

Thinking, Fast and Slow

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Human beings are hardly rational economical agents, at least they do not comply with the classical economical theories of economic transactions. They do not formulate utility functions, the pursuit of which they are expected to conduct with relentlessness and consistency. This is hardly a surprising insight but one which most people, except possibly economical model builders, instinctively hold. On the other hand every model by necessity involves drastic simplifications, in order to be manageable and clearly show the salient features. To abandon a simple model which has shown itself useful only makes sense when its predictions start to diverge too much from real life. This is a book addressed to a general public, and thus the author, a psychologist turned economist, does not make any attempt to show how classical economical models fail and how they can be suitably modified, but constricts himself to elaborate on the obvious shortcomings, which to most readers must be intuitively obvious and hence gratifying, as man merely as a rational agent is to most of us seen as unnecessarily restrictive, with the implications that any theories that neglect those, must by necessity be radically flawed. The author is careful to point out that he does not make a claim for the irrationality of man, on the contrary, without some rationality assumptions, predictions become impossible, only that he wants to make the notion of human rationality more nuanced, pointing out its limits. The author shares with most academic economists a sanguine belief in the possibility of quantization in the social world, thus not doubting its ontological aspect, only its present epistemology.

The starting point, which provides the title of the book, is the distinction between fast and slow thinking, which roughly corresponds to the basic division between the subconscious and conscious pioneered by the nowadays discounted Freud¹. We all have an uncanny ability to recognize faces, something which so far has not been possible to simulate on a computer in spite of its superior computing power. We do so very quickly and with no apparent effort in spite of all the computation that must be involved. Furthermore the act is not deliberate but involuntary and automatic. We cannot will ourselves not to recognize a well-known face. Those cognitive gifts are given to us by God to serve us well in our daily life. Although nowadays we prefer to formulate it in terms of natural selection and survival (and hence reproductive) advantages. Unless pursued, which it seldom is, the latter formulation does not really carry much more illumination than the classical. Similar to those are our abilities to effortlessly retrieve a lot of different facts, such as that Paris is the capital of France, or vocabularies of languages we speak with mindless fluency. Opposed to the automatic and almost instantaneous thinking is the slow and laborious

¹ It is noteworthy that one of the blurbs printed on the back cover 'As Copernicus removed the Earth from the centre of the universe and Darwin knocked humans off their biological perch, Kahneman has shown that we are not the paragons of reason we assume ourselves to be' which is a conscious or subconscious paraphrase of how Freud himself characterized his work.

one, which involves a lot of effort, which actually shows definite physiological symptoms in terms of dilations or pupils, increases in heart rates and blood pressures, and hence actually allows some objective quantitative measures. This kind of thinking is conscious and craves attention and deliberation and excludes other kinds of thinking. The typical example is making a standardized computation in your head, involving keeping items in your working memory. When standardized you can easily gauge limits to your cognitive ability. Most people can with effort multiply two two-digit numbers but are unable to multiply two three digit numbers².

Most of our lives are spent in a default mood, all the decisions that are required are supplied by habits, once in a while there is an emergency, the senses realize it quickly and the fast thinking supplies an automated and instant response which in most cases is fully adequate. In this sense we do not depart from animals in general. However, our fast thinking is not always appropriate, and then the slow thinking takes over, but only reluctantly so, as it is always associated with a large effort (and, one surmises, depletion of energy). If a ready answer is supplied it often takes an effort to question it³ Now our God-given intuitions are not always perfect. And here, we do encounter the first difference between God and Natural Selection. We are not supposed to question the perfection of God, but we are encouraged to explore the failings of Natural Selection.

The first thing to remember that there are too many contingencies in life, especially the social life of humans, to have precedents in the development of the human race, or for that matter to be encodifiable in genes. What may be pre-programmed, so to speak, are certain tendencies to come to conclusions of a speedy judging processes, known as the gut feeling. The fallacies of our fast thinking, according to the author, is that the fast survival process only looks at the information at hand and does not actively look for additional information⁴. Furthermore it weighs the different components, not according to their objective importance, but how vividly they appear to the mind. Finally there is a premium on presenting a coherent and logically structured narrative, because as humans we have a propensity for stories, and are very good at remembering them, as the different components of it are tied together by logic and association⁵. What comes through to the mind by such natural intuition is compelling. But as Popper reminds us, conviction is a subjective feeling and should not be confused with truth. It takes a lot to challenge

² The author provides as a generic example 17×24 when I attacked it I thought at first of doubling the first factor successively, then I realized that I should rewrite it as $(17 \times 3) \times 8$ and the task becomes trivial. I guess this was not intended by the author. To what kind of thinking does this exploration belong to? It was not painful, yet clearly it usurped my attention.

³ As an example. Two people split \$1.10, one picks a dollar more than the other, how do they split it. An instantaneous answer presents itself, namely \$1 and \$0.1 those are obviously false, yet I fell into the trap. Why? Lazy, and the question did not interest me in the least. Had it been A is ten years older than B, their total age is 44, I would not have floundered.

⁴ Referred to as WYSIATI meaning 'what you see is all there is'

⁵ This is why a mathematician can recall a complicated proof, not verbatim of course, but as a story. Or why a genial musician like Mozart, can recall, verbatim in fact, a piece of music, only heard once. Or one, supposes, a chess master, recalling a position by a mere glance, seeing in it a story poignant with possibilities

such an emotionally charged conviction, and nothing short of a brutal disappointment of expectation will do it. Those propensities of the human intuition are responsible for the egregious errors of applying and estimating probabilities which people, even those suitably educated, come prey to. To that we will return.

To counter the failings of human judgement it is, the author points out, important to have some mechanical algorithm that does the job. Such a stratagem goes against the grain of most people. How can a mindless algorithm which often is crude and based on inaccurate assumptions, seriously compete with human experience and that extra-sensory sense that intuition is supposed to represent. (In another age one could have referred to it as divine inspiration, without blushing. Now people would blush at such terminology, but what they are suggesting does not really differ.) The advantages of the algorithmic approach is that 1) it works against the bias of readily available information and forces you to collect more of what is relevant to the case. 2) By using some mindless formula you check against the tendency to rely on subjective weights and finally 3) by getting a number or some such thing, you guard against the seduction of constructing an attractive narrative. There are also of course obvious disadvantages, but those are so obvious that they need not be spelled out. As an example the author cites three components which come into play when you are going to predict the quality of a given vintage of wine, all simply referring to the weather. The amount of precipitation in the fall and spring and the average temperature of the latter. In particular tasting the wine does not enter at all into consideration, something which sticks in the eye to the classical wine connoisseur. However, this simple scheme, seems superior to the regular methods. Whether this is true or not, we simply have to take the word of the author, there being no other alternative, save an investigation of your own. In particular the stratagem is very controversial in the clinical setting. But once again we have to that the authors word for it, in studies made, the diagnostic precision of clinicians (as testified by subsequent autopsies?) is discouragingly low, and simple algorithms do better. In fact in modern medicine quantitated test play a greater and greater role, and the old wisdom of the family doctor with his holistic approach of taking in the whole person, is fading into the remembrance of quaint practices.

Now, the disparagement of intuition caused a lot of controversy, and rather to engage in pungent but eventually fruitless polemics the author chose to invite his antagonist in a joint exploration that eventually led to some joint papers and, one assumes, increased wisdom⁶. The compromise they hammered out, was that in some instances there is something to be called professional intuition, but it needs to be honed during a long time, with constant opportunity to more or less instantaneous feedback to small piecemeal changes. Learning to drive a car and bicycle are examples of this, when you can fine-tune the honing of your skill. But also in more conceptual ways, not just pertaining to your motor-abilities, it may work and its exploitation is basically that of recognition. A clinician does not necessarily get the prompt feedback on his pronouncements, and when given feedback it will be on the

⁶ Popper points out the importance of discussing with people opposed to your views. The experience is not pleasant, but can be made tolerable with some practice, but is inevitably mutually beneficial, as long as your object is not to win the argument, but to take in points of view of the other and acknowledge weaknesses in your own reasoning and thus be motivated to strengthen your own arguments and more clearly present you own point of view.

complex judgement itself, not pieces thereof. This also indicates that the human intuition may very well be in the nature of a refined algorithm after all, the workings of which have been modified during an extended exposure to the real world. In short a matter of trial and error, the mode of operation of evolution.

There are many examples of where experts are much in demand, such as in the prediction of political development (will there be a war? Who will be elected President), where the connection between claiming and testing is too extended in time and too intermittent to either influence the expert beneficially or engage the critical intelligence of the observer. The author has in mind the various pundits in political science, whose attractiveness does not depend on the accuracy of their predictions but with the abrasiveness and confidence they can deliver their opinions with. Other examples are financial experts on the stock market whose performances are disappointingly weak when checked against the future, in fact seldom more efficient than the random advice a monkey could have supplied throwing darts on a board. This does not mean that one cannot make a killing on the stock market beyond pure luck. Large investors with access to inside information and big enough that their actions actually have an impact on the market, thus allowing for a measure of control, but an individual player, looking for trends, is in a position no better than the hapless gambler by the casino. The house always has the upper hand. And finally, it is not at all clear how much effect a CEO has on his company, what is due to skill and what is due to pure luck, in that his position is very similar to a general in a battle, he may be an inspiration, but the actual dynamics on a battle field follows a logic of its own when set free. But of course, clinician, political pundits, and financial advisors have more than a vested interest in keeping up the illusion.

The notion of probability is a vague human notion connected to possibility, plausibility and likelihood and a hoist of related concepts. It has a purely formal definition, due to Kolomogorov, which does not accord exactly with the intuition. It is an example of the traditional phenomenon that a mathematical model is imposed on a social and psychological reality. The relentless logic of the mathematics will eventually diverge from the human reality, which is then dismissed as illogical. There is a certain element of truth to that, but it is a subtle question having to do with the effectiveness of mathematics in non-physical sciences, in which it does not appear unreasonable, although hardly reasonable either. In the Kolomogorovian sense, given a population of p individuals of type A and q individuals of type B, one may say that the probability of an individual being of type A is $p/p + q$ nothing more nothing less. To speak about the individual without specifying of what type is a very convenient fiction, but one should not forget that it means nothing more than in the given population there are p individuals of one sort and q of the other⁷. One could develop a mathematical theory of probability without even ever mentioning probability. It would be artificial, because it is convenient for the way we reason to think in terms of probabilities. But the notion is specious and seduces us into thinking that one can speak about the probability of an event without even specifying the context, without which a definition cannot be made. Hence such questions as what is the probability that

⁷ Given a population space, or more generally a space of outcomes, one may think of derived spaces, the objects of which are combinations of the basic objects, so called virtual objects. Those can easily become very large and require a great deal of combinatorial ingenuity to compute.

human intelligence arouse on Earth, or why I met my wife, which can be given many different answers depending on the particular context one deems pertinent.

Now when it comes to events the mind is not able to give an objective assessment. Events which loom large and vivid in the imagination easily usurps far more prominence than warranted. As I point out, if plane crashes were more common, people may be less worried about flying. Now plane crashes are spectacular events, because they are so dramatic and rare, that they engage the imagination and acquire thereby a high degree of plausibility (in fact what is more plausible, a plane that stays up in the air, or one that crashes to the ground?) which is easily confounded with probability. This is the basis of terrorism, which is about creating the greatest fear with a minimum of casualties⁸. On the other hand common dangers may be downplayed as being too mundane. Often there is no awareness of dangers at all, or the dangers that actually exist are seen as irrelevant to your case. In fact, the latter is indicative of a state of mind referred to by the author as the inside view. We tend to experience life from the inside and seldom take an external point of view, meaning seeing ourselves as mere actors no different from others. In the classical Indian epics, it is pointed out that the most remarkable thing is the propensity of people to view themselves as immortal in spite of all the evidence of people around them coming to grief. When you are engaged in a project, you see it as something unique, and you gauge its progress not by comparison with other similar ventures, of which you most likely not only are unaware but have no desire to find out, but with internal yardsticks. This makes for optimism, when a rational assessment would have proscribed caution, if not downright pessimism. Most people starting businesses take on a very sanguine point of view, when the facts should be staring them in the eye. On the other hand, what is wrong with optimism? If sperms would know of the odds against their success, surely none of them would embark on the epic journey of fertilization? Many of us believe that if we are not immortal nevertheless we have a very good shot at living to a mature old age, especially as we most of the time feel in good health and have no intrinsic reason to conclude that the normal state of affairs will come to an end, after all normality is what we are primed to expect. Similar sentiments may influence our expectations of becoming rich and famous, it happens to other people why not to me, and besides there seem once again to be no compelling intrinsic reason why our expectations should be stymied. And after all, what is wrong with such rosy fantasies? Life is hard and brutal, why not try to soften it? And as with posthumous fame, disappointment is not to be experienced.

In addition to being unaware of the baselines, as the author expresses it, even when we are, we are slow to act on it appropriately. When told that 80 percent of all the cabs in a city are blue, we are likely to ignore this when being told that a cab involved in an accident was yellow with 80 percent certainty. However, if we instead are informed that 80 percent of all cab accidents involve drivers in blue cabs, we certainly will take that into account. This statistics somehow indicate an active agent, while mere numbers and frequencies seem inert and passive and thus not worthy of our attention.

The very notion of probability is also, for similar reason, vague in the minds of people,

⁸ The author remarks correctly, that even at the height of suicide bombings in Israel, they never surpassed the level of normal traffic accidents. He found himself un at ease while driving behind a bus, not necessarily because he seriously

even those who are trained. At least it does not easily comply to the formal strictures imposed by Kolmogorov. When told that a certain woman (incidentally called Linda) is an active feminist most people will consider her more likely to be a feminist bank teller than just a bank teller, although from a strictly logical point of view the latter includes the former, and thus tautologically becomes more probable. Even Stephen J. Gould admits to the error, as relayed by the author, or at least finding himself very much seduced by a possibility that his logical mind rejects as nonsense. But is it so surprising after all, the intuitive notion of probability is an active one, and if you are asked to rate different occupational possibilities for a character you have seen described, you naturally looks for the most likely option, among those you tend to think are mutually exclusive. Thus it is not unnatural that you will pick the option, in which the appearance of your character seems most likely, in the sense that would you pick a random example from it, chances are the greatest that you will hit the target. In particular, you are more likely to hit the target Linda, by choosing a woman randomly among feminist bank tellers than from a collection of bank tellers at large.

Maybe the most insidious fallacy that statistics invite the sophisticated to fall into, is that of finding irregularities where there are none and confuse correlations with causality. In fact the more sophisticated you are, the more fervent your imagination, the greater the seduction. Maybe one of the most obvious ones are regressions to the mean. If events are truly independent of each other, the likelihood that a good run will be followed by a worse run are greater than not. In fact this almost tautological fact remains even if there are dependencies, provided they are not too pronounced. Good performances may elicit praise and encouragement, and when followed by disappointing ones (meaning not quite as good), those are given all kinds of explanations, such as praise may spoil people, or make them tense and set up expectations which have an inhibiting effect. While bad performances, which provoke censure, more likely than not will be followed by improvements, which then can be seen as appropriate reactions to the former. That an initial bad start will strengthen character and foster a laudable determination to improve. But of course it is just an illustration of that performances will center around the mean. If you have ten heads in the row, it does not mean that the next flip is more likely to be a tail, it only means that the next ten flips will be more likely to contain nine heads or less, which is of course worse than ten heads, but the first statement would be true regardless of whether ten throws have already been made or not, it is only that they set the benchmark. Going worse is a fact but the connection is entirely in our minds⁹. One may as well argue that the sequence of ten subsequent throws with a mediocre number of heads, causes the previous. Similarly small samples show greater variations than large. In one throw you have either a head or a tail, zero or one, But in a thousand throws you will hardly have a thousand tails or a thousand throws, Thus when looking for correlations in voting districts, those will be far more marked in the small one, and have nothing to do with the fact that those tend to be rural and Republican. One may of course always discount obvious cases of spurious correlation, in medicine this is routinely done by setting up control groups, still there is

⁹ Distantly connected to this is the phenomenon of anchoring, that the author discusses in some detail. If asked to gauge a number, just being given one, invariably influences the process, as the number invites a comparison, as well as a suspicion that it is not entirely arbitrary.

always the possibility of non-obvious biases, the kinds of which we have no idea of. Thus the principal objection against setting up statistical tests to verify hypotheses: there is always something we may overlook.

Now the supposed irrationality of economic agents is not entirely due to an inability to formally work with probabilities. One may in addition wonder to what extent calculations, conscious and deliberate, subconscious and automatic, actually enter into decisions. Of more importance though may be the psychological twists that the human mind is subjected to. If so, those twists, if properly understood will in fact not be dismissed as mere irrationality, but instead be seen as a refined version of it. Rationality is ultimately about a consistent way of pursuing your priorities, not necessarily the setting of them. It is as with axioms, the choice is up to your discretion, but the consistency is not. It seems to be a universally accepted maxim that a loss is harder to sustain than a gain, meaning that you are more likely to accept a small and secure benefit than going for a more uncertain one. It is known as risk aversion. On the other hand, you do not want a sure loss, than you are more likely to gamble to avoid it, even at the risk of incurring an even greater loss. This causes the tendency to throw good money after bad. If you have invested a lot of money in a failing venture, you are reluctant to cut your losses, and instead trying to undo damage by investing even more. This is usually seen as irrational, meaning, counterproductive. At least when it does not work. But what works for money does it work for age? Would you rather settle for a final age of say eighty rather than having a go at say a hundred with a suitable probability? Would you not then hold out for the possible rather than to settle for something definite? After all knowing a definite death date is more or less the same as a death sentence.

Another psychological quirk is that equivalent proposals may meet with very different responses, depending on wording and even ordering, when the two are being compared, This is irrational in the sense that proposals in isolation cannot be properly judged. A may be preferred to B when considered without any comparison, but B may prevail when you have to make a choice, even if the two are equivalent. You need to take in the entire context. The author talks about framing. As an example, my mother told me that she never felt any disappointment by not winning when she bought the intermittent lottery ticket. The likelihood of winning is very low, so you do not expect it, hence you are not disappointed when it does not happen. On the other hand, the mere possibility of a win, is a pleasant thought, well worth the expenditure of the ticket. Of course this assessment is purely subjective and the reason why lotteries work. A more rational assessment of the worth of the ticket would take into account the expected value. But of course this is not how the human mind works, as opposed to that of the economic agent. Now assume that the tickets would be free, but whenever you do not win you would have an actual loss equal to the cost of the ticket you were prepared to pay in the first place. Would you still not experience not winning as a disappointment? Is it not easier to accept a voluntary cost than an involuntary loss, even if the amounts are the same?

Perhaps the most interesting part of the book is the discussion of the distinction between the *experiencing self* and the *remembering self*, which has existential philosophical ramifications that go much beyond the economic corollaries which it is meant to explain. I am thinking of the importance played by say regret in your economic decisions. This

forces you to take into account two people, the one at present, and the one in some future, whose desires may impinge as much on yours now, as yours obviously do on his¹⁰.

As noted the distinction is more interesting from a philosophical point. Who leads your life really? What is important in life? That you are happy and have no regrets on your deathbed, or that you enjoy the moments, even if that enjoyment may be obliterated by inevitable oblivion? The remembered life sees existence as a sequence of episodes which should form some coherent narrative. Something has worth if it can be remembered with pleasure and satisfaction. Thus should you lead your life in such a way that it becomes a gripping biography which will be a pleasure to savor even for external readers? The latter if you think about it, it may strike you as both silly and chilly, after all are not many of our most deeply felt emotions, private in the sense that they cannot be shared and become universal and official. The feeling that your life is your own and no one else owns it. Yet in fact many moral admonishments take on that view. You should lead a life that is exemplary. People who collect, clearly take this view of life to finding its meaning in its recollection. They actually invest for the future, building up an accumulation. But you cannot bring what you collect with you to the grave, the casket in which you are put does not come with additional storage space. This mania for collection does of course not confine itself to material objects and gadgets. It could be books, when you see with pleasure how many books you actually will read during your life, and every book purchased will be a saving for future days, and this conversion of time into reading, gives meaning to your life. Or it could be the collection of happy moments, whose real pleasure will reside more in recollection than actual experience.

As to the difference between an experienced sensation and one merely recollected, one may, as the author does, look at pain. Pain is an experience that only belongs to the actual moment, as little as you can readily experience the pain of others, save by mere empathy, you cannot directly experience your own pains of the past. You may recollect the amount of pain, if not its quality, and this assessment of pain, may contradict elementary logic. The same level of pain may be remembered differently depending on the context. Pain that you suspect is out to hurt you, becomes intolerable even at low levels, while pain which is for your good, you are far more easily to accept. Hence in a sense, all torture is fundamentally mental not physical. Pain that is extended by a lower level of pain, may be more acceptable to memory, because it is the average pain, or more generally the total experience, that will matter, thus you may more easily anticipate with equanimity a pain which is actually worse when experienced as well as more sustained, if the total effect is seen as more tolerable to memory.

Anyway the distinction between the present self and the future one. The one which is in direct contact with reality and the one which is constructed, is a most fascinating one. For one thing, would our memories of episodes be more powerful, both as to remembering

¹⁰ As to making decisions you will not regret, the secret is, the author informs the reader, is not to put yourself in the position that you can in retrospect argue that had I but acted as I could have had, this would not have happened. So either, when you are engaged in longterm momentous decisions, make them very deliberate, as to convince yourself in the future, that at the time you really did not have another option, or act without any deliberation at all, thus preempting any charge of not having acted on something you had actually considered.

more episodes as well as being able to recall them with more intensity and vividness, make up for shorter life-spans? We think that our lives are too short, that time goes too quickly, especially as we get older, while we are experiencing time there actually is no such difference, and time itself seems painfully slow. When we look back upon an event, it feels very satisfying that it seems to have happened a long time ago. because it gives the feeling that since then we have had a long life. So much must have happened, so much must have changed. On the contrary if an event, chronologically distant, is felt as if have happened very recently, we feel cheated. All those years have passed and what do I have to show for it? Nothing seems to have happened, nothing seems to have changed, I have just squandered precious years which will never come back. Such considerations cut at the heart of the human condition. The imagery is somewhat economic in nature. There is a feeling that life is a capital that is given to you, and which you can only spend, never add to. As you grow older, the capital is depleted, the only comfort being that you are not really sure when it will run out. The capital is exchanged for life and experience. While your prospect diminish, your experience accumulates and grows. When you come towards the end, any slice of time will be more proportionally precious compared to what you have left, and what you get out of it will be proportionally insignificant compared to what you have already experienced. You pay more and more for getting less and less.

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