LÁSZLÓ SZEPESI[1] – GYÖRGY KOMÁROMI[2]

So many goods, so many anchorings

This article will discuss some aspects of the well-known behavioral pattern in decision making; the anchoring. We will present some empirical evidence that in bidding for three different goods the strength of the anchoring effect was significantly different, which could be explained by qualitative issues. Using experimental data we found no significant difference between female and male decisions, and we could not support that involving money in the experiments would matter either.[*]
Keywords: anchoring, experimental economics
JEL: D01, C91

1. Introduction

Anchoring is a well-documented psychological phenomenon which biases the decision making process, like the pricing of a given set of goods. This paper examines how robust this bias is and whether its strength depends on the type of goods being considered. We conducted experiments on bidding for three different goods in eight groups of graduate students, and we found that the levels of influence of anchoring were not equal in cases when a bottle of wine, a cappuccino voucher and a 1000 HUF book coupon were offered them to buy. The main focus of this paper is to emphasize that qualitative issues can explain such differences. These qualitative issues include the probable level of knowledge of the market price and the level of marketability of the good.

In our statistical analysis, we found no significant dissimilarity between the decisions of female and male subjects, while on the other hand, we present several cases showing differences which can support our qualitative reasoning mentioned above. We also discuss a methodological issue related to involving money in the experiments. Our analysis rejects the hypothesis that making participants feel real in the experiment (by asking them to really pay for the goods that they bid for) could make a difference. Based on our findings, we suggest that further control experiments to be executed could bring more sophisticated explanation about the influence of qualitative issues on the anchoring effect.

[1] László Szepesi, lszepesi@ibs-b.hu, Assistant Professor in Finance (International Business School, Budapest), PhD student at the University of Pécs

[2] Dr. György Komáromi, gyorgy@komaromi.net, College Professor in Finance (International Business School, Budapest), Assistant Professor in Finance (University of Veszprém).

In Section 2. we will give a short overview of the related literature on the anchoring effect. Section 3. will describe the design of the experiments we conducted with college students, and our hypotheses will be also formulated here. We will present the empirical and statistical evidence supporting or rejecting our hypotheses in Section 4., and we will explain how our findings support the main purpose of the paper that qualitative issues could have an impact on the strength of the anchoring effect. We will discuss some open questions and propose further experiments in Section 5.

2. Backround and relevance of anchoring

Anchoring is one of the three heuristics described in the now classic work of Tversky & Kahneman (1974), along with availability and representativeness. All three are facilitating the human decision making process by offering short-cuts, accelerating the process by simplifying it. However useful that might be, these heuristics also can lead to biases, i.e. distorting the final answer.

In the case of anchoring, "people make estimates by starting from an initial value that is adjusted to yield the final answer (…) adjustments are typically insufficient" (Tversky & Kahneman 1974). As a consequence, initial values (called 'anchors') have a direct influence on the final estimates, which are biased toward the initial values.

Since its original formulation, this heuristic was demonstrated to be effective in a large number of cases. One of the original examples involved asking respondents to guess the number of African states members of the United Nations. Before that, they were given a random number, which came from a spun of a wheel of fortune. It was found that groups that received higher random numbers as initial anchors gave on average a higher estimate than those who received a lower random number (Tversky & Kahneman, 1974). In a more recent study, Kruger (1999) demonstrates that when asked to compare their driving skills with that of their peers, people tended to anchor their driving abilities first and adjust for the peer's skills only in a second phase. The adjustment being insufficient, this lead to exaggerating each one's driving skills.

The psychological reasons explaining this phenomenon are still being analyzed. In its extensive review, Chapman (2000) proposes that anchoring might intervene at three stages. At the first stage, when information is retrieved from memory, the presence of the anchor could influence which information is retrieved. Second, when integration of the several pieces of retrieved information into a judgment is performed, the anchor could influence the weight of

the individual pieces . Finally, during the third stage, when judgment is articulated to the external world, the choice and usage of a specific scale could also be influenced by the anchor.

A number of experiments have been conducted in recent years to research how anchoring could influence valuation processes. In one experiment, students were offered goods and asked whether they would buy them at a given anchor price (randomly generated by the last two digits of their social security number). In a second phase, responding students had to bid for the same goods, and results showed that those presented with higher anchor numbers bid higher prices as well (Ariely, Loewenstein & Prelec, 2003).

While analyzing the anchoring effect on the willingness-to-pay of consumers, Simmonson (2003) notes that the strength of the anchoring effect (the degree to which anchoring interferes with unbiased decision making) is not uniform. In this research, a relation is demonstrated between what Simmonson calls the "compatibility between the anchor and the focal point of uncertainty" and the strength of the anchoring effect. In other words, the more the anchor can be interpreted as a likely value to the original question, the more it will bias the decision making process. The following example illustrates what is understood as compatibility: an anchor relating to the length of the river will influence more the answers regarding the length of the river than its width. Strack & Mussweiler (1997) regard this as the proof that relevance of the information contained in the anchor is influencing the strength of the phenomenon.

A number of methodological issues concerning the testing of the anchoring effect have been raised during the past years. Among those, in a survey based on a large number of experiments with undergraduate students, Rubinstein (1999) reports that he feels that creating an artificial laboratory type of environment to conduct such surveys is not necessary. He argues that simply making students fill questionnaires in a clearly hypothetical situation yields exactly the same results as the more formalized experimental designs. Therefore he rejects the necessity of the standard practice which consists, among other procedures, of requesting real payments to be effectuated by participants, stating that involving "real money" in the experiment does not influence its outcome.

3. Anchoring different goods: design and hypotheses

The first goal of our research was to check whether anchoring works on different types of goods and whether the anchoring effect would be different in its size or orientation based on

the quality of the goods themselves. Second, we intended to check whether valuation results were influenced by either gender or by the commitment to buy the goods.

We conducted the experiment with 129 undergraduate business students at IBS, International Business School in Budapest. They were offered the possibility at the beginning of their regular seminars to participate in what was described to them as a research on how the human decision making process works. All subjects received a questionnaire (see Appendix 1) that had two parts. In the first section, after stating their gender, they were asked whether they were willing to pay a certain price in HUF for three goods. The goods involved were a bottle of Bordeaux wine, a coupon worth 1000 Hungarian Forints to be used in a chain of bookshops ("Libri book coupon"), and a voucher to be exchanged against a cappuccino in the bar of the school. We set three different anchor prices:

Table 1

Anchor prices for the goods

Goods \Condition	Low	Medium	High
Bottle of wine	600 HUF	1,500 HUF	3,000 HUF
Book coupon	700 HUF	1,000 HUF	1,500 HUF
Cappuccino	200 HUF	350 HUF	450 HUF

In the second part, the subjects were asked to give the price they would like to pay for the three goods (willingness-to-pay, WTP). They were subsequently required to indicate whether they were ready to pay really for the goods, and as a conformation of real participation (and for contact reason) we asked for their email address.

Based on the preliminary results, we conducted a similar control experiment with a total of 47 students at University of Veszprém. The results of this second survey are to be further analysed.

The following formal hypotheses were formulated:

Hypothesis 1: We expected the anchoring effect to be of different strength, with the wine showing the strongest anchor effect, the book coupon the weakest, and the cappuccino voucher an intermediate strength.

Hypothesis 2: We expected the value put on the goods to be different between male and female respondents.

Hypothesis 3: We expected the value put on the goods to be different between those respondents who agreed to buy the goods and those who were just playing.

The first hypothesis is based on the idea that the three goods offered are of different quality in several aspect. One of their main characteristics is the level of knowledge of their real value by the participants: while the real cost of the book coupon is known with a total confidence, the price of the bottle of wine can only be guessed in a wide range, since there are a large number of similar products whose appreciation is not possible unless the respondent is an expert in this particular field. The cappuccino voucher is in an intermediate position in this regard: while its price is usually not known for sure, the proximity of the product, the availability of background information (like the general level of prices in the local bar) can serve as an indicator in the valuation process.

Behind the second hypothesis is the assumption that the (supposed) masculinity or femininity of the goods can influence the valuation process. In this respect, wine was thought of as the most masculine and cappuccino as the most feminine good.

The third hypothesis was put in place to check whether involving real money in the experiment would matter. This basically tests the robustness of the valuation process by adding or removing real money payments in the experiment and checking whether this influences the answers.

4. When it does matter, and when it does not

Hypothesis 1

We found that anchor prices biased the average bids in our experiment. The extent of the deviation, however, seems to be different for the three goods, as it can be seen in the summary table of descriptive statistics below (see Table 2). Comparing the average bids (AVG) with conditions Low and High, the order of relative differences supports that the anchoring effect is the weakest for the Book coupon: Book coupon (15.34%) < Wine (80.76%) < Cappuccino (83.74). As the relative differences for Cappuccino and Wine are very similar, we may conclude that the asymmetric anchor prices we used in the questionnaires for these goods have had small explanatory power on valuation of the goods.

The relative standard deviations (RSDEV) of the bids also suggest that anchor prices have different effect when bidding for different goods with different quality; the higher the relative standard deviation, the lower the probable level of knowledge of the market price.

This qualitative characteristic may explain that the RSEDV of Wine is the highest, while the RSDEV is the lowest for the Book coupon.

Table 2

Average bids and relative standard deviations

		Wine		Cappuccino		Book coupon	
	No	AVG	RSDEV	AVG	RSDEV	AVG	RSDEV
Low	42	1,055	91.41%	123	66.91%	639	37.42%
Medium	44	1,799	107.39%	166	69.07%	649	50.33%
High	43	1,907	60.79%	226	68.53%	737	47.66%

Bids in HUF; average = AVG; relative standard deviation (RSDEV) = standard deviation / average.

We suggest that the differences between the three goods in the relative standard deviation figures in Table 2 and the acceptance rates in Table 3 can be explained by the different level of marketability (or flexibility of use) of the goods. Another possible explanation for the differences is the level of knowledge of the 'real' market value of the goods. At this stage, we conclude that some differences are apparent and that further control experiments need to be conducted to circle the nature of the possible qualitative reasons explaining these differences.

Table 3

Acceptance rate for goods with different condition

	Low	Medium	High
Wine	83%	82%	67%
Cappucino	43%	20%	14%
Book coupon	79%	48%	14%

The strength of anchoring effect can be examined in three ways. First we compared the relation of averages of Low and High in the 8 groups involved in the experiment (see Table 4), expecting Low < High relation. We can see that for the Wine and Cappuccino, averages with Low condition are always higher than averages with High condition in each groups. The distortion effect of anchor price may be slightly weaker for the Cappuccino, because the lowest AVG with High is always higher than the highest AVG with Low (variability of the averages is smaller than for the Wine), which effect may be rooted in the different level of price knowledge we proposed in Hypothesis 1. While no opposite relations were found in the previous cases we have the opposite relations in 3 out of 8 cases for Book coupon (indicated in gray background in Table 4). Although these findings may support the hypothesis 1, that the strength of anchoring effect is increasing in the Book coupon, Cappuccino and Wine order, more statistical analyses are needed to compare the significance of these differences.

Table 4

Average bids of the 8 groups of subjects

		G1	G2	G3	G4	G5	G6	G7	G8
Wine	Low	1 742	750	950	767	817	1 760	767	806
	High	2 717	1 625	1 625	2 157	1 750	2 520	1 500	1 214
Cap.	Low	122	113	145	94	130	140	83	141
	High	362	188	210	150	217	294	208	186
Book	Low	633	750	575	500	625	820	633	625
	High	867	650	625	500	700	750	884	914

Bids in HUF; G1 – group 1, etc.

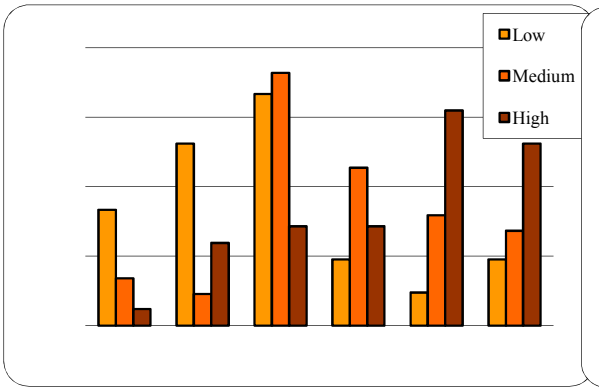
We calculated the categorical relative frequencies of groups (averages with one or two different conditions) in order to assess the degree to which the pattern of Group A (e.g. Bids for Wine with condition Low) differ from the pattern of the Group B (e.g. Bids for Wine with condition High).

We intended to filter out the distortion effect of asymmetric anchor prices, and set the following ranges: (0;Low/2), (Low/2;Low), (Low; (Low + Medium)/2), ((Low + Medium)/2; Medium), (Medium; (High + Medium)/2), (High + Medium/2; ∞). As a start, Figure 1 offers a visual representation of the distribution of the bids. As one can see, the analysis is very sensitive to the type and boundaries of the ranges used (see second Cappuccino graph, established with 2 ranges only, showing a seemingly distinct pattern from the first)

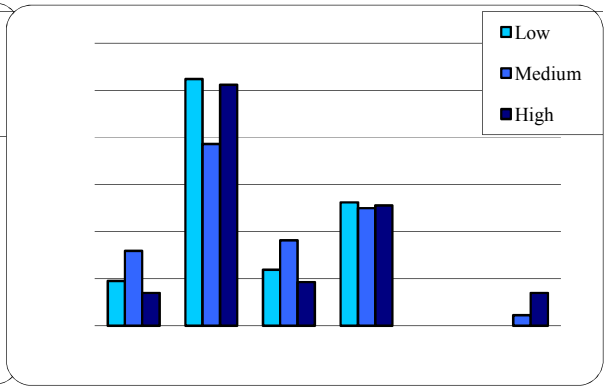
Figure 1

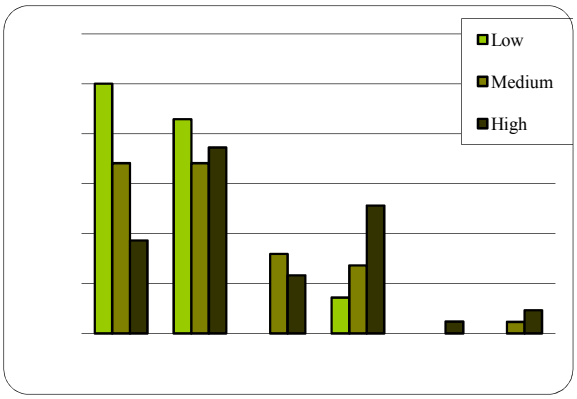
Relative frequencies of bids in defined ranges

Wine

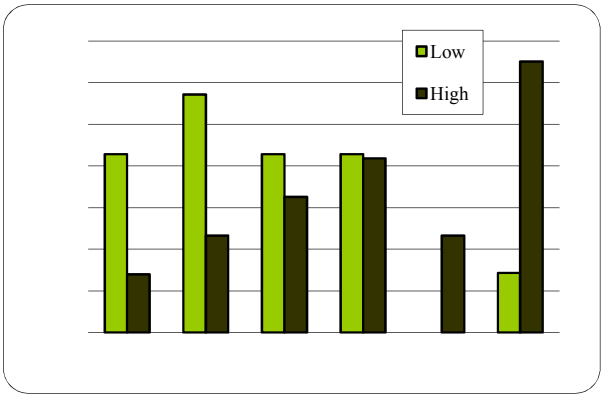


Book coupon





Cappuccino



Cappuccino with smaller ranges

We also analyzed the frequency data with Kolmogorov – Smirnov (K-S) test[3] in order to get the level at which the frequency patterns significantly differ. See Appendix 2 for results. As a first result, we note that the number of cases where significant difference can be noted is higher in the case of the wine bottle than for the cappuccino: out of 15 pairs being analysed, only 4 show no significant differences for the wine, and 6 show no differences for the cappuccino. Moreover, the number of cases where the significance is lower (10%, 20% instead of 1%) is much higher for the cappuccino than for the wine. The results for the book ticket are clear: there were no significant differences in any of the cases.

This seems to support our view that the anchoring and its strength is not uniform and that the difference can probably be explained by qualitative factors.

Hypothesis 2

See results for the K – S test in Appendix 2.

We reject the original hypothesis that valuations (pattern of bids) of female vs. male subjects are not the same.

In some other experiments (e.g in Komáromi (2006)) significant difference was found between male and female decisions. In our current study, out of 9 tested, only one case shows weak support for the hypothesis. We therefore reject it, in spite of the fact that feminine and masculine characteristics of the goods can clearly be spotted (for instance, in the wine case, anchoring works for males but not for females).

Hypothesis 3

See results for the K – S test in Appendix 2

We reject the "involving money matters" hypothesis, since there were only very few cases when the patterns of bids were significantly different comparing the real and the hypothetical auctions.

It seems that Rubinstein's proposal was correct, but one might question whether this would still hold in repeated games or experiments when subjects have "money" experience.

[3]K-S test, a type of "goodness of fit" tests is widely used in analysing frequency data, because it is distribution free, and suitable for small sample.

5. Discussions and further research

- Wider rage of goods (feminine vs masculine) : eau de toilette
- Absolute difference – measuring what qualitative factors make the anchoring stronger or more efficient
- Extreme pricing

References

Ariely, D., Loewenstein, G., & Prelec, D. (2003): Coherent arbitrariness: stable demand curves without stable preferences. *Quarterly Journal of Economics* 118: ??-??

Chapman, J. (2000): Incorporating the Irrelevant: Anchors in Judgments of Belief and Value, in Gilovich, T., Griffin, D. W. & Kahneman D. (????) (eds.), *The psychology of intuitive judgment: Heuristics and biases*. New York: Cambridge University Press.

Dodonova, A. & Khoroshilov, Y. (2004): Anchoring and transaction utility: evidence from on-line auctions. *Applied Economic Letters* 11: 307-310.

Frykblom, F. & Shogren, J. F. (2000): An Experimental Testing of Anchoring Effects in Discrete Choice Questions. *Environmental and Resource Economics* 16: 329-341.

Kruger, J. (1999). Lake Wobegon be gone! The "below-average effect" and the egocentric nature of comparative ability judgments. *Journal of Personality & Social Psychology* 77: 221-232.

Komáromi, Gy. (2006): Beauty Contest Game and Overconfidence. Research presentation. (http://www.komaromi.net/research/behavioralexperimentalstudies.htm)

Rubinstein, A. (1999): Experience from a Crouse of Game Theory: Pre- and Post-class Problem Set as a Didactic Device. Games and Economic Behavior 28: 155-170.

Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science,* 185: 1124-1131.

Appendix 1[4]

Instructions

This experiment we invite you to participate has a scientific purpose; we are doing a research on the human decision making process. No confidential information will be required; it is up to your decision to what degree you want to be involved.

Read the instructions carefully.

First of all, please indicate your gender: FEMALE / MALE
Read the Part I first, and answer its questions individually.
Please do not communicate with your neighbors, and keep the order when answering.
Please do not modify because of the subsequent questions.
If you are ready with the Part I, then read the Part II, answer its questions.
You have 10 minutes altogether.
If you have completed the questionnaire, please give it to the instructors.
Feel free to consult the instructors, if you have further questions.

Part I.

This is a hypothetic auction for the products you can see on the table.

Would you pay 3,000 HUF for the bottle of Bordeaux wine? YES NO
Would you pay 1,500 HUF for the 1,000 HUF Libri book coupon? YES NO
Would you pay 450 HUF for the ticket for a cappuccino at IBS bar? YES NO

Turn the page.

[4] These instructions are for the High condition. We used different prices for the other conditions; Medium - Wine: 1500 HUF, Book coupon: 1000 HUF, Capuccino: 350 HUF; Low - Wine: 600 HUF, Book coupon: 700 HUF, Capuccino: 250 HUF

Part II.

This is a real auction for the products you can see on the table.

How much would you pay for the bottle of Bordeaux wine? _____HUF
How much would you pay for the 1,000 HUF Libri book coupon? _____HUF
How much would you pay for the ticket for a cappuccino at IBS bar? _____HUF

Please indicate whether you are willing to pay real money for the products, because we draw a person from the students, and he/she are to buy the product for the price he/she offered in the Part II.
I am ready to buy the products at the price I offered in the Part II. YES NO
You will get an email from us, if you are drawn.

YOUR EMAIL ADDRESS:
Thank you for your participation.

Appendix 2

Summary of results from Kolmogorov-Smirnov „Goodness of Fit" Test[5]

Good	Groups	Condition	n	Dmax	α.	Groups	Condition	n	Dmax	α.
Wine	Low / Medium		42	0.316	1%	Low / High	real auction	23	0.504	1%
Wine	Medium /High		44	0.275	1%	Low / Medium	hypot. auct.	19	0.415	1%
Wine	Low / High		42	0.476	1%	Medium /High	hypot. auct.	17	0.29	5%
Wine	Low / Medium	Male	27	0.38	1%	Low / High	hypot. auct.	19	0.471	1%
Wine	Medium /High	Male	17	0.302	5%	Male/Female	Low	27	0.251	10%
Wine	Low / High	Male	27	0.66	1%	Male/Female	Medium	17	0.093	>20%
Wine	Low / Medium	Female	15	0.289	15%	Male/Female	High	26	0.221	15%
Wine	Medium /High	Female	27	0.21	15%	Real /Hypot	Low	23	0.141	>20%
Wine	Low / High	Female	15	0.27	20%	Real /Hypot	Medium	27	0.609	1%
Wine	Low / Medium	real auction	23	0.137	>20%	Real /Hypot	High	28	0.143	>20%
Wine	Medium /High	real auction	27	0.64	1%					
Book	Low / Medium		42	0.074	>20%	Low / High	real auction	23	0.088	>20%
Book	Medium /High		44	0.089	>20%	Low / Medium	hypot. auct.	19	0.182	>20%

[5] We used the online statistical tools of VassarStats (http://faculty.vassar.edu/lowry/VassarStats.html). Explanation for level of significance: α=1% - very strong, α=5% - strong, α=10% - weak. α>10% - no

Book	Low / High		42	0.069	>20%	Medium /High	hypot. auct.	17	0.235	>20/
Book	Low / Medium	Male	27	0.124	>20%	Low / High	hypot. auct.	19	0.068	>20%
Book	Medium /High	Male	17	0.169	>20%	Male/Female	Low	27	0.075	>20%
Book	Low / High	Male	27	0.087	>20%	Male/Female	Medium	17	0.166	>20%
Book	Low / Medium	Female	15	0.186	>20%	Male/Female	High	26	0.108	>20%
Book	Medium /High	Female	27	0.166	>20%	Real /Hypot	Low	23	0.12	>20%
Book	Low / High	Female	15	0.118	>20%	Real /Hypot	Medium	27	0.124	>20%
Book	Low / Medium	real auction	23	0.047	>20%	Real /Hypot	High	28	0.193	20%
Book	Medium /High	real auction	27	0.133	>20%					
Cap.	Low / Medium		42	0.247	1%	Low / High	real auction	23	0.378	1%
Cap.	Medium /High		44	0.167	>20%	Low / Medium	hypot. auct.	19	0.36	1%
Cap.	Low / High		42	0.371	1%	Medium /High	hypot. auct.	17	0.149	>20%
Cap.	Low / Medium	Male	27	0.315	5%	Low / High	hypot. auct.	19	0.348	1%
Cap.	Medium /High	Male	17	0.109	>20%	Male/Female	Low	27	0.096	>20%
Cap.	Low / High	Male	27	0.424	1%	Male/Female	Medium	17	0.123	>20%
Cap.	Low / Medium	Female	15	0.163	>20%	Male/Female	High	26	0.051	>20%
Cap.	Medium	Female	2	0.24	10%	Real /Hypot	Low	2	0.048	>20%

	/High		7					3		
Cap.	Low / High	Female	15	0.356	1%	Real /Hypot	Medium	27	0.172	>20%
Cap.	Low / Medium	real auction	23	0.173	>20%	Real /Hypot	High	28	0.091	>20%
Cap.	Medium /High	real auction	27	0.207	15%					