

# Reference-Dependent Preferences in Multi-Issue Bargaining

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**Abstract.** Game theoretic bargaining models usually assume parties to have exogenously given preferences from the beginning of a negotiation on. Preferences in these models do not depend on the history of offers made during a negotiation. This paper argues that preferences are based on issue-wise reference points changing during the bargaining process as result of the counterparty's offers.

*Keywords:* Negotiation Analysis, Bilateral Bargaining, Consumer Preferences, Behavioral Economics, Endowment Effect, Loss Aversion

## 1 Introduction

In a bargaining situation two individuals have interests in reaching one of several possible agreements, but their preferences over these agreements are not completely identical. ‘What will be the agreed contract, assuming that both parties behave rationally?’ is the question posed by Rubinstein (1982) in his seminal article. The situation sketched by Rubinstein becomes even more challenging, and more realistic, if one accounts for the fact that many negotiations not only deal with dividing a single fixed pie, but are multi-issue negotiations. Parties usually have the possibility to simultaneously bargain over several goods or attributes and to search for integrative potential – they play a non-constant-sum game.

Empirically, negotiators oftentimes fail to reach mutually beneficial agreements in integrative multi-issue negotiations and – even if they reach an agreement at all – it is oftentimes non-Pareto optimal (Pruitt 1981; Raiffa 1982). This is frequently attributed to cognitive biases like the fixed pie illusion, the illusion of conflict, the reactive devaluation of the counterparties offers, different fairness perceptions, and the self-enhancement bias. Bazerman and Neale (1992) give an overview on these ‘common mistakes in negotiations’.

However, besides these manifold well-known cognitive biases, it appears that there might be another one preventing Pareto-optimal solutions, namely the *endowment effect* leading to endogenous preferences changing over the course of the bargaining process. This is outlined in more detail in the following section.

## 2 Endogenous Preferences

Cooperative game theory deals with the question of the *just* or *fair* outcome and provides advice, like e.g. the Nash solution (Nash 1950), for an arbitrator.<sup>1</sup> Non-cooperative game theoretic bargaining models aim at implementing cooperative solutions as equilibrium of non-cooperative games. One such approach is the pioneering alternating offer single-issue bargaining model proposed by Rubinstein (1982) which possesses a stationary-perfect Nash equilibrium. However, up to date there is no known equilibrium for a bilateral multi-issue alternating offer bargaining game with incomplete information. This shortcoming of game theoretic analysis leads to heuristic assessments of bargaining situations and the research discipline of negotiation analysis (Raiffa 1982; Bazerman and Neale 1992). Negotiation analysis gives prescriptive guidance to negotiators without having equilibrium models.

In the absence of equilibrium models, integrative bargaining is oftentimes regarded as joint problem solving and jointly exploring the space of potential agreements; negotiation support systems and automated negotiation systems propose search techniques like logrolling and trade-off heuristics for finding mutually beneficial agreements (e.g. Tajima and Fraser (2001) and Faratin, Sierra, and Jennings (2002)). However, many heuristics have the limitation of assuming preferences to be exogenously given and fix during the bargaining process – this might not be the case in many real life negotiations.

The value of a good to an individual increases when the good becomes part of the individual's endowment (Kahneman, Knetsch, and Thaler 1990). This effect – termed *endowment effect* (Thaler 1980) – is a well established behavioral bias and can be explained by S-shaped value functions in line with prospect theory (Kahneman and Tversky 1979). The endowment effect grows stronger with duration of ownership and prevails after termination of ownership (Strahilevitz and Loewenstein 1998).

During a negotiation process, parties constantly gain *virtual possession* on single issues and afterwards feel entitled to the specific value on this issue. Negotiators value the counterparty's proposals relative to a reference point and this reference point is adjusted issue-wise during the bargaining process. A proposal which is seen as a loss relative to the current reference point on one or more issues, is devalued – preferences are endogenously changing and depend on the history of the specific negotiation. Each single offer proposed to the counterparty might change the counterparty's preferences and therefore might destroy potential agreements.

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<sup>1</sup> See Roth (1985) for a collection of papers on cooperative bargaining.

Searching the agreement space becomes a process in which each step deforms the topology of the space and exploring as many as possible potential agreements might not be a good advice any more. Extensive search, like postulated by several search heuristics in automated negotiations research, becomes prohibitive.

Cray and Kersten (1999) report on data gathered with the Inspire system: in a pre-negotiation phase they elicit preferences from the parties, then they conduct the negotiation, and, if an inefficient agreement is reached, they at last present Pareto-improvements to the negotiators. 60.2% of negotiations which ended with an agreement were inefficient with respect to the preferences elicited in the first phase. However, only 20.8% of negotiators were willing to accept the proposed Pareto-improvements. At first sight this seems puzzling and irrational; but if preferences are endogenous and reference points change during the negotiation as argued above, then the systems proposal in the post-settlement phase may be unacceptable with respect to the ex-post preferences at the end of the negotiation; the low acceptance rate could be rationalized.

Vetschera (2004) analyzes utility functions, offers made, and final agreements in thousands of Inspire negotiations. He reports that in about 25% of the cases, negotiators violated consistency in the sense that they either rejected an opponent's offer during the negotiation although it yielded higher utility than the final agreement, or that a negotiator makes an offer which gives lower utility than the final compromise. Again, utility functions are elicited before negotiation takes place – negotiators' inconsistency could possibly be tracked back to a changed preference structure by the time the seemingly inconsistent behavior is observed.

Endogenous reference-dependent preferences and the process of updating reference points is formalized in the full paper. Furthermore, it is argued that negotiators not only feel entitled to a certain level of utility, but that their relative weighting of issues changes by observing the counterparty's offers – issue-wise reference points are not merely utility aspiration levels. Ex-ante inefficient but ex-post Pareto-optimal results of negotiations are exemplified.

### 3 Related Work

Besides foundations in negotiation analysis, game theory, and behavioral economics, there are some noteworthy papers directly related to the current work. Compte and Jehiel (2003) and Li (2004) build models of players' reference points shifting as a function of offers received in the past; both papers focus on single-issue bargaining only. Bendersky and Curhan (2003) and Curhan, Neale, and Ross (2004) study negotiators' preferences changing during a negotiation with a focus on dissonance and self-perception theory, not on endowment effects. Finally, and again for the single-issue case, Kristensen and Gärling (2000) find experimental evidence on subjects evaluating offers relative to reference points and adapting their reference point during the course of a negotiation.

## 4 Conclusion

The paper argues that negotiators oftentimes do not enter a bargaining process with a fixed valuation of alternatives and invariable trade-offs between issues. On the contrary, preferences are endogenously adapted and depend on the history of offers in the ongoing process.

For negotiation support systems (NSS), the implications are as follows: (1) Systems might warn their users to avoid the sketched bias, (2) they should re-elicite users' preferences at the end of a negotiation if a proposed improvement should be acceptable, and (3) if the changed preference structure is temporary and the ex-ante preferences recur, the system should propose improved agreements with considerable delay after the end of the negotiation. A prescriptive advice for a negotiator's offer creation heuristic is not to create virtual endowment for the counterparty, which might subsequently not be used for integrative improvements any more.

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