



JIM'S READING CORNER

I hugely enjoyed reading this intelligent, informative and funny book. Taleb, who is of Lebanese origin, emigrated to the USA years ago and *"has spent his time immersing himself in problems of luck, uncertainty, probability and knowledge. Part literary essayist, part empiricist, part no-nonsense mathematical trader, he is currently the Dean's Professor at the University of Massachusetts at Amherst."*[1]

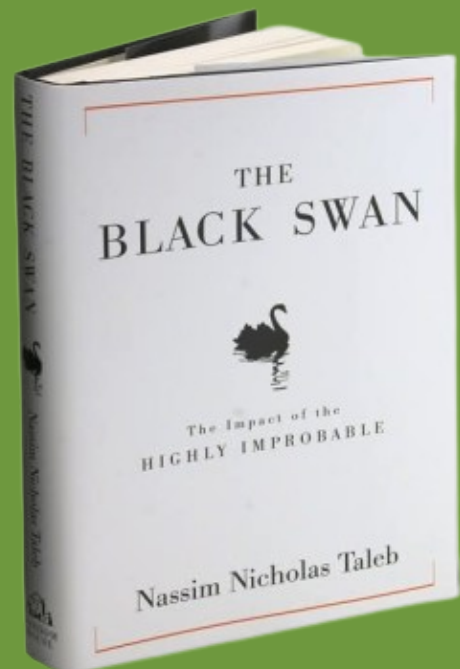
The primary thesis of the book is that we increasingly live in a world where what we do not know nor can predict is key, where traditional statistical and prediction tools are irrelevant in many areas, though not all. Taleb is a masterful storyteller, always ready to provide an anecdote or a telling encounter to substantiate his ideas and theses. He has a good way of explaining complicated issues in simple language and is particularly good at debunking the often-empty jargon of experts. His very fine sense of humour is not the least of his qualities.

But what is a "Black Swan"? The image derives from the fact that before the discovery of Australia, centuries of empirical observations led to the firm conviction that all swans are white. The discovery of one single black swan makes the theory crumble. "Black Swans" are momentous occurrences of unforeseen and unpredictable events, with significant consequences, often shaping the history of mankind. Our traditional tools do not equip us to deal with those events. There are of course many areas where physical or other limits reduce the effects of unforeseen events. Take physical height of humans: if you take a sample of 1,000 people and calculate their average height, the addition of a giant of 2,30 m will not significantly alter the overall picture. The Gaussian Bell curve is of use here. But now take wealth and look at what happens when to a sample of 1,000 people you add Bill Gates! In the first example, we are in the realm of Mediocristan; in the latter, in that of Extremistan. As he puts it: *"... randomness and uncertainty underlie our lives, from bestsellers to world disasters. Their impact is huge; they're nearly impossible to predict; yet after they happen, we always try to rationalize them."* [2]

But Taleb's work is not simply an intelligent treatise on randomness and uncertainty. It is also, by the same token, a jubilant taking apart of economists, statisticians and central bankers, of self-styled experts and eminent forecasters, and of ... French

THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE

BY NASSIM NICHOLAS TALEB



[1] Note that this fiche was written in 2012

[2] And we prepare yesterday's war!



intellectuals! He speaks fluent French and often quotes French thinkers but seems to have with France a love-hatred relationship. What he likes about America is the pragmatism, the tolerance for trial and error, the willingness to exploit opportunities.

Taleb is also a bit of a guru, showering us with advice and with tips, often in the negative form: "don't do this or that". Don't read newspapers or watch TV, don't walk fast, don't try to predict what you cannot possibly predict, (but work on your capacity to exploit the unexpected), don't go for a 'medium-risk strategy' because it does not make any sense...[3] I thought it worthwhile doing quite an extensive summary of "The Black Swan" because it is so intelligent and full of insights.

PROLOGUE

"Before the discovery of Australia, people in the Old World were convinced that all swans were white, an unassailable belief as it seemed completely conformed by empirical evidence. The sighting of the first black swan might have been an interesting surprise for a few ornithologists (and others extremely concerned with the colouring of birds), but that is not where the significance of the story lies. It illustrates a severe limitation to our learning from observations or experience and the fragility of our knowledge. One single observation can invalidate a general statement derived from millennia of confirmatory sightings of millions of white swans. All you need is one single (and, I am told, quite ugly) black bird."(xxi, Prologue)

From this Taleb derives the notion of the Black Swan, which is an event with three attributes:

- It is an outlier
- It carries an extreme impact (negative or positive)
- It causes humans to concoct explanations after the fact (retrospective predictability)

The problem is that we tend to act as if the Black Swan does not exist (ask a portfolio manager for his definition of *risk*, and odds are that he will supply you with a *measure* that *excludes* the possibility of the Black Swan!). We are blind with respect to randomness! We keep focusing on minutiae; that is why *"reading the newspaper actually decreases your knowledge of the world"*[4]

[3] Many of those things, except the bit on walking, I have felt intuitively for some time. But it's good to have your intuitions confirmed in this manner!

[4] Very true if you read them passively. I have taken of late to skimming through them very quickly and only read some background articles from time to time. I have not the impression that my level of knowledge has decreased because of that.

"But we act as though we are able to predict historical events, or, even worse, as if we were able to change the course of history. We produce thirty-year projections of social security deficits and oil prices without realizing that we cannot even predict these for next summer-our cumulative prediction errors for political and economic events are so monstrous that every time I look at the empirical record I have to pinch myself to verify that I am not dreaming."(xxiii-iv, Prologue)[5]

But what to do then? Black Swans being unpredictable, we need to adjust to them rather than naïvely try to predict them, says Taleb. Contrary to conventional wisdom, almost no discovery, no technologies of note, came from design and planning – they were just *Black Swans*. Therefore, *"the strategy of discoverers and entrepreneurs is to rely less on top-down planning and focus on maximum tinkering and recognising opportunities when they present themselves."*(xxv, Prologue) Taleb therefore recommends to *"collect serendipitous Black Swans"* (more of that later), especially since in the areas of scientific discovery and venture capital investments, there can be a disproportionate pay-off from the unknown[6].

"I do not particularly care about the usual. If you want to get an idea of a friend's temperament, ethics, a personal elegance, you need to look at him under the tests of severe circumstances, not under the regular rosy glow of daily life. Can you assess the danger a criminal poses by examining only what he does on an ordinary day? Can we understand health without considering wild diseases and epidemics? Indeed, the normal is often irrelevant."(xxix, Prologue)[7]

Taleb stigmatises another very common mistake people do, which he calls *"Platonicity"*: *"...our tendency to mistake the map for the territory, to focus on pure and well-defined forms, whether objects, like triangles, or social notions, like utopias, even nationalities. When these ideas and crisp constructs inhabit our minds, we privilege them over other less elegant objects, those with messier and less tractable structures..."*(xxx, Prologue).

PART I: UMBERTO ECO'S ANTILIBRARY, OR HOW WE SEEK VALIDATION

[5] Remember the OECD forecast in 1992 for the Swedish public debt in 2000: 128%. The real figure: 53%. But we happily fight about whether the Greek debt in 2020 will be at 120 or 121%.

[6] It is in this area that the U.S are far more intelligent than we are; they allow for trial and error more readily than Europeans do; and it is here where the zero tolerance or zero risk approach so prevalent in EU politics is so nonsensical.

[7] That is why those TV interviews with neighbours after a crime are so utterly absurd...as is a lot of reporting, by the way.



Eco owns some 30,000 books, many of them unread. Read books are far less valuable than unread ones, says Taleb, because a library should contain as much of what you do not know as your financial means allow you to put there. The image, paradoxical as it may sound, helps understand the three ailments the human mind suffers from as it comes into contact with history ("the triplet of opacity"):

- the illusion of understanding, while the world is more complicated and random than you realise;
- the retrospective distortion (imposing meaning on events ex-post; history seems so much clearer and more organised in history books than in empirical reality[8]);
- The overvaluation of factual information and the handicap of authoritative people when they create categories and *platonify*.

One day a friend told Taleb to go for a *scalable* profession, i.e. one in which you are not paid by the hour and thus subject to the limitations of the amount of your labour. He thought it was bad advice, because it only makes sense if you are among the lucky and in the right place at the right time. Those jobs are more competitive and produce monstrous inequalities; they are also far more random, with huge discrepancies between effort and reward. But the advice put Taleb on the trail of a very useful classification for ranking uncertainty and knowledge. He gives examples of scalable products in the modern world: books, shares, songs, etc. Technology has changed things greatly. Take an opera singer in the 19th century, before sound recordings. He can only reach audiences by performing in front of them, which limits the amount of people he can reach. Of course, someone singing in the Scala will have larger audiences than a provincial singer, but inequalities are relatively mild. Now look at today's situation: the well-known singer in Milan will reach millions of auditors and may well put out of business many local singers. He may also prevent people from emerging who are in fact as talented as he is. The same with bestsellers or anything related to concepts and ideas which are scalable.

From the scalable/nonscalable distinction, Taleb moves towards a clear-cut difference between two varieties of uncertainties, two types of randomness. Take 1000 people randomly selected from the general population and have them stand together in a stadium. If you now add the heaviest person, you can imagine and add him/her to the sample, he will represent no more than a very small fraction of the

[8] Hence the interest of a diary; it allows you to recall history as it unfolded, not as it was analysed *après coup*. Taleb read Shirer's diary of events leading up to WWII and "it turned out to be a training program in the dynamics of uncertainty".

weight of the entire population. "*In the utopian province of Mediocristan, particular events don't contribute much individually, only collectively. I can state the supreme law of Mediocristan as follows: When your sample is large, no single instance will significantly change the aggregate or the total.*" But now take the net worth of the thousand people you lined up. And add to them Bill Gates, let's say. He may well account for 99.9% of the total wealth represented. "*In Extremistan, inequalities are such that one single observation can disproportionately impact the aggregate, or the total.*" Now why is this important in our context? Well, because Extremistan can produce *Black Swans*, and does, because a few occurrences can and have huge effects on history. The traditional tools of probability and statistics are irrelevant in this case, and moreover it is hard if not impossible to predict the event of *Black Swans* from past experience or information.

Taleb then turns to the problem of induction, using an example inspired from Bertrand Russell. "*Consider a turkey that is fed every day. Every single feeding will firm up the bird's belief that it is the general rule of life to be fed every day by friendly members of the human race... On the afternoon of the Wednesday before Thanksgiving, something wholly unexpected (for the turkey, that is! [9]) will happen to the turkey. It will incur a revision of belief.*" (Page 40) [10] You could also call the turkey problem "Hume's problem", by the way. But the problem itself is much older and probably as old as philosophy itself. The violently antiacademic and antidogma activist Sextus Empiricus formulated it with great precision a millennium and a half before Hume.

Assuming our blindness to the *Black Swan*, Taleb lists a number of themes arising from that sad reality:

- We focus on preselected segments of the seen and generalise from it to the unseen: **the error of confirmation**. The best way to avoid this is to adopt negative empiricism. A series of corroborative facts is not necessarily evidence. Seeing thousands of white swans does not prove the nonexistence of black swans. But the sighting of one black swan proves that not all swans are white. This asymmetry is immensely useful and helps us to become semi sceptics! (Popper developed this idea; he developed a technique he called *falsification*)
- We fool ourselves with stories that cater to our Platonic thirst for distinct patterns: the **narrative fallacy. It is literally impossible to ignore**

[9] The turkey lives in Extremistan, as far as he is concerned. Of course, the perspective of the butcher is a different one; he knows what will happen to the turkey. But in the modern world, we tend to be turkeys more often than we would care for.

[10] This reminds me of a friend of mine who worked as an analyst at Lehman brothers. He regularly sent me little notes entitled "10 things which keep me awake at night". I received the last one 5 days before the firm went belly up. The note talked about all kinds of possible crises throughout the world, but there was of course not the slightest mention of any risk to Lehman brothers!



- posterior information when solving a problem. This simple inability to remember not the true sequence of events but a reconstructed one will make history appear in hindsight to be far more explainable than it actually was –or is. There is another aspect: the pull of the sensational. As Stalin once said: *"One death is a tragedy; a million is a statistic"*. We talk endlessly about terrorist acts, which kill far less than the environment, which makes us overestimate the likelihood of potential terrorist attacks.
- We behave as if the *Black Swan* does not exist; human nature is not programmed for *Black swans*; our emotional apparatus is designed for **linear causality**.
- What we see is not necessarily all that is there. History hides *Black Swans* from us: this is **the distortion or neglect of silent evidence**^[11]. Cicero tells an interesting story. One Diagoras was shown painted tablets bearing the portraits of some worshippers who prayed, then survived a shipwreck. The implication was that praying protects you from drowning. Diagoras then asked; *"Where were the pictures of those who prayed, then drowned?"* Montaigne describes the same problem. A similar remark applies to job protection measures. You notice those whose jobs are made safe and ascribe social benefits to such protections. But you do not notice those who cannot find a job as a result, since the measures will reduce job openings. Or take studies of millionaires showing what they share in common: courage, risk taking, optimism, and so on and inferring from that that those traits help you become successful. But the graveyard of failed people will be full of people who shared the following traits: courage, risk taking, optimism, etc. "The entire notion of biography is grounded in the arbitrary ascription of a causal relation between specified traits and subsequent events." (page 105) There are of course differences in skills and behaviour between people, but often what truly separates winners from losers is ...luck. *"One should not compute odds from the vantage point of the winning gambler, or the lucky Casanova, or the endlessly bouncing back New York City, or the invincible Carthage (sic), but from all those who started in the cohort."*(Page 119).
- The "tunnel": we focus on a few well-defined sources of uncertainty, on too specific a list of

[11] *"Our neglect of silent evidence kills people daily. Assume that a drug saves many people from a dangerous ailment, but runs the risk of killing a few, with a net benefit to society. Would a doctor prescribe it? He has no incentive to do so. The lawyers of the person hurt by the side effects will go after the doctor like attack dogs, while the lives saved by the drug might not be accounted for anywhere."*(page 112)

Black Swans, neglecting the really important ones.

He discusses each of these points in the following chapters and shows that in effect they are all the same topic.

PART 2: WE JUST CAN'T PREDICT

The computer, the internet and the laser are among the recent inventions that have had the biggest impact on our lives. None of them was planned or predicted or even appreciated until quite late after their invention. They were consequential, they were *Black Swans*. The master plan only exists in our retrospective imaginings. We are actually quite bad at predicting, which in no way seems to deter us from predicting all and sundry. Economists are among the worst species here, of course.

Taleb has conducted experiments to test the difference between what people actually know and how much they think they know: it is sobering. But there is another interesting aspect to this: the flooding with "information" about minutiae of daily business is worth than useless, it is toxic. It gives you the impression you know while you do not. That is why Taleb invites the reader to spend as little time as possible reading newspaper, watching TV or looking at blogs. Listening to the news on the radio every hour is far worse in this respect than reading a weekly magazine, because the longer interval allows information to be filtered^[12].

He then talks about the expert problem. In a nutshell, he shows that things that move, and therefore require knowledge (espistēmē) rather than know-how (technē) do not usually have experts, while things that do not move seem to have some experts. The latter can be too arrogant and overestimate their competence, but at least they have some.

The worst case is arrogance mixed with incompetence, the "empty suit". They people the realm of Extremistan where predictions are much more difficult if not impossible. You can predict the bursting of a boiler by calculating the pressure it can withstand. It is much more difficult to predict stock market developments or growth. The problem is

[12] Watching the French presidential election unfold is interesting in that respect. How much could you learn from the presentation on French TV on Sunday evening? Nothing except the actual results; and even there, better to wait until 11pm or so and get the correct ones rather than the results de la sortie des urnes. On France 2, at 8pm, Sarkozy was at 25.80% and Le Pen at more than 20%. So all the comments were coloured by this small difference between the two. But the true result that came out later showed Sarkozy at more than 27% and Le Pen at less than 18%, a difference of more than 9%! The tonality of the comments did not however change for that matter, the first impression remained. Or take Le Journal du Dimanche I read on Sunday morning. There was a double page with six questions and a lot of speculation about who would come first, about whether Le Pen would be ahead of Mélenchon, etc. A complete waste of ink and time really: you just had to wait until the very same evening and get the (correct) result.

made worse by the herd instinct: economic forecasters do not want to be off the wall, they tend to fall closer to one another than to the resulting outcome! [13]

People would not be people if they did not have a blind spot towards their own predictions. Here are some of the excuses you hear routinely:

- They were playing a different game (they knew everything about the workings of the USSR but those bloody Russians were hiding economic facts).
- They invoke the outlier (the model was right but here was something completely outside the system. It won't happen again) [14].
- They were "almost" right (but that does not help much, does it, when one small variable can have a huge impact).

Modern technology unfortunately has made projections easier, or so we believe. "But things have changed with the intrusion of the spread sheet. When you put an Excel spread sheet into computer-literate hands you get a *"sales projection" effortlessly extending ad infinitum. Once on a page or a computer screen, or worse, in a PowerPoint presentation, the projection takes on a life of its own, losing its vagueness and abstraction and becoming what philosophers call reified, invested with concreteness; it takes on a new life as a tangible object.*" (Page 158) [15]

In the following chapter Taleb gets deeper into what he calls the unadvertised structural limitations on our ability to predict. A different way of looking at this is to examine the history of discoveries. People often search for one thing and find something different. Remember Christoph Columbus, for one! Many inventions are the product of serendipity: the term comes from Hugh Walpole who derived it from a fairy tale, *"The three princes of Serendip"*. These princes were always making discoveries, by accident or sagacity, of things they were not in quest of [16].

Taleb mentions the discovery of a background noise that was a trace of the birth of the universe by two radio astronomers who were mounting a large antenna at Bell Labs in New Jersey in 1965. They thought that bird poop was behind the noise, initially. As Popper showed, one should beware of

historicism. He made scepticism a method; he made of a sceptic someone constructive. He advocated an approach that was bottom-up, open-minded, sceptical and empirical, as opposed to Platonic, i.e. top-down, formulaic, closed-minded, self-serving, and commoditised.

Taleb calls an *epistemocrat* someone who has a low degree of epistemic arrogance, who accepts to say "I don't know", who holds his own knowledge to be suspect. The major modern epistemocrat is Montaigne for him. The word "essay" conveys the tentative the speculative, the nondefinitive.

Now does this mean that we should stop having judgments, or avoid predicting things? Not at all, after all we are human, and why should we stop being fools? But, says Taleb, just be a fool in the right places. What one should avoid is unnecessary dependence on large-scale harmful predictions—those and only those. Avoid the big subjects that may harm your future. *"Do not listen to economic forecasters or to predictors in social science (they are mere entertainers), but do make your own forecast for the picnic. By all means, demand certainty for the next picnic; but avoid government social-security forecasts for the year 2040."* [17]

But there is above a positive way of looking at things. Because there many positive accidents, if only you are prepared and ready to seize your opportunities (well, look at footnote 15, for instance). Taleb describes the *"Barbell Strategy"* he has pursued in investments. Rather than being mildly aggressive or conservative, he advises, be as hyperconservative and hyperaggressive as you can. Instead of putting your money in "medium risk" investments [18] (whatever that is!), you need to put a portion, say 85 to 90%, in extremely safe instruments, like Treasury bills, and the remaining 10 to 15% in extremely speculative bets, as leveraged as possible, preferably venture capital-style portfolios (with plenty of small bets!). In other words, put yourself in situations where favourable consequences are much larger than unfavourable ones ("the great asymmetry").

[17] That reminds of when I was aspiring to become a teacher of English in Luxembourg. I enlisted in a programme run by the Luxembourg government before leaving for university in England. One day, I received a long letter from the Ministry begging me not to study English literature and try to become a teacher; they confidently predicted a surplus of teachers of English within 5 years. They offered me a special scholarship if I accepted to change track. Which I did with great pleasure, having already decided that I would not spend my life teaching "I am, you are, he is ..." in a Luxembourg college. So I switched to linguistics and Russian, and pocketed the rather hefty subsidy. A few years later, I read per chance – in the Luxemburger Wort that there was an acute shortage of teachers of English in Luxembourg.

[18] The sad reality is that EU law obliges the private banker and the client to choose a "risk profile". Average people like me then choose "medium risk" of course. I can tell you from experience that it indeed does not make any sense. If European directives allow me to do so, of which I am not certain at all, I now want to opt for a true medium risk profile, in Taleb's vein.

[13] I had a graphic illustration of this at a recent dinner. One of the guests, a very sharp and very arrogant trader, was describing how "the market functioned". He explained how strong the pressure is on individual traders to follow the herd: "You just don't want to be the odd man out."

[14] Presumably because next time they will factor in that element. Too bad that the next *Black Swan* will be a different one, as unpredictable as the last. Remember the Maginot line.

[15] Now this is a not to discourage our brilliant programming unit. Do not forget: it was Oana who gave me this book!! They do beautiful charts, too, but they do not pretend to rule the universe. As to PowerPoint: I hate the thing, it is an elegant way of hiding the absence of ideas.

[16] See also Arthur Koestler's *"The Sleepwalkers"*, describing discoverers as sleepwalkers stumbling upon results and not realising what they have in their hands.



PART 3: THOSE GREY SWANS OF EXTREMISTAN

In this final part Taleb looks at the following four issues:

- The movement from Mediocristan to Extremistan and the issue of inequality
- The delusion of the Gaussian bell curve
- The Mandelbrotian (or fractal) randomness
- The ideas of philosophers who focus on phony uncertainty

In the modern world, because of scalability and the tournament effect—someone who is marginally better (or luckier) can easily win the entire pot, leaving the others with nothing—inequalities are on the rise; just look at football players, writers, singers, or bonus hunters[19]. Add to that the "Matthew effect"[20] by which people take from the poor to give to the rich and the picture becomes even uglier. Taleb describes academic publishing. Someone writes a paper quoting 50 people (of equal merit, let us assume). Another researcher will randomly cite three of those 50. A third researcher will read that paper and quote the same three authors. And so on. The more those authors are quoted, the more they appear in bibliographies and Google, and the more they will be quoted. Taleb's point is that the initiation of the process can be quite random: academic success to some extent is a lottery. Without mentioning the game of cliques of authors who quote one another. In the art world, the cumulative-advantage effect is particularly high. At the same time, there are many instances where a winner can be unseated by someone new popping up out of nowhere. No one is really safe. The same incidentally applies to civilisations and their decline.

In modern economy there is an interlocking fragility in the globalised world. This gives the appearance of stability and thus creates devastating *Black Swans*. *"Almost all banks are now interrelated; so the financial ecology is swelling into gigantic, incestuous, bureaucratic banks (often Gaussianised in their risk measurement) - when one falls they all fall."* Unless, that is, the public authorities bail them out on a massive scale, with all the negative effects this has on sovereign debt. Note that the book was published in 2006, hence before the onset of the crisis; the 2010 editions adds a postface but does not alter the text of the first edition. Note also what Taleb said about Fanny Mae, "which seems to be sitting on a barrel of dynamite, vulnerable to the slightest hiccup. But no worry: their large staff of scientists deemed these events unlikely" (page 225). Remember, this was in 2006!

The next chapter ("The Bell curve, that great intellectual fraud") starts as follows: *"Forget everything you heard in college statistics or*

probability theory. If you never took such a class, even better."[21] And it goes on to mention the shock Taleb experienced one day when he had a look at a ten deutschmark banknote representing Gauss and the bell curve! The main point of the Gaussian is that most observations hover around the mediocre, the average. The odds of a deviation decline faster and faster (exponentially) as you move away from the average. But if you take wealth, which is scalable (*Mandelbrotian*, says Taleb): here the speed of the decrease remains constant or does not decline. The Gaussian-bell curve variations face a headwind that make probabilities drop at a faster and faster rather as you move away from the mean, while *"scalables"* (or Mandelbrotian variations) do not have such a restriction. In the Gaussian framework, inequality decreases as the deviations get larger caused by the increase in the rate of the decrease. Not so with the scalable: inequality stays the same throughout. The inequality among the superrich is the same as the inequality among the simply rich—it does not slow down.

The Gaussian model does make sense in the case of variables for which there is a rational reason for the largest not to be too far away from the average. The notion of standard deviation has a meaning here, but it is meaningless outside of Mediocristan.

Taleb goes into technical detail to explain all of this (I skipped that part, it not being indispensable for non-specialists). He then turns to his dear friend and idol Benoît Mandelbrot, the *"poet of randomness, the man who made many swans grey"*. Mandelbrot starts from the observation that platonic categories are at odds with the real world: *"mountains are not triangles or pyramids; trees are not circles; straight lines are almost never seen anywhere. Mother nature did not attend high school geometry courses or read books of Euclid of Alexandria."* (Page 256-7) The geometry of the rough and broken is called "fractal" by him. Fractality is the repetition of geometric patterns at different scales, revealing smaller and smaller versions of themselves. Small parts resemble to some degree the whole. The fractal applies to the brand of uncertainty of Mandelbrotian randomness (I am not sure I understood the technical explanations; I am pretty sure I did not understand them, actually, even if I did not heed Taleb's advice to skip the theoretical part). The following quote suffices: *"Thus I would like to eliminate many Black Swans, or at least mitigate their effects and be protected from them. Fractal randomness is a way to reduce these surprises, to make some of the swans appear possible, so to speak, to make us aware of their consequences, to make them gray. But fractal randomness does not yield precise answers... If you*

[19] At least with Lionel Messi millions of people can actually see that he is outstanding; can you say that of bonus hunters?

[20] "For onto everyone that hath shall be given, and he shall have abundance, but from him that hath not shall be taken away even that which he hath" (Matthew 25:29, King James Version)

[21] Sounds reassuring to someone like me; I sure have forgotten all about it. But it is not very reassuring, really, as we shall see.

know that the stock market can crash, as it did in 1987, then such an event is not a Black Swan." (Page 272)

The problem is that we or rather statisticians handle matters that belong to Extremistan but treat them as if they belonged to Mediocristan. The application of phony mathematics to social science is a harbinger of disaster. And the Nobel Prize has consistently encouraged this approach, with deadly consequences! In 1997, the Committee awarded the prize to Myron Scholes and Robert Merton who had improved on an old mathematical formula and made it compatible with the existing grand Gaussian general financial equilibrium theories; hence acceptable to the economic establishment. They confused absence of proof with proof of absence. They founded a large speculative trading firm called Long-Term Capital Management (LTCM); they managed to enlarge the "ludic fallacy" (the assimilation of real randomness to casino randomness, which is quite different) to industrial proportions. In summer of 1998 erupted the Russian financial crisis, which took place outside of their beautiful model; it was a *Black Swan* (to them). LTCM went bust and almost took down the entire financial system with it. And yet, MBAs in business schools went on learning portfolio theory. And we know what happened later, do we not?

Finally, a few elements from the Postscript essay written in 2010 and called "*On Robustness and fragility, deeper philosophical and empirical reflections*". **A few things Mother Nature likes or does not like:**

- It likes redundancies (we have two eyes, two lungs, two kidneys etc; it does not like "optimisation", mathematised (poorly!) by Paul Samuelson;
- It does not like anything too big: much stability would be achieved if governments stopped helping companies that are "too big to fail";
- It does not like too much connectivity and globalisation: by taking us into Extremistan, they increase the risk of *Black Swans*. One cannot nor should stop travel or globalisation, but be aware of the side effects, the spread of epidemics, for instance, or a financial crash somewhere in the world bringing down the whole system...

Taleb evokes of course the 2008 crisis, but only briefly because to him it is intellectually interesting: "...[it] was a lot of things, but not a Black Swan, only the result of fragility in systems built upon ignorance-and denial-of the notion of Black Swan events. You know with certainty that a plane flown by an incompetent pilot will eventually crash...there is nothing in the developments that had not happened before, at a smaller scale. It was just a financial opportunity for me..." (Page 321) Taleb lists main errors in understanding the message of the book: (1) Mistaking the *Black Swan* for the logical problem; (2) Saying the maps we had were better

than having no maps [22]; (3) Thinking that a *Black Swan* should be a *Black Swan* to all observers; (4) Not understanding the value of negative advice; (5) Not understanding that doing nothing can be much more preferable to doing something potentially harmful; (6) Applying to the ideas in the book labels off a supermarket shelf; (8) Thinking that the book is about the errors of using the bell curve and that it is enough to substitute a number from the *Mandelbrotian* in place of another; (9) Claiming "that we knew all this and there is nothing new" (and then going bust in 2009!); (10) Treating probabilities as measurable; (11) Spending energy on the difference between ontic ("true") and epistemic (stemming from lack of knowledge) randomness instead of focusing on the distinction between Mediocristan and Extremistan; (12) Thinking the author is saying "Do not forecast" or "Do not use models", rather than "Do not use sterile forecasts with huge error" or "Do not use models in the fourth quadrant[23]"

On stress tests: taking the worst possible past deviation as an anchor event to project the worst possible future deviation is a mistake. This means forgetting that you would have failed to account for that past deviation if you had used the same method on the day before the occurrence of that past anchor event. And at the very end, here are the **10 principles for a Black-Swan-Robust Society[24]:**

1. What is fragile should break early, while it's still small;
2. No socialisation of losses and privatisation of gains;
3. People who were driving a bus blindfolded should never be given a new bus;
4. Do not let someone making an "incentive" bonus manage a nuclear plant-or your financial risks;
5. Compensate complexity with simplicity;
6. Do not give children dynamite sticks, even if they come with a warning label;
7. Only Ponzi schemes should depend on confidence. Governments should never need to "restore confidence";
8. Do not give an addict more drugs if he has withdrawal pains;
9. Citizens should not depend on financial assets as a repository of value and should not rely on fallible "expert" advice for their retirement;
10. Make an omelet with the broken eggs.

[22] I like that one. It is like saying that in the Paris metro it is better to have a plan of the London metro than none at all!

[23] The Fourth Quadrant is the spot on the map where the problem of induction and the pitfalls of empiricism come alive, where the absence of evidence does not line up with evidence of absence. It is where event generators belong to Extremistan and very large deviations are possible.

[24] Almost all of them directly relevant for the present crisis and the crisis management