Contingent Behavior, Biases, and Adaptivity in Distributive Negotiation

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Abstract

Behavioral decision making research on negotiation has obtained significant results but has not yet been able to provide a complete picture of the mechanisms underlying the definition, selection and usage of reference points, or to specify the processes responsible for the formulation and evaluation of the negotiators' offers. We present the results of an experiment, requiring a bargain between a human buyer and a computer-simulated seller, in which we were able to obtain both the notorious biases caused by the initial offer and the framing effect, and an adaptive behavior related to the availability of a discount. The effects of discount, initial offer and framing have been analyzed as a function of both the reference points and the anchors utilized by the participants in the different negotiation phases. The experimental results and the linear models of the buyer support a contingent view of the negotiation behavior that affects the definition, selection and usage of the reference points.

Heuristics, Biases, and Reference Points

According to the bounded rationality approach, negotiators can be considered decision makers with limited processing capacities that rely on simplifying heuristics, and often take into account only part of the available information. It has been suggested that negotiators focus on a single predominant reference point (White, Valley, Bazerman, Neale & Peck, 1994), that they tend to ignore the opponent's cognitive processes or that they are prone to simplifying the contingencies of future events (Carroll, Bazerman & Maury, 1988).

The use of heuristics is justified by their efficiency, but it could produce various biases in the negotiation behavior (Neale & Bazerman 1991). Among the heuristics that can be found in the literature, here we focus on (a) the framing effect, and (b) the anchoring and adjustment process.

The framing effect arises from the evaluation of an option in relation to a reference point. If the option is considered as a gain, it is assumed that the negotiator assumes a risk-averse attitude and is leaning towards accepting the option. If the option is considered as a loss, on the other hand, it is supposed that the attitude becomes a risk-seeking one and the negotiator is likely to look for further concessions from the opponent. Another explanation for the framing effect is related to the greater significance of loss than of gain. The adopted frame influences the concessions made by the negotiators and the likelihood of agreement (Neale & Bazerman, 1985).

The use of the anchoring and adjustment heuristics has been proposed as a partial explanation for some relevant effects, such as the influence of the initial offer and the reference points (Kristensen & Gärling, 1997d; Yukl, 1974). This heuristic assumes that negotiators start from a value that is considered as an "anchor", and adjust it to provide the subsequent offers or estimates. The anchor is set on the basis of the information, sometimes objectively irrelevant, available to the negotiator. Generally, the adjustment made during the process is insufficient, with the negotiator remaining too close to the anchor.

Both anchoring and adjustment and the framing effect are grounded on the definition and adoption of reference points. Research on reference points highlighted the role of the initial offer and the market price (Kristensen & Gärling, 1997a), of the negotiator's reservation (White, Valley, Bazerman, Neale & Peck, 1994; Kristensen & Gärling, 1997b) and aspiration price (White & Neale, 1994), and of the opponent's reservation price (Kristensen & Gärling, 1997c).

While behavioral decision research on negotiation has obtained significant results, we still lack a complete picture of the process and of the relations that exist among its phases. (Van Poucke & Buelens, 2002). Among the issues that need to be further investigated we can mention: (a) the mechanisms for the definition and selection of the reference points, (b) the criteria for evaluating the received offers, and (c) the processes underlying offer formulation, as well as anchoring and adjustment.

In this paper we analyze the processes of definition, selection and usage of the reference points, and their relationship with the biases and the adaptive behavior shown by the negotiators. To this end we present an experiment and some linear models of the negotiator that have been used to test some specific hypotheses concerning the reference points and the anchoring and adjustment process.

A Price Negotiation Experiment

The experiment aimed at testing some hypotheses related to the theoretical perspective described above in a context of a distributive dyadic negotiation (Raiffa, 1982).

More specifically, we constructed a negotiation scenario that: (a) could be representative of a real world situation, (b) could allow for the systematic manipulation of the availability of cues capable of activating both adaptive and bias-inducing negotiation strategies, (c) could provide an adequate experimental control, and (d) could allow for the unobtrusive collection of the estimates and of the judgments provided by the participants during the negotiation process. We adopted a procedure derived from De Dreu, Carnevale, Emans, & Van De Vliert (1994), that had been proven adequate (Fum & Del Missier, 2001). The procedure arranges a negotiation between a (human) buyer and a (computer-simulated) seller. The participants are made to believe they are negotiating with another individual while they are in fact interacting with a computer program. This program implements a negotiation strategy whose pattern of offers is made partly contingent on the buyer's behavior. The program also allows for the exchange of offers and counteroffers during the negotiation process. In addition, it records the participant's satisfaction with the received offers, the value of the buyer's reference points (i.e., the reservation price and the aspiration price), the buyer's estimates of the seller's reference points, and the time associated with each action. Beyond providing the context for the negotiation, the program is also used as a process-tracing tool.

Hypotheses

We systematically manipulated the value of two cues that are notorious for activating some bias-inducing strategies in the buyer: (a) the initial offer, and (b) the relation between the initial offer and the market price.

The initial offer is often considered an anchor in the process of counteroffer formation (Neale & Bazerman, 1991). The related adjustment process sometimes proves insufficient, and it can yield an inadequate counteroffer. Moreover, the value of the initial offer can influence the setting of the reference points that are utilized to evaluate the subsequent offers.

The relationship between the initial offer and the market price can induce a framing effect when the market price is presented as an objective estimate of the value of a product, and it is assumed as a reference point (Fum & Del Missier, 2001; Kristensen & Gärling, 1997d). In general, when the frame is positive, the negotiator's satisfaction increases, and her/his attitude becomes more cooperative and concessive. This can induce a less rigid policy when setting the reference points. However, in the case of a negative frame, a tougher attitude in the negotiation can generally be found (Bazerman, Magliozzi, & Neale, 1985; Carnevale & Pruitt, 1992; De Drue, Carnevale, Emans & Van De Vliert, 1994). This attitude can yield a decrease in the value of the buyer's reference points. It is important to take into account, however, that the role of the buyer in a negotiation process is always associated with an implicit negative frame (Neale, Huber, & Northcraft, 1987) that will most likely influence the outcome.

In the experiment we manipulated a third cue to evaluate whether the participants were capable of modifying their behavior to take advantage of explicit environmental contingencies. This cue constitutes a discount mechanism that should allow a substantial modification in the participants' behavior because it is explicitly connected to the results of the negotiation policy, and because it creates a linkage between the different negotiation episodes. The discount availability should induce a more concessive policy and higher values for the buyer's reference points.

In the experiment we tested three hypotheses:

H1 (initial offer): the initial offer should affect both the initial setting of the reference points and the overall negotiation performance. The higher the initial offer, the higher the value of the settlement price, the estimates of the reference points, and the number of negotiation cycles needed to conclude the deal.

H2 (framing): the frame should affect (especially when its magnitude is high) the satisfaction concerning the first offer, and the setting of the reference points. With a positive frame we expect more satisfaction, higher reference points and settlement price, and a lower number of negotiation cycles to reach an agreement; when the frame is negative, less satisfaction, lower reference points and settlement price, and a higher number of cycles should be obtained.

H3 (discount): the presence of a discount mechanism should produce a higher settlement price, higher values for the reference points, and a lower number of negotiation cycles. If the negotiator is adaptive, it is reasonable to suppose that the gain produced by the discount will compensate for the concessions made during the negotiation process.

Method

Participants The participants were 96 undergraduates (66 females and 36 males) enrolled in a psychology course, ranging from 18 to 37 years of age (median = 20). All participants were familiar with computers, and were able to use the keyboard and the mouse.

Procedure The experiment required participants to negotiate the purchase of some out-of-print books needed for a course assignment.

A set of instructions were given to each participant, stating that the information about the market price of the books would have been provided by a trustworthy source

(a student union). The participants were further informed they would have to negotiate with a seller using a networked computer. The instructions also explained that a reward, consisting of extra credits for the course would have been given to the top scoring participants.

The participants were informed that their negotiation goal was to make the best deal, i.e. to purchase the four books at the minimum price. Half of the participants were randomly assigned to the "discount" condition. The instructions for this condition stated that a 20% discount on the total amount due would be given to the participants if they managed to reach an agreement in the majority of deals, without receiving an ultimate "take-or-leave" offer from the seller.

All the participants were also informed that, in the case of no agreement with the seller for a given book, they had to purchase the book on the free market. In this case, the price of the book was set according to a probability distribution. A distribution graph was shown to the participants that made explicit the fact that the most likely price would be the market price (p=0.50), with the probability of obtaining a more favorable price diminishing with the increase in the difference between the market price and the new price.

After reading the instructions, the participants went through a training trial to acquaint themselves with the task. The experiment required four negotiation trials to be performed during which the initial offer and the market price of a different book were systematically varied.

Each negotiation trial comprised a variable number of cycles. At the beginning of each cycle, the market price of the book was presented by the interface. Following this, the seller's offer was displayed, and the participants had to rate it on a five-point scale. They were then asked to state their reservation price (i.e., "the maximum amount of money you are willing to spend"), their aspiration price (i.e., "the best outcome you can reasonably expect"), and they were also requested to provide an estimate of the seller's reservation price ("the minimum amount of money the seller will be willing to accept") and aspiration price ("the best outcome the seller can reasonably expect"). Finally, the participants could (a) accept the seller's offer, (b) break the negotiation trial, or (c) make a counteroffer. Participants were told that only their reply would be sent to the seller. After a random time interval, a new seller's offer was presented, and another negotiation cycle started.

To end a trial the participant could accept the seller's last offer or break the negotiation. The computer-simulated seller could end the trial by accepting the buyer's proposal or by sending an ultimate offer. The communication between the buyer and the seller was limited to the offer and counteroffer interchange.

A few days after the experiment, the participants were given detailed information about the research and the true identity of the seller.

The Computer Negotiation Strategy The strategy followed by the computer seller was almost identical to that used in Fum & Del Missier (2001) to which we refer for a detailed description. The strategy was developed through a series of empirical tests, and it was judged as plausible from the point of view of the buyer. Its main assumptions (Carnevale & Pruitt, 1992: Raiffa, 1982) are as follows: (a) the seller's concessions progressively decrease; (b) the amount of the seller's concession is related to that of the buyer's; (c) a contentious attitude by the buyer is reciprocated by the seller.

The automated seller followed some simple rules to end a negotiation trial. It accepted a buyer's offer when the offer was equal or higher than the request it would have made in the following cycle. It sent an ultimatum in the case of sustained non-cooperation or, in any case, after six negotiation cycles.

Apparatus A G3 Power Macintosh computer was used for the experiment. A program implementing the human-computer interface, the seller's negotiation strategy, and the process tracing facilities was written in Common Lisp and Clim2. It represents a variation of the Java program used in Fum & Del Missier (2001). The only two significant differences were as follows: (a) participants could now move some sliders, instead of typing values, to express their offers and to make their estimates[1], and (b) the information concerning the last offer received or made by the participant, and the estimates provided in the last negotiation cycle were made available as external memories in the interface (on the sliders and on the panes). These modifications were introduced to reduce the errors made by participants in providing their input, and to eliminate the influence of some memory-related effects on the decision making and counteroffer formulation processes (Fum & Del Missier, 2001).

Experimental Design The experiment followed a mixed 2 (Initial Offer: 100,000 vs. 110,000 Italian Lire) x 2 (Discount: yes vs. no) x 2 (Frame: positive vs. negative) x 2 (Frame Magnitude: 5,000 vs. 10,000 Lire) design. The Discount and Frame factors were between subjects while the Initial Offer and Frame Magnitude factors were within subjects.

A framing effect was established by manipulating the relation between the seller's initial offer and the market price: if the initial offer was higher than the market price, the frame induced in the buyer was negative (loss), if the market price was higher than the initial offer, the frame

[1] At the time the experiment was carried out Italy, as well as another 11 European countries, had already adopted the Euro as currency. Given the difficulty encountered by people (and ourselves) in reasoning with the new currency, we decided to state all quantities in good ol' Lire (1 Euro = 1936.27 Lire).

was positive (gain). The size of the frame was established by manipulating the difference between these two quantities.

Results

Initial Offer (H1) The initial offer affected both the reference points, and the overall performance (see Table 1). The first counteroffer (i.e. the buyer's first offer), the settlement price, and the values of the reference points were significantly higher when the initial offer was high. The difference in the number of negotiation cycles needed to reach an agreement was not significant. These results corroborate hypothesis H1.

Framing and Frame Magnitude (H2) The frame affected the initial satisfaction judgment both on its own ($F(1,84)=5.52$, $MSE=1.53$, $p<.05$) and in interaction with its magnitude. When the frame was positive, the satisfaction was higher, especially when the frame magnitude was high (i.e., 10,000 Lire). The satisfaction judgment means were as follows: positive frame with a high magnitude: 1.62, positive frame with a low magnitude: 1.49, negative frame with a low magnitude: 1.33, negative frame with a high magnitude: 1.15). The interaction between the frame and its magnitude affected three out of the four initial reference points: the buyer's reservation price ($F(1, 84)=10.83$, $MSE=48$, $p<.01$), the buyer's aspiration price ($F(1, 84)=9.32$, $MSE=59$, $p<.01$), and the seller's aspiration price ($F(1, 84)=4.72$, MSE=47, $p<.05$), the only unaffected point being the seller's reservation price. The interaction produced higher values when the frame was positive. No significant differences were obtained in the number of cycles and settlement prices. These results support hypothesis H2 only for the setting of reference points, while the predictions concerning the overall performance are not corroborated.

Discount (H3) The results showed a remarkable effect of discount upon performance; this factor affected in the anticipated direction both the settlement price (mean for the discount condition = 76,097, no discount = 69,165, $F(1,84)=5.42$, MSE=774, $p<.05$) and the number of negotiation cycles (mean for the discount condition = 4.177, no discount = 5.087, $F(1, 84)=7.08$, $MSE=10.21$, $p<.01$). There was also a marginally significant effect of the discount on the buyer's first counteroffer ($F(1, 84)=3.492$, $MSE=1546$, $p=.065$; mean for the discount condition = 66,107, no discount = 58,243). Only part of hypothesis H3 is supported by the experimental evidence. It seems that the discount availability does not affect the setting of reference points, but only the performance. After the application of the discount (whenever appropriate), a comparison between the settlement prices for the two conditions (average amount per trial in the discount condition = 63,114, in the no discount = 69,085) revealed a significant effect ($t(86)=2.39$, $p<.05$). Participants in the discount condition took advantage of this opportunity by adopting a policy that avoided ultimate offers without making excessive concessions.

Negotiation Strategies and Agreements The number of trials ending without an agreed settlement price was very low (3% of the total). The prevailing negotiation strategies were the 'always increasing concessive' (i.e. the participants formulated in every negotiation cycle an offer that was higher than their previous one: 60% of the trials) and the 'monotonic concessive' (i.e. the participants never formulated an offer that was lower than a previous one, even if they occasionally repeated the previous offer: 19% of the trials). An analysis, carried out on the negotiation traces with at least three offers and associated with the 'always increasing concessive' strategy, showed that the participants' reference points were kept constant, or almost constant throughout the negotiation process. In the discount condition (n=93) the proportions of traces with no change was between .75 and .80 (depending on the reference point). In the no discount condition (n=86) the same proportion was between .74 and .84.

The Linear Models of the Buyer

In this section we describe the result of a modeling investigation carried out (a) to test some hypotheses on the contingent nature of cue selection aimed at explaining the effect of the discount, and (b) to test some linear models of the buyer's behavior in the experimental task.

We tried to achieve these two goals by following the tradition of linear models of judgment (Cooksey, 1996).

Table 1: Initial Offer main effect.

		First Counteroffer	Settlement Price	Buyer's Reservation	Buyer's Aspiration	Seller's estimated Reservation	Seller's estimated Aspiration
ANOVA		$F(1, 84)=24.29$ $MSE=64$ $p<.0001$	$F(1,84)=79.09$ $MSE=35$ $p<.0001$	$F(1, 84)=74.16$ $MSE=43$, $p<.0001$	$F(1, 84)=42.23$ $MSE=50$ p<.0001	$F(1, 84)=26.04$ $MSE=53$ $p<.0001$	$F(1, 84)=50.79$ $MSE=43$ $p<.0001$
Mean	High offer	64.281	75.463	79.618	64.134	74.166	92.913
	Low offer	60.069	69.799	73.587	59.224	70.185	87.915

Our hypotheses are based on two assumptions. First, the buyer adopts a predominant reference point (White et al., 1994) that we assume will reflect the attitude held during the negotiation. In the no discount condition it is assumed that negotiators will essentially focus on their aspiration price. In case of discount the predominant reference point will be the reservation price. Second, it is assumed that the dominant heuristic used to form a counteroffer will be anchoring and adjustment. (Kristensen & Gärling, 1997d). These assumptions allow the formulation of three hypotheses:

H4 (first counteroffer): The buyer's first counteroffer will depend on an anchoring and adjustment process, and will be influenced not only by the initial (i.e., seller's) offer but also by the predominant reference point (aspiration or reservation price).

H5 (stopping rule): In deciding when to stop the negotiation process, the buyers will rely on their predominant reference point. Therefore, the settlement price will be related to the predominant reference point.

H6 (counteroffer generation): The buyers are expected to utilize an anchoring and adjustment process in formulating the subsequent counteroffers. For every negotiation cycle, the anchor could be represented by the newly received seller's offer or by the offer formulated by the buyers themselves in the previous negotiation cycle. The degree of adjustment will be influenced by the presence or absence of the discount.

To test these hypotheses we carried out three separate multiple regression analyses on the negotiation traces corresponding to the 'always increasing concessive' strategy, for both the discount and the no discount conditions. We applied the forward stepwise method and then, after the elimination of the negligible predictors from the resulting models, we estimated the final models using a standard multiple regression approach. We carried out the analyses on the first counteroffer (H4), on the subsequent counteroffers (H6), and on the settlement price (H5). We used the following predictors: the previous buyer's offer (BO_{t-1}) and the current seller's offer (SO) for hypothesis H6, the buyer's reservation (BR) and aspiration price (BA) for H5, and BR, BA, and the seller's estimated reservation (SR) and aspiration price (SA) for H4.

Results and Discussion

The results and the final models are presented in Table 2. The fit of the models varies from acceptable (R^2_{adj}=.47) to excellent (R^2_{adj}=.976), a successful outcome considering the current status of the research on the negotiation models (Van Poucke & Buelens, 2002).

Our hypothesis concerning the determinants of the first counteroffer (H4) seems to be supported: the buyer's reservation price influences, together with the seller's reservation price, the discount condition while the buyer's aspiration price plays a significant role in the no discount condition. It is important to note that the models of the first counteroffer use both the buyer's and the seller's estimated reference points. This suggests that, in this context, the first counteroffer could have been generated by taking into account two reference points, one related to the participant and the other to the counterpart.

The buyer's reference points (the aspiration price in the no discount condition and both the aspiration and reservation price in the discount condition) are relevant for the negotiation ending (H5). After the inclusion of the first counteroffer in the set of predictors, only the effects of the buyer's reservation price in the discount condition remains significant. These results do not support H5 completely.

Finally, the generation of subsequent counteroffers (H6) was influenced by the buyer's previous counteroffer and by the seller's current offer. The model coefficients for the two conditions are almost identical. Two models of simple regression, exclusively focused on the seller's previous counteroffer, obtained an equivalent fit (no discount: R^2_{adj}=.974; discount: R^2_{adj}=.909) and resulted very similar (no discount: BO_t=6.12+(BO_{t-1}*.95), Beta BO_{t-1}=.987; discount: BO_t=10.51+(BO_{t-1}*.89), Beta BO_{t-1}=.95).

Table 2: Multiple regression results for the discount vs. no discount conditions.

CRITERION	DISCOUNT		NO DISCOUNT	
First counteroffer BO_1	Final Model:	BO_1=-17.62+(BR*.494)+(SR*.517)	Final Model:	BO_1=-40.55+(BA*1.017)+(SA*.372)
	Parameters:	BR (p<.001), SR (p<.0001)	Parameters:	BA (p<.001), SA (p<.0001)
	Beta:	BR=.372, SR=.405	Beta:	BA=.703, SA=.298
	Model Fit:	R^2_{adj}=.47, F(2,90)=41.69, p<.0001	Model Fit:	R^2_{adj}=.65, F(2,83)=81.22, p<.0001
Counteroffer BO_t	Final Model:	BO_t=4.79+(SO*.07)+(BO_{t-1}*.888)	Final Model:	BO_t=1.84+(SO*.054)+(BO_{t-1}*.95)
	Parameters:	SO (p<.01), BO_{t-1} (p<.0001)	Parameters:	SO (p<.0001), BO_{t-1} (p<.0001)
	Beta:	SO=.051, BO_{t-1}=.95	Beta:	SO=.040, BO_{t-1}=.982
	Model Fit:	R^2_{adj} =.911, F(2,331)=1717.03, p<.0001	Model Fit:	R^2_{adj} =.976, F(2,335)=6741.47, p<.0001
Settlement price SP	Final Model:	SP=37.87+(BR*.225)+(BA*.285)	Final Model:	SP=37.69+(BA*.546)
	Parameters:	BR (p<.01), BA (p<.001)	Parameters:	BA (p<.0001)
	Beta:	BR=.335, BA=.434	Beta:	BA=.721
	Model Fit:	R^2_{adj} =.52, F(2,90)=51.2, p<.0001	Model Fit:	R^2_{adj} =.51, F(1,84)=90.91, p<.0001

These results do not show any difference between the two experimental conditions in the adjustment processes occurring during the negotiation.[2]

Conclusions

As hypothesized, the results show that participants were able to develop a behavior that produces some of the known negotiation biases (i.e., framing and initial offer), while simultaneously adapting to take advantage of available environmental opportunities (discount). It is possible to explain this evidence by assuming that the anchoring and adjustment process and the offer evaluation rely on reference points that are defined, selected, and used in a partially contingent way. This contingent structuring of reference points seems to be affected by environmental cues such as initial offer, frame, and discount availability. These cues could induce different concessive attitudes, yielding to different policies for anchoring and adjustment in the formulation of the first counteroffer.

Some useful indications on the nature of reference points, and how they are utilized, have been obtained by linear models of the negotiator that have supported some of the experimental hypotheses, and provided interesting indications about those which were non corroborated.

The main contribution of our research is the support acquired for a partially contingent and constructive view of negotiation that waives the conflict between adaptive and biased behavior to focus instead on a detailed analysis of negotiation heuristics.

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[2] Using a separate slope model, we tested the interaction of the first offer and discount availability with all the significant predictors of the linear models. The analysis was carried out on the buyer's first counteroffer and showed the significant effects of each of the three-way interactions (ranging from $p<.05$ to $p<.0001$, with a single $p=.07$). Furthermore, the initial offer main effect is no more significant, but the discount main effect is still significant ($p<.05$). These results generally support the joint influence of the initial offer, of the discount and of the reference points. They are consistent with contingent weighted adding models, which weights (and cue utilization) depend on specific configurations of experimental conditions.