

Behavioral Finance II - Heuristics and Biases

In our last Letter, we presented a more conceptual background, describing Behavioral Finance research program and its efforts in pursuing behavioral explanations for individuals economic decisions, based on more realistic assumptions regarding their psychological condition. We saw that people tend to resort to heuristic rules that could result in biased judgments. Now, it's time to describe some of these deviations. This is a task of general interest, since everybody's day-to-day life is filled with minor decisions, some of them trivial and some of them critical. In this case, we also have specific interests: i) as asset allocators, our business involves a sequence of judgment processes culminating in the decision to invest/desinvest; ii) a significant part of our work analysis involves creating intelligence on the decision capacity of companies and their senior management. Thus, we seek to illustrate certain paradigms of deviations of reason with finance related examples, an area with which we are more familiar. Lastly, it is vital to remember that there is no antidote available that can render us impervious to these failures of judgment. It is almost impossible to accurately isolate such tendencies, let alone completely eliminate them. The aim here is to identify their general profile, in order to enhance the quality of our choices.

Anchoring

When we are faced with complex problems and statements of hard comprehension, we tend to grab onto the initial data received. We remain 'anchored' to known information that frequently is entirely irrelevant to the respective decision process. Then there is the now classic experiment carried out by Daniel Kahneman and Amos Tversky, "K&T", (1982): Imagine that you standing in front of a wheel of fortune that, after spinning, comes to a halt at number 65. Immediately thereafter, you have to answer the following question: is the percentage of African member nations of the United Nations greater or less than

65? Your answer is less. What, in your opinion, is the exact percentage? 45%, answered the contestants. Imagine now that you are another person, one who was not involved in the competition. The wheel of fortune spins again and stops at number 10. The same question regarding the number of African member nations of the United Nations is asked. The answer is greater than ten percent. The exact percentage? The contestants reply 25%. In other words, an irrelevant and random piece of information 'anchored' the replies of the undecided contestants.

Thus, just as we only appear to be capable of focusing on one single scene in a landscape or hear only one single conversation at a party or meeting, our decision making process tends to concentrate on only one item of evidence at the moment we process estimates. As a general rule, the data first processed tends to weigh more decisively in the final estimate. Not only does the anchor data become transformed into a prominent starting point, but also tends to add a bias to the nature of the data sought and recovered in the subsequent judgment process stages.

Among its more prevalent manifestations of anchorage is our propensity to maintaining the *status quo*. In our last Letter, we saw that Prospect Theory explains this type of behavior when individuals perceive negative changes as being more harmful than the potential impact of positive changes. We prefer what is familiar and, when we contemplate change, we tend to confine our exploration to the neighborhood of existing options. This spontaneous trend to maintaining current situations and action plans is well known in the corporate environment, to the extent that it can become a threat to a company's competitive adaptation process. Hence the importance of innovation and the need to develop permanent incentive mechanisms to promote creativity among all levels of a company's hierarchy.

When it comes to securities, the trend is to remain anchored to market prices.

Our Performance

Over this first quarter, Dynamo Cougar quotas devalued by 1.25%, while the *Ibovespa* average appreciated 1.51% and *IBX* by 3.83%. The Fund's accumulated return since its foundation was 30.8%^{p.a.} over the *IGP-M*, while *Ibovespa* gained 8.3%^{p.a.} during this same period.

The relative stability of both these indices and the Fund's quotas during this quarter masks a fairly volatile three-month period. *Ibovespa* dropped by close to 10% and then rose by 12.5%, while the Fund fluctuated marginally less – between -4.5% and 8.2%. Generally speaking, our portfolio held important participation in iron ore and long steel companies, *Ambev*, and *Itaúsa*. On average, these shares performed consistently over the quarter. The weakened results were caused by intermediary positions investments like *Coteminas*, *Klabin*, and *Marcopolo*.

In April, the Fund's major positions performed negatively, as did the domestic and global markets in general. The generalized drop in the market brought some shares to very attractive levels, when we took the opportunity to reinforce the Fund's major investments. This reduced both the cash position and the position of some intermediary shares.

In our next Letter, which should be issued shortly, we intend to analyze the Fund's portfolio in detail, with particular emphasis on iron ore and long steel investments which are somewhat *contrarians* at present. We shall also have the benefits of a trip to China in mid-June.

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es. In the case of equities, where the volume of data to be processed is extremely extensive and varied, market prices represent an important reference for individual estimates. We avoid buying a share because the price rose recently, or we postpone selling it because the price dropped, even if an in-depth analysis points to do so¹. Even professionals and fund managers can fall into this ambush, particularly when they lack sufficient confidence in their own analysis processes. This behavior is also common among market analysts, where their DCFs results are adjusted based on market price variations. Then we behold the bizarre acrobatics where the analysts' *fair values* swing based on the market and not as a function of the fundamentals of the companies. Another widespread anchoring is that of relative valuations, where the company is held hostage to standard sector multiples. Here, yet again, specific analysis counts for very little, and the value of the company is based on the market status of its peer companies.

Representativeness

On the foundations of our thinking mechanics lies an association process. Even the most complex methods of reasoning, such as logical deduction and hypothesis tests are based on associative systems. This tendency to produce similarities makes an early appearance in and dominates our spontaneous judgment process, while not necessarily accurately reflecting the contingencies involved in the matter. Thus, mentally constructed similarities can distort our capacity to record important information and prevent us from logically accessing the statistics of the pertinent events. This insight increases in importance when we recall that, by its very nature, investment decision is essentially a comparative process.

In other words, when we are faced with a problem such as, what is the probability of event A have been originated from process or phenomenon B, we tend to evaluate the extent to which B resembles or represents A. It is a fact that we build this association in terms of similarity without analyzing the respective probability structure. Typically, we fall into the heuristics of representativity, where we confuse similarity with statistical frequency. In the words of Stephen J. Gould: "our minds (for whatever reason) were not designed to deal naturally with the laws of probability".

K&T (1982 b) illustrate this point with the following experiment:

Linda is 31 years old, single, outspoken, and very bright. She majored in

philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

Please circle the more probable alternative:

- a) Linda is a bank teller
- b) Linda is a bank teller and is active in the feminist movement.

Close to 90% of the participants chose alternative b). In fact, alternative b) is less probable than alternative a) because it involves a conjunction, requiring a double event. People chose alternative b) because the description of Linda reminded them of feminists. The degree of details in the text triggers a similarity relation, and induces the reader to commit a statistical inference error. K&T call this phenomenon a 'conjunction fallacy', a manifestation of representativeness bias. The message here is directed to individuals who deal with decision mechanisms involving many variables and multiple sources, such as investing in corporate stocks: a higher volume of data and an increased amount of details does not necessarily upgrade the quality of the analysis or decision process. Great care must be taken in relation to the tendency to reduce attention to important data by absorbing irrelevant information.

Another consequence of a representativity bias is what is commonly known as the 'law of small numbers', in counterpart to the statistical principle known as the 'law of large numbers' (stating that the larger the number of sample data, the closer the sample average will be to the original population). The 'law of small numbers' is the belief that small random samples of the population are likely to resemble the original population, far more than statistics would project. In other words, this is the trend to draw conclusions based on few events, to find standards and correlations where they do not exist. Examples are: Projecting a promising future for a company that has recorded excellent results for two or three quarters, selecting asset managers with a background of outstanding performance for two or three semesters.

Availability

The bias of availability or vivacity occurs when a person overestimates the probability of events occurring because he/she tends to recall data or experiences that are more recent and/or more compelling. In other words, the decision is based on the event's capacity to provoke recall and not on its frequency of probabilities. The identification of this heuristic in the K&T (1982 c) empirical experiments has been supported by neuro-scientific

advances. Today, we know that the activity of areas of the brain that kindle or rescue memories are stimulated by the action of neuro-modular substances (noradrenaline, dopamine, serotonin, etc), whose rates of release are associated with differing intensities of the emotional state. It is interesting to note that both representativity and availability judgments involve recovering long-term memory. Their differences are subtle: in the availability process, individual instances are recovered and frequency judgment is accessed in terms of facility or prominence. In the representativity process, information on generic concepts is recalled, and the respective topic undergoes a comparison with the recovered mental category.

On being asked about their chances of being killed in a shark attack or an airplane crash, most Americans taking part in this experiment answered that sharks are a more probable threat. The truth is that deaths caused by falling aircraft were thirty times more probable at the time of the survey. The explanation for such an enormous error of accessing probabilities in this case is that shark attacks are more widely covered in the media, usually in dramatic accounts, which makes this type of accident, already loaded with a high emotional content, more 'available'. Research has shown that this type of bias occurs among investors when they decide to buy shares of companies and invest in fund managers whose names appear frequently in the media. A warning: an interesting study (Gadarowski 2001) of companies that had the most press coverage in the US concluded that they tended to underperform over the next two years.

Ordering and framing

Framing bias occurs when the ordering or presentation of the problem affects the decision. Here we have a violation of the principle of non-variance of the expected utility theory. There, in the reign of 'pure logic of choice', one same problem presented in two different manners could never produce different results. But in the world of practical decisions, the order of the factors involved can alter the end product.

And this is exemplified by another K&T (2000) experiment. The participants are asked to imagine a situation where they must decide on implementing a public health program involving a population of 600 persons, to combat an epidemic disease. The options are presented as follows:

- a) If program A were applied, 200 people would be saved.
- b) If program B were applied, there would be one-third of chances that 600 would

(1) The three anchoring prices influencing investment decisions are: extreme prices (high and low), recent prices, and acquisition price (v. Mussweiler and Schneller, 2003).

be saved and a two-thirds probability that nobody would be saved.

After computing the answers, 72% participants voted for Program A and only 28% selected Program B. At this point, the following problem was presented to a different group.

- c) If program C were applied, 400 people would die.
- d) If program D were applied, there would be one-third of chances that nobody would die and a two-thirds probability that 600 would die.

Here only 22% voted for Program C, and the majority for Program D. The truth is that A and C are identical as are B and D. This is a major failure of the principle of non-variance, and reports confirm that this occurs as frequently among the more naïve people as it does among sophisticated individuals. When the problem is presented as a way of 'saving lives', people are conservative; averse to risk, they would rather guarantee saved lives. When the context is 'losing lives', people tend towards risk, and would take chances in the hope of avoiding the loss of lives.

Framing problems are common among financial analysts. Surveys show that the US sell side utilizes *pro forma* statements more than US GAAP, despite being aware that the former tend to overestimate company results. Another recurring mistake committed by analysts is to allocate greater importance to reported earnings rather than to cash flow, even in the knowledge that they tend to be negatively impacted by accounting rules, non-recurrent results, and non-cash items. A significant part of job analysis consists of critically filtering available data in both form and content, with due regard for the structures of the presentations, disposition of charts and tables, the usefulness of deflators and indices, and the materiality/consistency of the information provided by the companies or by the brokers.

Overconfidence/Excess of Optimism

This bias reflects the tendency of individuals to overestimate their forecasting capacity and control over future events. There are a number of different interpretations of the main psychological factors leading to this judgment phenomenon. Among these is a tendency to undervalue the aspects of a situation where the individual is relatively ignorant, or the tendency to make estimates based exclusively on aspects of the present scenario or of the case in point.

Overconfidence and excess optimism are possibly the most widely documented psychological errors. This is chiefly manifested by evidence that individuals

tend to classify themselves as above average, believing that others will judge them as being better than they are, exaggerating their skill in controlling the environment (control bias), believing that positive results are the outcome of their own skills, and negative results are due just to chance or bad luck (egocentric bias or error of attribution), in addition to inadequately balancing probability estimates.

In the world of finance, studies show that overconfidence can lead traders to perform a higher number of transactions, which generally produce poorer performance. In corporate environment, excess optimism results in diversification, which also tends to reduce returns. Successful executives in certain segments believe they have the skill to replicate their 'success' in new projects. Equity investors also suffer from this type of deviation. As a general rule, when price increases, we wait until it

Dynamo Cougar x IBX x Ibovespa Performance up to march/ 2005 (in R\$)

Period	Dynamo Cougar	IBX	Ibovespa
60 months	300,40%	142,76%	49,56%
36 months	193,05%	136,51%	98,88%
24 months	138,50%	140,81%	135,53%
12 months	41,50%	33,95%	20,41%
3 months	-1,25%	3,83%	1,51%
NAV/Share on 03/31/2005=R\$86,29133538			

rises a little more, until it attains the right price. Alternatively, when the share price drops, we tend to believe that it will rise again. In other words, excess optimism can lead to a perceptual imbalance that not unusually impacts the adjustment/review of our initial expectations.

Group Judgments

Individual attribution and judgment biases are frequently present in collective decisions. Occasionally, individual heuristics can cancel themselves out, but as a rule, group discussions tend to broaden the group members' initial views, an effect known as polarization. There have been several experiments showing that individuals emerge from decision meetings even more convinced of the accuracy of their original views: if they were mildly inclined towards risk, they more enthusiastically embrace the prospect of risky action; if their inclination was to prudence, they become even more cautious.

A basic human sociology consideration is that people who frequently communicate among themselves tend to think alike. When groups are cohesive and relatively isolated, the objectivity and efficacy of their decisions tend to be further undermined. Studies have identified a number of group bias symptoms, such as, illu-

sions of invulnerability, that can lead to excess optimism and risk taking behavior, a collective effort to rationalize or disregard advice and warnings, an unshakeable belief in the morality of the group, stereotyped perception of the competition, pressure brought by group members against dissenting opinions, sharing a false unanimity, self-criticism against any deviations from an ostensible consensus.

We have said many times before that here at Dynamo our portfolio decisions are always taken on a group basis. Aware and alert to the risks that potentially jeopardize the quality of collective judgments, we use to submit our investment ideas to an in-house firing squad of provocative criticism. As a rule, we reach an agreement through technical discussion and intellectual confrontation. In line with the Popperian model, only premises that we are unable to falsify are considered.

Our experience has confirmed the results of a number of empirical experiments, such as that evidencing that group decisions achieve better results than those of isolated individuals, particularly when all group members are encouraged to freely express their opinions.

Moreover, whenever we have the opportunity of participate in company boards of directors, it is our policy to recommend board members with a professional background differing from those of the other members. Homogeneous boards, especially those of family businesses, are less impervious to group bias. Experience has taught us that a diversity of education and personal background in board members tend to revitalize the discussion ambience, by broadening a company's business perspective and creating an ideal environment for proper corporate decisions.

Mood and Emotion: bias or reason?

Before we finish, a note on the role that emotions and 'state of mind' play in our decision capacity. Several experiments confirm the belief that mood affects a person's view of the world, influencing personal decisions and even his or her strategy for processing information. We cite two of these relating to the stock market: Saunders (1993) noted that "the weather in New York has a long history of significant correlation with major stock indexes". Hirshleifer and Shumway (2001) confirmed this results in 26 different countries, and concluded that investors tend to be more optimistic on sunny days².

Surveys have revealed some situations where people tend to rely more on their feelings/emotional states as a basis for their judgments: i) when feelings are rel-

evant to the decision in question, ii) where additional available information is scanty; iii) when the decision is more complex and cognitive resources scarcer, iv) in the case of time constraints or when other decision tasks are requiring simultaneous attention, and v) when the general mood is 'positive'; in other words, when people are happier.

Investing in the stock market is a complex activity requiring analysis of countless variables interacting in a frequently chaotic behavioral context. At the same time, circumstances sometimes demand a very fast short-term decision. The environment would thus seem to favor actions based on feelings. The situation becomes even worse in more extreme circumstances, those of bubbles or crises, where the market loses all references to what had hitherto been deemed 'reasonable'. At such times, a pro-cyclical component enters the scene, where poorer quality of available information leaves room for feelings to loom larger in the decision process.

Given that fluctuations in states of mind/feelings are inherent to the human condition, it is vital that we at least become aware of their influence on our day-to-day decisions. In some analysts' reports, we can identify a certain "rooter" attitude towards the business or the company's performance. Frequently, what lies behind this absence of objectivity is a well-known sympathy for the company or an affinity with its management. This same diligence applies to fund managers like ourselves.

However, time has passed since emotions have been regarded as reason distorting interferences, fit only to sabotage balanced thinking processes. Today, thanks to greater comprehension of the workings of the brain's circuitry, we now know that emotions play a crucial role in our judgment mechanism. They provoke physiological and cognitive activities that result in speedy and superior behavioral responses, whereby individuals are able to act adaptively. For example, there is amply documented information that the

absence of fear can result in less than ideal decisions, particularly when the pay-off is negative (Damasio 1994). Thus, emotions bear their fair share of 'ecological rationality'.

We end this Letter commenting on yet another finance based study. Lo and Repin (2001) performed *in vivo* tests of the function of emotions in the activities of financial market traders. This was achieved by a control of their physiological performance among their heart beat rates. The authors suggest that emotional responses play a crucial role in real time financial risk processing and conclude that emotions are "important determining factors in the evolutionary adjustment of financial traders". Earlier, in the XVII century, the young Pascal had already prophesied: "the heart has its reasons that reason knows nothing of". A goodly measure of enthusiasm has always been an ingredient in corporate success stories.

Rio de Janeiro, March, 27th, 2006.

(2) Although Goetzmann and Zhu (2003) found no evidence supporting this argument.

Dynamo Cougar x Ibovespa x FGV-100 (in US\$ dollars)

Period	DYNAMO COUGAR*			FGV-100**			IBOVESPA***		
	Quarter	Year to Date	Since 01/09/93	Quarter	Year to Date	Since 01/09/93	Quarter	Year to Date	Since 01/09/93
1993	-	38.78	38.78	-	9.07	9.07	-	11.12	11.12
1994	-	245.55	379.54	-	165.25	189.30	-	58.59	76.22
1995	-	-3.62	362.20	-	-35.06	87.87	-	-13.48	52.47
1996	-	53.56	609.75	-	6.62	100.30	-	53.19	133.57
1997	-	-6.20	565.50	-	-4.10	92.00	-	34.40	213.80
1998	-	-19.14	438.13	-	-31.49	31.54	-	-38.4	93.27
1999	-	104.64	1,001.24	-	116.46	184.73	-	69.49	227.58
2000	-	3.02	1,034.53	-	-2.63	177.23	-	-18.08	168.33
2001	-	-6.36	962.40	-	-8.84	152.71	-	-23.98	103.99
1 st Quar/02	13.05	13.05	1,101.05	3.89	3.89	162.55	-2.76	-2.76	98.35
2 nd Quar/02	-19.15	-8.60	871.04	-22.45	-19.43	103.60	-31.62	-33.51	35.63
3 rd Quar/02	-22.31	-28.99	654.37	-31.78	-45.04	38.90	-44.17	-62.88	-24.28
4 th Quar/02	29.76	-7.86	878.90	38.00	-24.15	91.67	45.43	-46.01	10.12
1 st Quar/03	4.47	4.47	922.65	4.63	4.63	100.55	5.39	5.39	16.06
2 nd Quar/03	27.29	32.98	1,201.73	38.16	44.55	177.07	34.33	41.58	55.91
3 rd Quar/03	19.37	58.73	1,453.83	24.72	80.29	245.56	22.34	73.20	90.74
4 th Quar/03	22.18	93.94	1,798.51	35.98	145.16	369.91	39.17	141.04	165.44
1 st Quar/04	4.67	4.67	1,887.16	2.35	2.35	380.16	-1.40	-1.40	161.72
2 nd Quar/04	-4.89	-0.45	1,790.04	-8.66	-6.51	339.30	-11.31	-12.56	132.11
3 rd Quar/04	35.12	34.52	2,453.91	23.73	15.67	443.56	21.13	5.92	181.16
4 th Quar/04	22.17	64.35	3,020.19	25.32	44.96	581.16	21.00	28.16	240.19
1 st Quar/05	-1.69	-1.69	2,967.41	-1.66	-1.66	569.87	1.06	1.06	243.80

Average Net Asset Value for Dynamo Cougar (Last 36 months): R\$ 276.733.594,47

(*) The Dynamo Cougar Fund figures are audited by KPMG and returns net of all costs and fees, except for Adjustment of Performance Fee, if due.

(**) Index that includes 100 companies, but excludes banks and state-owned companies. (***) Ibovespa average.

Please visit our website if you would like to compare the performance of Dynamo funds to other indices: www.dynamo.com.br

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