencies, property repairs and other terms of sale (Murad, 2016). Firstly, the price is usually where the negotiating process starts, since it is typically the most crucial aspect of the deal. In order to reach an agreement, the price has to be acceptable for both sides as the buyer and seller may exchange counteroffers back and forth. Secondly, the closing date is when the transaction is officially completed and the buyer finally takes possession of the property. The closing date may be negotiated between the buyer and seller to make sure it benefits both sides. Financing or appraisal contingencies, on the other side, are requirements that must be satisfied before the sale can be finalized as the buyer might need to get external financing or have the property evaluated. The terms of these contingencies may be negotiated between the parties to ensure that they are fair and practical. The buyer and seller may also discuss who will be responsible for completing the repairs, if any, and how they will be paid for. Finally, there may be some other terms of sale to discuss, such as who will cover closing expenses or if any personal property (such as appliances) would be included in the sale.

When it comes to negotiating preparation and planning are critical. According to Smith (1992), most of the success is attributed to this phase. Without appropriate preparation, those involved in negotiations are likely to commit common mistakes and negotiate poorly. During the time before the actual negotiation, the sides must gather information, assess the situation, and identify their objectives. This includes the importance of having a clear understanding of their own goals but also of the needs of the other party involved. Gathering the information can be done through various means, such as conducting market

research and learning about the motivations of the client. Additionally, good communication skills ensure an effective negotiation process.

Another aspect that facilitates smooth bargaining is selecting the right strategy. One of the most common ones is compromising bargaining. This strategy assumes that the players make compromises to achieve a successful negotiation process outcome, which typically yields roughly in the middle of between both parties' initial viewpoints. Giving up certain benefits of one party usually comes in exchange for some other form of compensation. If both parties have strong interests at stake, the negotiation might become a difficult process, but this strategy can help to make an agreement. It can also beneficial if the parties trust each other or have limited time resources to conduct the negotiation process. However, this strategy overlooks the fact that those who adopt the most extreme stances frequently receive more of what is offered. Additionally, another threat to this strategy is that it is commonly used as an excuse for not preparing properly to the negotiation and not choosing a better strategy with more potential gains (Coburn 2015).

Apart from compromising bargaining, to reach an agreement in an amicable way, the parties might decide to follow another strategy, which is a cooperative bargaining strategy. It focuses on building a collaborative relationship between them, while emphasizing mutual benefits. In this process, two parties negotiate how to divide a surplus that they may jointly produce. The parties engage in a dialogue to explore each other's perspectives and maximise the overall payoff. This is a great tool for solving problems that might arise during the negotiation process while searching for a method in which both parties achieve their objectives at the least possible cost to the other side (The Lowry Group, 2021). Therefore, this type of negotiation can be particularly useful for any negotiator that values the relationship with its clients and is willing to build a long-term relationship with them. This can be beneficial to resulting in a positive outcome of a negotiation, because the satisfaction with the process and whether an agreement was reached is highly influenced by the reputation of the negotiator (Goates, Barry & Friendman, 2003). Additionally, to further benefit the relationship between the parties and support a successful cooperative negotiation process, Susskind & Cruikshank (1987) highlight the importance of a negotiation assisted by a mediator.

On the other hand, some investors believe that taking an assertive stance will help to achieve their desired outcome. In this case, neither building their reputation nor the relationship with the other party holds value for them. For that reason, they might choose to pursue competitive bargaining, which assumes attempting to gain an advantage over the other party. Investors will now focus on their own payoff rather than seeking a mutually beneficial agreement. This usually involves making aggressive demands and little to no concessions. This strategy can be effective when negotiating with a weaker party or when some issues are non-negotiable (Lax & Sebenius, 1986). However, threats and intimidation oftentimes have a detrimental effect on negotiations as they can breed anger and mistrust between the parties. Therefore, this strategy will unlikely allow the parties to build a relationship based on trust (Bacharach & Lawler, 1981).

Regardless of the strategy that the parties decide to pursue, to understand the interactions between the buyer and the seller, it is important to introduce the concept of ZOPA, which stands for "Zone of Possible Agreement". It refers to the range between the two parties' reservation points (the lowest and the highest values they are willing to accept). Therefore, it is essentially a collection of all potential outcomes that are agreeable to both parties if the buyer's reservation price is less than the seller's reservation price. This concept is attributed to the fact that typically, both seller and the buyer have some kind of a target price. This is the point that once reached, guarantees an acceptance of the deal by one of the sides. An example of ZOPA can be seen in the following scenario. The minimum price set by the seller is 100,000€, while the maximum bid from the buyer is $120,000. The ZOPA in this negotiation will be between 100,000€ and 120,000€, hereby indicating the range of prices within which a deal may be reached by both parties (Patel & Rubin, 2016).

Any price outside of the ZOPA will be rejected by either side. Choosing a correct negotiation strategy can help to reach a point within the price range (Patel & Rubin, 2016). However, Yao, Zhang & Lui (2020) highlight that some factors like mental fatigue have a detrimental effect on one's ability to reach ZOPA and therefore, to successfully finalize a negotiation process. In such case, it is important to introduce another term related to negotiation, BATNA. This stands for Best Alternative to a Negotiated Agreement. It was initially characterized by Fisher, Ury and Patton (1991) in their bestseller called "Getting

to yes". BATNA is an alternative that the party has outside of the negotiation range, in other words, a bottom line of an investor. Therefore, knowing your BATNA is crucial as it can affect the outcome of a negotiation process. The authors of "Getting to yes" also suggest a solution on whether it is worth disclosing the BATNA. According to them, this lies fully in the interest of the investor. If the BATNA is attractive, it might be beneficial to let the other side know. However, in the opposite case, disclosing it might weaken one's position.

Additionally, the negotiation outcome and strategy choice can be influenced by one's willingness to exposing themselves to risk. According to a concept of behavioural economics called anticipated regret theory, it refers to the unpleasant feeling caused by regret we think we might feel in the future. Therefore, it is very likely to influence our current decision. It is experienced while considering risks and can lead out actions to have a risk aversion nature (Straker, n.d.). In real estate bargaining, it might be a representation of a conservative seller, who doesn´t want to risk losing a client, so they might accept a non-satisfactory offer that they received. On the other hand, it might also be represented by a buyer who fears regretting not buying the property when it was available so they will pay for it more than they initially planned.

When it comes to efficient negotiations another important aspect is ethical considerations. Both buyers and sellers must act in good faith as well as be transparent, as it can lead to legal issues and consequently damage the reputation of the parties involved. Sellers should always provide accurate information about the property to disclose any information that can influence its value. Buyers, on the other hand, should be transparent about e.g., their financial capacity. None of the parties should engage in misleading or discriminative tactics, nor take advantage or the other party's vulnerability. By keeping these ethical principles in mind, both buyers and sellers can ensure their negotiations are carried out in a fair and professional way, which can lead to developing trust and credibility between them (Craver, 2010).

Finally, as mentioned earlier, reputation plays a crucial role in navigating the outcomes of the negotiation process. The concept of trust, and therefore a reputation of being a trustworthy negotiator is a perception mechanism that emerges over time. Once achieved, it is relatively easy to maintain. However, once distressed, it is difficult to build back. It

helps to overcome the uncertainty in the negotiation process. Because the negotiators have incomplete information, they need to make judgements about each other's intentions before deciding how to behave and respond in the negotiation. Reputation helps to understand the other side's character and interpret their actions. As a result, reputations impact the outcomes of negotiations (Tinsley, Cambria & Kupfer, 2007).

c) Game Theory application to real estate bargaining

Real estate and game theory are related fields as game theory offers a useful tool to analyse and comprehend the bargaining process in real estate transactions. By simulating and analysing the interactions between buyers and sellers as a game, game theory can help determine the best strategies for each player and predict the potential outcomes of the negotiation process. This section will explore how different game theory concepts can be applied to real estate bargaining and what benefits they can have in improving decision-making in real estate transactions.

In 1950, one of the greatest mathematicians of all time, John Nash, introduced a concept that we now call the Nash equilibrium. The concept revolutionized economics and other social sciences and has become one of the most prominent theories in understanding any game between the n number of players. The equilibrium describes a set of strategies that is each player's best response to the game. In other words, once this strategy is identified, there is no incentive for the player to change it, even after considering the opponent's strategy, because no better payoff can be achieved. According to Kim (1989) Nash equilibrium has significant application in static games, where the players make choices from their own personal set of options and then these choices interact with each other to reach an equilibrium, that is when each agent's choice is the best for that agent given the other agent's choice. In such cases, Nash equilibrium represents a dominant strategy, that would be a natural outcome of the game theory modelling (Yue et al., 2012).

To further explain the use of Nash equilibrium in real estate negotiation, let's imagine the following scenario. There is a potential buyer interested in the property and they have a maximum price they are ready to pay for the property (reservation price). However, the seller wants to sell at the highest price possible. The seller selects a starting price. If they set it too high, the buyer will not be able to pay it. On the other hand, if they set it too low, they will not meet their objective of maximising the profit. The Nash equilibrium in this case would represent a price selected by the seller that will maximise their profit and be feasible by the buyer.

Since real estate negotiations are in most cases a sequential type of game, it is important to introduce one more concept: a subgame perfect Nash equilibrium. It is a refinement of

a Nash equilibrium that represents the most efficient outcome at every stage (subgame) of an original game (Guo, 2018). Application of this concept is later developed in the section "Examples", where I use the most common tool for determining subgame perfect equilibria, called backward induction.

As we have seen, bargaining outcomes are influenced by various factors, including economic, social and governmental ones. However, ultimately, the success of the negotiation process will depend on the bargaining power of the parties involved (PON Staff, 2022). Bargaining power is a complex and dynamic concept that requires constant attention throughout the negotiation process. It is defined as an ability of a player to influence the outcome of a process by the degree of their control and leverage. The greater it is, the more favourable outcomes this party can achieve. Although it drives the process, it is not a fixed attribute possessed by any of the players, but rather a dynamic and constantly evolving relationship between the parties. The most common sources of bargaining power can include alternatives, available information and knowledge, status and social capital, with the most important one being BATNA, which was explained in the section above (Bacharach & Lawler, 1981). Bargaining power can be distributed in various ways, according to the real estate bargaining situation. For example, in a market with a lot of demand and limited supply, the sellers will have greater bargaining power over buyers. On the other hand, in the opposite scenario, it would the buyers who have more bargaining power to influence the outcome of negotiation processes. Therefore, the distribution of the bargaining power will be highly dependent on the location, level of competition, as well as experiences of the parties involved (Uchida, 2006). One may argue that taking advantage of your bargaining power and targeting it at a vulnerable opponent is unethical. However, Bacharach & Lawler (1981) state that it is not immoral or coercive since it is based on the social roles, knowledge, or other attributes of the negotiators. Moreover, effective communication or willingness to compromise can help to bridge the gap between the distribution inequalities (Uchida, 2006). Additionally, game theory can help the parties to identify the optimal strategy keeping in mind the bargaining power and its distribution.
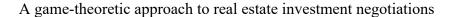
Game theory assumes the rationality of the players. This is based on the idea that people will act to eventually reach their goals or increase their profit. A hyper-rational choice is

one when a player takes into account the profit or loss on the other side and will choose an action that is desirable for him (Askari et al., 2019). However, as described earlier using an example of the "ultimatum game", it is not always the case, as human nature is biased. These assumptions are crucial when it comes to a real estate negotiation process. Goodpaster (1992) suggests that to increase the chances of making the best-informed, therefore rational decisions, the parties need to fully comprehend the situation by thoroughly preparing to the negotiation. This can help to prevent humans from making unconscious judgements and irrational choices, however, it is confirmed to be always sufficient.

Additionally, game theory is also applicable to the concept of conflict resolution in real estate negotiations. Since it is a theory of rational decisions, it can help to reach an agreement between the parties in a non-conflictive manner. Since real estate negotiations are characterized by an information asymmetry, game theory can provide frameworks useful for choosing a dominant strategy and resolving conflicts. For example, since the Prisoner's Dilemma can be applied to many real-life scenarios, it can be also helpful in real estate negotiations. A dilemma can arise between the seller and the buyer since they are both trying to maximize their profits. By building game trees or payoff matrices and developing a cooperation strategy, the parties can reach equilibrium and a fair price referred to as a mutually beneficial outcome (Rapoport, 1989).

Yue et al. (2012) provide an excellent example of high housing prices in Hong Kong that can be explained by game theory when the supply and demand model fails to do so. Because of its colonial history, Hong Kong's housing market is unique. Hong Kong government is the sole owner of the territory, and no land is privately owned. Instead of selling it, the government leases land to a limited number of private developers. To explain this oligopolistic market game theory comes in handy. By building the payoff matrix, the authors prove that the high prices of real estate in Hong Kong are the Nash equilibrium of the game. In other words, in the game between the government and the developers, keeping the land price high is the natural outcome in the market, even if it doesn't maximize the governmental profits. This example proves that understanding the dynamics of game theory is essential to explain this unusual real estate market scenario.

The above examples show the application of the game theory principles to real estate negotiations. It has been proven, that game theory is certainly beneficial in reaching a mutually beneficial agreement. On the other hand, it is worth mentioning, that game theory is a theory and can be perceived as a simplified model that is unable to capture the complexity of real estate negotiations (Yue et al., 2012). Hence, in the following section, I will provide two simulations that will help to understand better the real-life scenarios.

Examples

To further demonstrate the use of game theory in real estate negotiations for reaching a mutually beneficial outcome, I have built two simple models of bargaining between a seller and a buyer over a commercial property. Both models are examples of sequential games, a market structure in which players take turns in making decisions. In sequential games, players must consider not only their own choices but also the possible responses of their opponents, because each decision affects what the other player can do next. Therefore, these games often involve anticipation of future moves. Sequential games can be represented using game trees, where each node in the tree represents a possible decision. Building models using a game tree helps us find the equilibriums in a sequential game. One common approach is a backward induction, where players start analysing the game at the end of it and work backwards to determine the optimal strategy at each stage of the game. This helps us find the best outcome for everyone involved.

For the purpose of this experiment, I will limit the simulations to two rounds of counteroffers, meaning that once an initial offer is made the seller can respond with a counteroffer, but only once. Similarly, the buyer can also respond with a counteroffer only once. In a real-life scenario, it is uncommon, to have a third round of counteroffers, as typically two rounds are sufficient for the parties to either come to a mutually acceptable sale price or decide to abandon the transaction.

Example 1

In the first model, there is only one seller and one buyer. Each party has three options – accept, reject, or counteroffer. For simplicity, suppose that the seller has listed the property for 100,000€ and the buyer is interested in buying it for 90,000€. For obvious reasons, the first movement in this game belongs to the buyer. After the buyer makes their initial offer for 90,000€, the seller must decide whether to accept the offer, reject it outright, or make a counteroffer. The tree representation of this simulation looks like this:
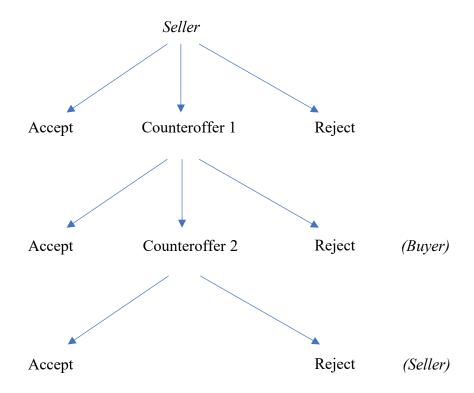
Seller

Accept   Counteroffer 1   Reject

Accept   Counteroffer 2   Reject   *(Buyer)*

Accept   Reject   *(Seller)*

Figure 1: Game tree of example 1
Source: Author´s own work

In this scenario, the seller has three options when faced with the buyer's initial offer of 90,000€. If the seller accepts the offer outright, the game ends and the seller receives a smaller amount of money than the one hoped for. If, on the other hand, the seller rejects, the game ends, with the transaction dismissed and both players end with a payoff of 0. However, the seller can also decide to counteroffer. We assume the first counteroffer is at 95,000€. If the seller decides to do that, the next move belongs to the buyer. At this stage, the offer can again be either rejected (that would imply dismissing the transaction, with a payoff of 0), accepted (that would finalize the sale) or counteroffered again (let´s assume this time is 93,000€). We also assume that the seller and the buyer have a cost of not completing the transaction. For the former, it is the cost of not selling while for the latter it is the cost of not buying. This represents the opportunity cost of not completing the transaction. This assumption is based on the idea that both parties have an equal stake in the negotiation.

To find an optimal strategy for the players, we can use backward induction. Starting from the last stage of the game tree, we can see that if the buyer counteroffers with 93,000€, the seller can either reject or accept. If the seller decides to accept, this will imply a payoff of 93,000€. However, if the seller rejects the offer, they will perceive the cost of not selling, which is 100,000€. Therefore, if the buyer counteroffers with 93,000€, the seller should accept this price, assuming it´s above the reservation price. Otherwise, the counteroffer should be rejected.

Moving one step back, the seller makes a counteroffer of 95,000€. The buyer has three choices. If accepted, the buyer received the property and the seller receives a payoff of 95,000€. If, on the other hand, the buyer rejects, they both would have to assume the cost of not buying or selling, respectively. The last option is to counteroffer with 93,000€. However, in this case, the buyer is risking losing the purchase as this price might be below the seller´s reservation price. This has been already analysed above.

Coming back to the first stage, the seller is faced with an offer of 90,000€. If accepted, it gives–a payoff of 90,000€. If rejected, as above, both assume the cost of not selling or buying.

Using this method of backward inductions, I have identified the optimal strategies for both players. The subgame perfect Nash equilibrium of this game is that the seller counteroffers with 95,000€ and the buyer counteroffers with 93,000€ (if this price is within the ZOPA margin). Alternatively, the subgame perfect Nash equilibrium could be for the seller to accept the initial offer of 90,000€ if they fear not finding another buyer with a better offer. However, this requires the seller to have a preference towards risk. This also proves that as long as the seller has no expectations of receiving a better offer, it is better to sell the property to the buyer than assume the cost of not selling.

Example 2

The example above presented a simple simulation of a negotiation process when only one buyer is involved in negotiations. However, in some cases, there might be more demand for certain properties. Now let´s imagine a scenario with one seller, buyer A and buyer B. As earlier, each party has three options – accept, reject, or counteroffer. For simplicity,

suppose that the seller has listed the property for 100,000€, buyer A is interested in buying it for 95,000€ and buyer B is interested in buying it for 93,000€. After the buyers make the initial offers, the seller must decide whether to accept one of them, reject them outright, or make a counteroffer. However, if buyer A gives a better offer than buyer B, the seller might decide to go for it, instead of counteroffering buyer B and risking losing it. Therefore, for this reason, as well as for the purpose of simplicity, the model doesn't include counteroffering both buyers at once. For this scenario, we also assume that seller counteroffers with 98,000€ and buyer B counteroffers with 96,000€. The tree representation of this simulation looks like this:
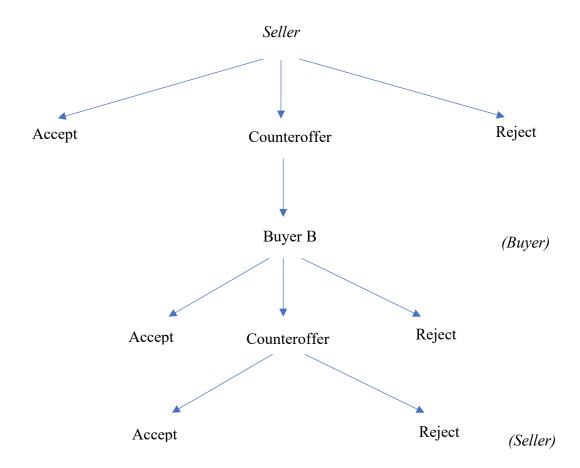

Figure 2: Game tree of example 2
Source: Author´s own work

To find the optimal strategies in this scenario, I will again use a method of backward induction. To do this, I start at the end of the game tree, where the seller has received a counteroffer from buyer B. This counteroffer can be either accepted or rejected. The first
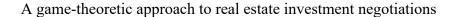
option will give the seller a payoff of 96,000€. The second option does not make sense since it is the higher offer out of the two received. Therefore, if the seller is not expecting more demand for this property, they will accept this counteroffer and reject the offer from buyer A.

Moving one step back, if buyer B is faced with a counteroffer of 98,000€ they can counteroffer it with 96,000€, which was analysed above. If buyer B thinks this price is above the seller´s reservation price, they might choose to follow this nod of the tree. If not, the buyer can also accept the offer or reject it. The former will close the sale at 98,000€. The latter, on the other side, will discard the sale. In such case, the buyer will have to assume to cost of not buying. However, the seller´s situation is different. If buyer B declines a counteroffer, the seller has still an option to accept the offer from seller A and pocket a payoff of 95,000€. This is an example of having a higher bargaining power. As seen, it prevents the seller from the risk of not selling in such scenario.

Coming back to the first stage, the buyer is faced with two offers, buyer A offering 95,000€ and buyer B offering 93,000€. The options that the buyer has are the following: accept one of the offers, counteroffer one of the offers or reject both offers. The first option leads to the question: which offer should be accepted? For obvious reasons, the seller would accept the buyer´s A offer since it results in a better payoff. The second option is to counteroffer buyer B to see if the price of 98,000€ would be below their reservation price. This was analysed above. Lastly, the seller can reject both offers, in hope of receiving a better one in the future. Since they received two offers (buyer A and buyer B) there might be a prejudice to think that there is more demand for their property. This is a risk that has to be assumed if the seller wishes to receive a better payoff from this transaction. Additionally, if the seller rejects the offers, the cost of not selling has to be assumed.

Using this method of backward inductions, I have identified the optimal strategies for the players. The difference between examples 1 and 2 lies in the bargaining power of the seller. Since there is more demand than supply in this market, the seller has a stronger BATNA, meaning they can freely choose a better offer and obtain a higher payoff.

To conclude this experiment, several notions need to be addressed. First of all, the behaviour of the players highly depends on their personalities, their relationship with the second party involved, their approach towards risk and many more. Secondly, the nature of the buyer or seller is an important factor, as in the case of institutional players they might be subject to different local regulations or smaller risk aversion than a private investor. Thirdly, the characteristics of the estate play a crucial role in such simulations. In the case of distressed properties (illegally occupied or in bad conditions), there might be less demand than for a newly renovated modern apartment in a good neighbourhood. Last but not least, the location of the property plays a crucial role in driving the demand for it. To address these factors, it is necessary to consider the real-life experiences of a real estate expert. That is attempted by conducting an interview and described in the following section.
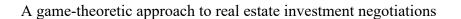
Methodology

This interview aims to understand the experiences and perspectives of an expert in the real estate field. To achieve this goal, a semi-structured interview has been conducted. Semi-structured interviews allow flexibility in the line of questioning while guiding the conversation around the research area. The sample size is one, which is further explained and justified in the "Possible Limitations" section.

The interviewee of the study is Álvaro García de Castro, the founder and CEO of Okuant, a real estate investment fund headquartered in Madrid, Spain. He has been chosen based on his experience and academic background. The interviewee is an Economics graduate from Universidad Complutense in Madrid (Spain). He also completed his master's in Business Management and Administration at IESE Business School in Madrid (Spain). He has more than 30 years of professional experience, both as a manager and as a business owner. He has been dedicated to the real estate market for over 12 years, during which he has been involved in numerous transactions and he has a reputation of an expert in the industry.

Okuant is a real estate investment fund dedicated to the opportunistic market within the residential sector in Spain. The opportunistic market refers to the market of properties that have been ruined and/or occupied by illegal squatters. The company is responsible for the whole process from acquiring these properties from banks or other financial institutions, then covering the entire legal process of taking possession, the valuation process, marketing and, finally, the sale of assets. The company's mission is to offer an alternative source of investment and to take care of the entire management process in order to ensure that investment procedures are carried out with guarantees.

The interview questions were based on the research objectives (see Appendix I). The conversation took place in a quiet and private room and was audio-recorded for transcription purposes. The interviewee had provided his consent prior to the interview.

The transcript from the interview will allow me to examine the behaviour of both sellers and buyers in the real estate industry. The insights provided by the interviewee will be later compared with the secondary research conducted in the "Literature Review" section.

The ethical considerations of this study included consent and confidentiality of the interviewee. He has agreed to reveal his personal information and required to store the audio tape of the conversation for the purpose of the study only.

Possible Limitations

One of the limitations of this research can be that only one interview has been conducted. The reason behind it is that the interviewee is a knowledgeable professional with more than 12 years of experience in the Spanish real estate market. Additionally, he has an academic background in economics and management. Therefore, his expertise is believed to be sufficient to provide value added to this thesis.

However, this can be a source of several limitations and potential sources of bias that should be taken into account. Firstly, the expert's perspective might be unique and not recognizable by other individuals. On one hand, it is difficult to avoid this limitation. On the other hand, the chosen interviewee is believed to have a universal knowledge obtained in both academic and professional experience, which is enough to assume their responses as adequate and replicable.

Secondly, the interviewee might be biased about this particular research topic or his focus in the area can be too narrow, which could negatively affect the validity of his answers. For that reason, the interviewee was chosen carefully and was informed about the purpose and importance of the research. This is believed to ensure the reliability of their responses.

Finally, the interviewer might introduce bias into the interview by leading questions in a certain way or misinterpreting the responses. However, conducting the interview in a semi-structured manner can help the conversation follow its natural flow and keep the responses neutral and unbiased.

Results

The purpose of the interview is to conduct research on the actual negotiation strategies used in the real estate industry. The expert contributes to the study with his insights providing information about real-world examples of game theory in real estate investing. Additionally, the results have been enriched by my personal observations and knowledge obtained during my 6 months long internship at Okuant between May and November 2022.

At the beginning of the interview, Álvaro describes a negotiation process step by step from the moment he receives an offer, when he first assesses it, and then negotiates and accepts or denies it. The factors that the team takes into account when assessing the offer are i.e., purchase price and financing method. The former refers to the price offered by the client and is important because the analysis team has to evaluate how far it is from the target price set by the valuation department. This is an important step as it ensures that the deal is financially viable and meets the company's financial objectives. The latter directly influences the closing date of the sale – external financing always requires more time and paperwork; therefore, it is important to know if the sale fits the schedule promised to the investors. The team also needs to assess the risk associated with external financing and determine whether it is the best option for the deal. Additionally, every buyer is later checked by the department responsible for the prevention of money laundering. This is an important step to ensure that the company is not involved in any illegal activities and that the sale is legitimate.

Once the offer has been assessed, the team will move on to the negotiation process. This involves discussing the terms of the deal with the client and trying to reach a mutually acceptable agreement. This process can take some time as both parties try to find common ground and come to a satisfactory agreement. The negotiation process is essential as it ensures that the deal is fair for both parties involved.

Finally, once the negotiation process is completed, the team will either accept or deny the offer. If the offer is accepted, the team will move forward with the sale and complete the necessary paperwork.

If the analysis team believes it is possible to obtain more profit or less loss on the property, they are very likely to make a counteroffer. However, before taking that decision, it is important to thoroughly understand the needs and interests of the buyer, as there is a risk of losing the sale. To address the issue, the company hires a sales agent who is responsible for communicating directly with the buyer and implementing a human and amicable approach. This approach is important as it allows the company to build relationships based on trust and therefore, to bridge the gap between the buyer and the analysis team to facilitate a mutually acceptable agreement. Another important aspect to analyse are the market conditions. The data collection department regularly prepares reports about the trends in the Spanish and global economy, as well as current housing industry conditions in each municipality of Spain. This information is crucial for the analysis team to determine a fair price for the property and to identify market trends that may impact the sale but have not been included in the valuation of the property. The goal of the counteroffer is to find a price at which both parties will be satisfied. As mentioned earlier, this is often a delicate balancing act, as both the seller and the buyer are trying to meet their own objectives and interests.

According to Álvaro, one of the key aspects of a successful negotiation is not exposing your target price to the buyer of the property. The target price is the price that the valuation team has determined as the minimum price that the company is willing to accept for the property. If this price is revealed to the buyer, it can weaken the company's bargaining power during the negotiation process. If the buyer knows the company's target price, they may be less likely to offer a higher price, and the negotiation process may be more challenging. It is also possible that the buyer may use this information to their advantage and try to negotiate a lower price, knowing that the company is eager to sell.

As observed, the process of negotiating the sales conditions can be challenging. As the interviewee mentions, this challenge is rooted in the level of attractiveness of the property which causes uncertainty about the presence of other offers. Properties that are less attractive to buyers or have certain drawbacks such as unfavourable location or poor condition can be difficult to sell, making it challenging to negotiate a sale with a client. Additionally, there may be other factors that impact the attractiveness of the property, such as changes in the local real estate market or the overall economic conditions of the

region. These external factors can make it challenging to anticipate the level of interest in the property and to negotiate a fair price that is acceptable to both buyer and seller. Moreover, the absence of other offers can make the negotiation process more difficult. If there are few or no offers on the property, the seller may have to be more flexible in their negotiation strategy to close the sale. Conversely, if there are multiple buyers interested in the property, Álvaro has more leverage in the negotiation process.

Once the offer for a property is accepted by Álvaro, the asset remains listed until the buyer enters a legally binding contract and pays the deposit (usually 10% of the offer). Up until this point, the seller is free to consider other buyers and accepts other offers. The purpose of that is to avoid the risk of losing the sale, as the real estate market can be unpredictable, and the buyer can change their mind or be unable to secure financing for the property. Keeping the property listed allows the seller to receive more offers from potential buyers. However, after a deposit contract is signed, both parties are obligated to act in accordance with its terms. Sometimes though, the offer might still fall apart, because of unknown circumstances. In such case, the deposit is not returned to the buyer (with a few exceptions, depending on the local law).

Regarding the rationality of his choices, the interviewee states that he is always rational when it comes to business decisions. He is essentially saying that he is guided by reason, logic and facts when making decisions that affect the company. He values objectivity and critical thinking in business and leaves no space for being swayed by personal bias. He knows the value of long-term success and he prioritises it over short-term gains. Acting so, includes the ability to accurately weigh each decision's pros and cons and use sound judgement to achieve a mutual agreement. However, the interviewee says that he might be emotional when it comes to personal investments. This means he is more likely to make an investment based on his personal thoughts or beliefs rather than solely on objective analysis and data. It is common for personal investments to be influenced by what is meaningful and interesting to the investor. Álvaro gives a very practical example of that. He states that if he was to buy a property for himself to live in with his family, he would consider a lot of aspects, such as if he likes the area, if it is close to his work or other family members´ houses and he will be willing to pay more to meet his personal considerations. It has nothing to do with the numerical analysis of the investment. Another

example is investing in stocks of a company that we particularly like or agree with its mission for society. Assuming that the investors that buy properties from Okuant have the same attitude can provide a certain disadvantage, as it will be very difficult to reach an efficient agreement with them in the negotiation process. Álvaro says that most of the time, the clients make rational decisions, but they can sometimes make irrational decisions influenced by emotional distress or other factors leading to bias.

Finally, the interviewee responds to a question regarding the loss aversion of his clients. It is a phenomenon that can have a significant impact on the way that professionals like Álvaro work with their clients. This well-known behavioural economics theory states that since the players are exposed to the anticipated regret theory, the fear of losing something can be perceived more negatively than the possibility of earning something of equal value. Investors may experience a wide range of negative emotions such as anxiety, stress or even anger, which can overshadow the benefit that they can potentially gain. The interviewee confesses that most of his clients associate losing something with more negative emotions than they associate gaining something with positive emotions, even regarding opportunities that are equally attractive. Therefore, Álvaro has to be aware of the influence of such thinking of his clients and tailor his approach in negotiations accordingly. By taking a holistic approach to understanding its clients' needs and motivations he can reach an efficient agreement that satisfies both sides.

The interview is a valuable source of information about real estate negotiations and the investing habits of both buyers and sellers. It helped to gain a deeper understanding of a perspective and experiences of a real estate investor. The interviewee's responses provide crucial notions that are further developed in the following section.

Discussion

After reviewing the current literature on game theory and real estate bargaining and conducting an interview with an expert in real estate investing, it is time to conclude this thesis with a final section dedicated to discussion of the findings. Literature review provides a comprehensive insight to game theory, real estate bargaining and applications of one to the other. On the other hand, the expert interview provides a fresh perspective on the topic and a deeper understanding of the concept of this thesis. To apply game theory to real estate negotiations most efficiently, it is important to compare these two in order to draw the best conclusions. As we will explore later, these two sources of research are most often complimentary, but in some situations, they do not always align with each other. This section provides an analysis of the most important concepts researched in this thesis, which are: imperfect information, asymmetry of information, bargaining power, prevention from effects of uncertainty, risk aversion, different negotiation strategies, conflict resolution and rationality.

When it some to imperfect information, the literature review tells us it is difficult to make well-informed decisions, since we don´t know all the facts. In fact, this is always a case in real estate negotiations as the knowledge of buyers and sellers is limited. If the information was perfect, the negotiations would be perfectly efficient, meaning the parties would always come to a price that satisfies both of them, there will most likely be fewer conflicts and the price would always reflect the actual value of the property. Álvaro addresses the problem of imperfect information when it comes to counteroffering. He highlights that his negotiators can never be sure if a counteroffer would not make the client back out if the new price proposal is above the buyer´s reservation price and the offer will break. Additionally, counteroffering reflects a risk of overvaluing the property. Since many factors include the actual sale price, Álvaro can never be sure if he can get something more out of an offer. To minimise this risk, companies hire a field agent who is an expert on the current market conditions related to different locations. With their knowledge, the company can make better-informed decisions and this way, attempt to overcome the obstacle of imperfect information.

On the other hand, the buyer has usually much less information than the seller which is a representation of a special type of imperfect information: information asymmetry. The

fact that the company has more information about the property is corresponding to the example of the sellers of cars in "Market for Lemons" by G. Akerlof. Respectively, the buyers of the real estate will never be sure about some features of the property such as hidden structural defects, future urbanization plans, underground issues or environmental hazards before they take over the possession of the property. Since the buyers are usually aware of these, they can dictate prices that adjust for the potential issues. As a result, the properties with no issues will be more expensive. However, since the buyers do not have enough information to differentiate from the properties that are worth a higher price and not, they will not want to risk overpaying and will choose the cheaper properties. Eventually, the demand for the good-quality properties will drop. The discussed consequences of this market structure include market failure and the economic cost of dishonesty. In case of Okuant, this concept is extremely important as they deal with distressed real estate. This means, the demand for their property is generally lower as this is a niche market. Therefore, such company usually discloses the property features and values honesty with its buyers to be able to close the sales efficiently.

Additionally, when it comes to a niche market, it also influences the distribution of bargaining power. Distressed real estate generates less demand, which is a disadvantage for the seller as it has a detrimental effect on their bargaining power. Buyers can use it as an opportunity to dictate lower prices, knowing that the seller might fear not getting another offer. In other words, they will have a stronger BATNA, which is one of the sources of bargaining power. In terms of a private seller, it might suppose a big problem as they have their own capital at stake. However, from a perspective of an institutional seller, such as Okuant, it does not always the case. They usually source the properties from financial institutions, which gives them an opportunity to sign a contract that allows them to return the property after some time if they can´t sell it. Terms of such contract are highly dependent on the location of the properties, as they are subject to regional laws, for example, it is regulated differently in most autonomous communities of Spain. Nevertheless, the seller would still care about their bargaining power and try to gain it from different sources than BATNA, for example, their experience, reputation, or relationship with the buyer.

When it comes to the uncertainty that arises between the buyers and the sellers, both sides will try to ensure they limit their exposure to it. The sellers have various ways to do it. First of all, they will ask the buyer the pay the deposit prior to signing the final sale. The deposit is usually 10% of the value of the offer and is an incentive for the buyer not to back out from the sale. This way, the seller can mitigate the risk of losing the sale. However, similarly to the case described above, the deposit contract is subject to different local regulations. For example, in Catalonia or the Valencian Community, the seller will be obligated to return the deposit to the client if the latter fails to obtain financing for the property. Secondly, another way sellers try to limit the influence of uncertainty is that they will keep the property listed online until the aforementioned deposit contract is signed. This way, they ensure that they might still receive another, possibly better, offer. Lastly, another source of uncertainty arises from the ways of financing of the purchase of the property. Companies like Okuant have a special department that is responsible for running a background check on every buyer to ensure the money they use does not come from money laundering or terrorist activities. On the other hand, when the buyer is dealing with an institutional seller like Okuant, they can be sure of them, as this is a company that is legally obligated to act in the client's good interest. Moreover, if the company is present online, the buyer is usually able to access reviews posted by the company's previous clients which can help them to eliminate any doubts they might have. When it comes to private sellers, this risk is much higher.

Speaking of risk, another important concept to address is the willingness of the investors to assume risk. In another word, it describes how they perceive potential risk and potential benefits. The current literature tells us that buyers and sellers are exposed to anticipated regret. They might choose a more conservative approach because they fear potential losses more than they benefit from the idea of potential gains. Álvaro confirms that, saying that most of the investors he has worked with are not risk-takers, especially when it comes to large-sum investments such as real estate.

Another logistics aspect mentioned in the literature review is related to disclosing one's target price. The authors of "Getting to yes" suggest that this decision depends on the investor. However, Álvaro points out that he never discloses the target price as it
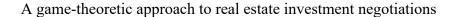
disincentivises the buyer to pay the price above it. To do so, would be a more common approach in the cooperative negotiation strategy.

The current bargaining scenario and specific personality traits of the players may lead them to follow different negotiation strategies. Prisoner's dilemma teaches us that the players not always act towards reaching their own payoff, in some cases, especially if they fear failing, they will attempt to reach a common benefit. Effectively, Okuant has established relationships with some buyers that are willing to build cooperation by supporting and trusting each other. In such case, the players might want to choose a cooperative strategy, where parties engage in a dialogue to explore each other's perspectives and maximise the overall payoff. However, depending on their motivations, the bargaining power, BATNA and ZOPA, they might choose a more aggressive approach or a different strategy.

In terms of conflict resolution, game theory literature teaches us that whenever a conflict arises, both sides need to carefully analyse all the variables and risks that they are exposed to. From the seller's side, Okuant has a specialized commercial team that takes care of that. Their job is to ensure a smooth negotiation process. On the other side, the buyer might want to seek help of an advisor to help them solve disputes. In some cases, Okuant will hire a mediator.

Lastly, when it comes to rationality, the literature suggests that people are usually biased, and human nature makes it difficult to make rational choices. Personal preferences, prejudice or pride can win over an economic payoff, like in the example of the ultimatum game. However, Álvaro does not completely agree with it and suggests that in reality, this concept looks different. When it comes to private investments, such as buying a house for your family to live in, the buyer will be biased and will take such purchase personally. However, on the other hand, when it comes to professional investments, the buyer will always act rationally. Their decisions will be driven mostly by an economic payoff or possible future benefits from holding the property. Therefore, it is important to differentiate one's opponent in the negotiation process, to better understand their motives and be able to predict their actions and behaviour more accurately.

This comparison between the literature review and real-life experiences provides a comprehensive understanding of the applications of game theory in real estate negotiations. This section identified imperfect information, information asymmetry, bargaining power, prevention from the effects of uncertainty, risk aversion, different negotiation strategies, conflict resolution and rationality as important concepts, whose exploration can help to make better-informed decisions, reach mutually beneficial agreements, and increase the chances of their success in real estate bargaining.

Conclusions

This paper explores the game-theoretic approach to real estate negotiations. With its findings, it contributes to this subject by investigating how game theory can be practically used in real-life settings. It provides an analysis of the effectiveness of the theoretical concepts and their contrast with practice. Additionally, the thesis indicates topics for more study and improvement and gives light on the limitations of game theory in certain situations.

The thesis argues that real estate investors could benefit from implementing game theory concepts in their negotiations. As explored and highlighted in the discussion section, comprehensive game-theoretical knowledge can potentially help to reach mutually beneficial agreements by helping the players make better-informed decisions, understanding the motivations of their opponents, limiting their exposure to the risk of uncertainty and more.

On the other hand, the thesis draws attention to certain limitations of using game theory in real estate negotiations. Since the real estate industry is very complex, theoretical knowledge might not always be able to capture all the factors that affect the outcome of the negotiation process. Human nature and bias are the main factors that make negotiations inefficient. Additionally, unlike most of the theoretical scenarios, the real-life ones include players that can act irrationally. In such situation, it is almost impossible to predict their actions and therefore the outcome of a negotiation process.

Finally, the thesis highlights the need for further research needed in the field of game theory and real estate. More cognitive and empirical studies could solve the problem of accounting for the non-quantifiable variables and provide more in-depth insights to the concept.

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Appendix I: Interview transcript

Interviewer: Hello Álvaro. Thank you so much for taking the time to meet with me today. Before getting started let me briefly review the purpose and process of the interview.

a) Purpose and format of the interview

The purpose of the interview is to learn about the negotiation strategies used in the real estate industry between the buyer and the seller of the property, as well as the nature of a typical real estate investor. The interview should not take longer than 15 minutes.

b) Confidentiality

Everything you share in this interview will be stored only for the purpose of conducting the thesis.

c) Audio Taping

To facilitate my notetaking, I would like to audio tape our conversation today. Please let me know if you agree to that.

Question 1:

Interviewer: Can you describe the process of negotiating sale conditions with the client. (What happens after you receive an offer? What protocol do you follow?)

Interviewee: When we receive an offer, first thing to see is far away is it from the target price. How far away is from our valuation? How much? How much time has been the property in the market to see if the if it is the first offer or we know when we are going to finally sell? Then we either make a counteroffer, or we accept the offer, or we deny it.

Question 2:

Interviewer: How do you decide when to counteroffer and if there are any exceptional situations? Have you ever accepted a non-satisfying offer without a counteroffer?

Interviewee: We make a counteroffer if we think that we can get something a little bit higher for the asset. If we have any history of previous offers, we seek something better

than that or if we think the value is higher, that's the same. Sometimes we can directly accept the offer if it is really high or if we know we are not going to get anything better and we want to sell the asset as soon as possible.

Question 3:

Interviewer: Another question, speaking of the target price, do you ever expose the target price of the property?

Interviewee: No, never.

Interviewer: And why is that?

Interviewee: Because if we expose the target price and nobody's going to pay above that price.

Interviewer: And if you receive an offer that's lower than the target price, can you say that this is our target price and we're not going to sell it for less?

Interviewee: No, this is our selling price and that's it. We will not say the target price.

Question 4:

Interviewer: What would you say are the biggest challenges in negotiating the sale conditions with the clients?

Interviewee: The biggest challenge is to know how attractive the asset is to know if we have margin, to know if we have other offers and to know how difficult to sell that property is.

Question 5:

Interviewer: Another question, how long does the property remain listed after you receive the offer? Do you ever, for example, after receiving an offer, still wait and see if you can get a better one?

Interviewee: We keep the offer listed until we finally sign a deposit and there is a commitment to buy the asset.

Question 6:

Interviewer: OK, and now let's move on to your decision-making and the nature of the average investor. I wanted to ask you a very general question. To what extent are your decisions rational? Are you ever biased by your intuition, or by other conditions like, let's say, even pride?

Interviewee: No, never.

Interviewer: Always rational.

Interviewee: If it is an investment about business, I will always be rational. If it is a personal investment, for example, I need to buy a house and decide where to live, I might be emotional.

Question 7:

Interviewer: Based on your experience, do you think that most real estate investors or clients, in general, are loss averse, meaning that they perceive real or potential loss more severe than the gain, or they have a risk-taking attitude?

Interviewee: They definitely perceive loss risks as more severe than gain.

Interviewee: Okay, so they are more conscious about it.

Question 8:

Interviewer: My last question would be, do you think that the clients ever make irrational decisions? Are you ever surprised that, for example, they don't want to raise the offer and you think that they should because it's still a good offer? What do you think of that? Because I would imagine the situation that, for example, a client makes an offer, and you

counteroffer and then they say that they don't want to pay the price that you ask them for because maybe they are too proud, or they just don't want to.

Interviewee: It depends, but I don't think it happens often. It depends if that asset is for living or for business and what is budget, they have.

Closing Note:

Interviewer: These were all the questions and that is the end of this interview. Thank you for your time, Álvaro.