

The Logic of Risk Taking

*Your shirts in the washing machine –A million here, a million there –Do you know your uncle point ? – Gambling in Saint Petersburg --
NonAbelian groups*

The next two chapters present the logic of risk taking and redefine rationality in accordance with it. Such a logic is markedly different from standard logic. For instance:

One may be risk loving yet completely averse to ruin

The central asymmetry of life is:

In a strategy that entails ruin, benefits never offset risks of ruin.

We will show how any violation of this rule is similar to violations of other rules of logic, like saying $1+1=3$. Actually, we will see that, under risk rules, $-1+1$ may not be equal to 0, but equals -1, (though $1-1$ is equals 0). We will also show how this logic is violated left and right in the common discourse.

Further:

Ruin and other changes in condition are different animals.

Meaning that people confuse risk of ruin with variations –a simplification that violates a deeper, more rigorous logic of things. Volatile things are not necessarily risky, and the reverse. Falling from a chair might be good for you, while falling from the twenty-second floor will never be so. Small injuries will be beneficial, never larger ones. Fearmonging about some class of events is fearmonging; about others it is not.

Finally:

Rationality is avoidance of systemic ruin.

This logic will, simply, lead us to the only rational definition of rationality I have found, that is, rigorous, consistent, devoid of contradiction, and logically tight. All others have contradictions in them. Rationality is indistinguishable from precaution.

The logic of risk bearing I propose here will allow us to show that some said “irrational” beliefs can be actually rational and some “rational” beliefs when subjected to formal examination aren’t so. But, mainly, it will allow us to understand the notion of precaution and the very concept of wisdom in decision making. The next chapter will reconcile it with classical virtues and will show how it matches the notion of *prudence* as exposed in Aristotle.

FROM WARREN BUFFET TO MARKOV CHAINS

We start with the concept of path dependence, which can be best explained as follows:

Ironing your shirts then putting them in the washing machine produces a different outcome from washing your shirts first, then ironing them.

The reader can either trust me on this, or try the experiment with both sequences on the next Sunday afternoon.

Now, assume that your capital is around one million dollars and you are involved in speculation. Apply path dependence to the reasoning.

Making a million dollars first, then losing it, is markedly different from losing a million dollars first then making it.

The first path (make-lose) leaves you intact; the second (lose) makes you bankrupt, insolvent, maimed, traumatized and more generally unable to stay in the game, thus unable to benefit from the second part of the sequence. There is no *make* after the *lose*. Hence an asymmetry; losses and gains do not offset each other in some conditions; there is no netting of costs versus benefits. And what is the condition? The mere probability of hitting the insolvency point which we can call by the respectable mathematical name “absorbing barrier” but is commonly known in no less scholarly circles of

gambling and speculation as “uncle point” or “throwing in the towel”. If your country is a former member of the Ottoman Empire, odds you will call this uncle point an “*aman*”, which is an expression thought by non-Turks to be usually uttered by Turks upon failed Turkish enterprises.

Warren Buffet –as well as literally anyone who survived in the risk taking business –has a version of it: “In order to succeed, you must first survive.” My own version has been: “never cross a river if it is *on average* four feet deep.”

I know, I know *it is only money* –we are simplifying for now. We are assuming, for the purpose of this example, that you are in a simplified world in which the *worst case* is what happens to you and you only, and that you can define it the way you want, which you did here by expressing it in financial health. Further, every example assumes that its worst case is really the worst case. The next chapter will generalize and take broader and more realistic assumptions and layer worst-cases from the individual to the collective to the ecosystem. Some worst cases are worse than others.

Why are we using financial examples? Because of illustrative simplicity and expertise: finance is the area for which probability theory has had the most applications, hence is way ahead of the rest of other fields in such studies, I may venture to say about at least half a century. It is like systematically driving cars at two-thousand miles per hour, which teach you the dynamics of motion far more than driving a truck to the shopping mall. Further, yours truly comes from this world: quantitative finance is entertaining. And it is easy to generalize from it –so long as we modify the examples. “Ruin” in finance is reversible, in physical life it is not.

Now back to the problem. We define ruin as something that make the sequence, any sequence of concern, stop, *finito*, that’s it. It is what we call an absorbing state.

For a simplified application of our central principle (that is, *in a strategy that entails ruin, benefits never offset risks of ruin*), consider that, in a strategy that consists in picking coins in front of steamrollers, the long term payoff is invariant to whether your coins are pennies, dimes, or dollars.

More mathematically:

Outcomes that entail ruin make sequences path dependent and noncommutative.

Let me explain these terms very quickly. This operation – the payoff sequence – is called *non-commutative*, that is, for a symbol f representing an operation that we name “follows” meaning “addition conditional on being alive at the time of event” (yes as simple as the regular addition but in a context, only works if someone is alive at times of the operation), so A added to B conditional on B being alive at the time of

operation, written $(A f B)$ is different from B following A ($B f A$) –or part of something unwieldy called a nonAbelian group. The symmetry is missing somewhere. Another technical name is non-ergodic Markov chain.⁴ Somehow your naïve use of accounting-style arithmetic needs to be suspended, unless you can improve it, when evaluating payoffs.⁵

Dynamic decisions do not allow the naïve summing of cost-benefit analyses.

And, further

Real life is dynamic, never static.

In other words, it is fine to make an analysis that is simplified and static, with a happy ending like the movies. But the real-world and real-life do not really have endings, and if they do we never know ahead of time, so we must consider “what happens next”.

The best way to view to point is to imagine playing Russian roulette, in which you have one sixth chances of not surviving.^{iv} It is foolish to think that you will play it once hence your chance of death is 1/6. What if you win? You may play again in the future. Typically, if you play it again, and again, you are guaranteed to exit life on earth with, literally, a bang. Just as we will see in the next chapter, it is foolish to study the risk of flying on the probability of a single episode if the operation is a repeated one.

Those who are familiar quantum logic will see a similarity with this risk logic. Quantum logic is the codification of the rules of logic governing subatomic particles, as formalized by von Neumann, which, while being self consistent, appear to be different from what we are used to.

Let us take stock. So far the idea as presented seems trivial. But it does not present itself readily in people’s minds, particularly with those plagued with *some* education –the same modicum of education that makes people Black Swan blind by missing fundamental differences in evidence.

For instance, I found almost all GMO advocates (actually, all) as generally sharing a mental defect affecting their logical faculties. Typically, when inquiring about the *risk* of a strategy, they show you... the (presumed) benefits. You insist,

⁴ More technically, path dependence arises with any Markov chain with an absorbing state, that is, a non-ergodic matrix, one with at least one transition probability of either 0 or 1.

⁵ The point isn’t just logic, but calculus and the calculus of variations. I just attended a lecture by Bruno Dupire on a mathematical method he developed called “functional Ito calculus” that addresses path dependencies. I wonder why it took so long, tens of thousands of papers, before the development of techniques of analysis such as that of Dupire’s. Bruno started by saying: these are intuitive and trivial to practitioners but “we” (that is, mathematicians) didn’t have tools for them.

they show you more projected, self-evaluated benefits. You insist more, you are show more projected benefits. The records obtained by the Right to Know organization show that Eric Sachs a hotshot at Monsanto (confidentially) instructed his skills to respond to a paper I co-wrote introducing the precautionary principle with an answer that produces precisely the exact fallacy. They tried to market the idea that the technology was “going to save the world” and “feed the children”, hence... reduce risk thanks to these benefits.

Shoddy sales arguments of such style “you are responsible for harming children if you prevent us from doing it” are often offered because nobody wants to look like an *a***hole* arguing against it. Remember: snake oil salespeople never tell you that it is good for them, here Monsanto, but how it is good for you or humanity in general, or the poor kids in Africa in the adduced picture, or starving farmers in southwestern Uttar Pradesh, all manner of people posing for pictures without a smile. They are in the business of supplying you with arguments you are unprepared to answer.

Clearly, the technology *may* save the world –but our point was that increasing risk, and “saving the world” do not offset each other. That is again from the fundamental logic risk bearing. Saving the planet requires, first, not causing irreversible damage to it. Typically, when I request risk studies, all I get is benefits studies and the person doesn’t realize the difference. Taken to its limit, the argument is of the style: “I need to play Russian Roulette to save my family from starvation”. Maybe a good idea, with plenty of possible benefits, but if you die, they will starve even more.

Further, the next chapter will show that increasing benefits, if it increases uncertainty, makes ruin more likely.

Symmetry does exist in some conditions though in a weak form, allowing us to ignore the problem –in fact we have been fooled generalizing from the wrong problems. We can identify where the symmetry applies as follows. Repeat the comparison of the two paths, *make-lose* versus *lose-make* with \$1,000 assuming your capital is one million. The reader can already see that, unlike large losses *small* profits and *small* losses do sort of cancel each other out, and the smaller the more the cancelling effect works. (But not if they are cumulative, that is, not if one gets cumulatively to the total loss, but ignore for now). For small amounts, there is no path dependence. We can thus see that the larger the stakes, the disproportionately larger the asymmetry. “Small losses” are different from those that have large consequences, qualitatively so. Regular arithmetic (netting benefits) only works as a good approximation for micro, not macro risks. And if we are fooled in life, it is because we are generalizing from an approximation, forgetting that it is an approximation.

To summarize the logical deduction so far, from the asymmetry:

Statements that entail ruin are qualitatively different from those that entail non-ruin losses.

So take this asymmetry for now as something critical in all decisions in life; we will tour through a bit of the development of as it has been part of the intellectual discourse since at least 1738.

Also take for now that there two different classes of risk. Those that entail ruin and those that don’t. (Let us not get into the discussion that all ruins are not equal, systemic ruin is vastly worse than individual ruin, etc., as we will deal with it later. Assume here that ruin is ruin.)

SAINT PETERSBURG

Some history of the thought about the asymmetry⁶. To their credit, economists and decision theorists have sort of gotten a version of the point –or tools to deal with the point –with the notion of risk aversion that was very active about a generation and a half ago. But it is a flawed one (what can you expect from economists?) And it remains that the *ruin* aspect of it has been progressively ignored over time, for reasons we will explain here. Unfortunately, mistakes of missing non-commutativity kept creeping up. Sometimes, by a mechanism similar to one of Parkinson’s laws, where there are many ideas in a field, with more and more production of insignificant but complicated niceties, central points vanish and the crap rises to the surface. This distraction and change of focus, is another effect from the absence of skin in the game among the nondoers. And whenever a violator has skin in the game, he exits from the pool –violators in the ivory tower stay in the game.^v

So instead of avoiding ruin, economists rely on the notion of “utility” which in a less simple but also less rigorous way does the job. I can explain as follows.

Consider the million dollar loss as having an “infinite” undesirability, the million dollar profit much less so in desirability –this is done by with the notion of “utility”, which allows us to ignore the actual dollars and transform them into another –imaginary – unit. How? Just replace your current wealth (a million) with the logarithm of a million (or some similar function), and do the same to the various future wealth possibilities. The log of 0 is minus infinity, meaning an infinitely bad outcome. And at all points a decline in your wealth is more undesirable (in absolute value) than an increase in it of the same amount is desirable. Further, small moves are more symmetric than larger ones. It necessarily flows from the fact that very bad outcomes are infinitely

⁶ The reader can skip this section as it may be technical.

undesirable and lead us to the following nonlinearity: a gain of ten million is less than twice as desirable as a gain of five million, but a loss of ten million is more than twice as undesirable as a loss of five million.⁷

RISK AVERSION

We can (sort of) reach a similar result by going in the opposite direction. The slightest risk aversion for small bets causes a huge one for larger ones, those that come close to total capital.

Let us see how –and define risk aversion. If I gave someone the chance to get a check for \$5 million for sure, versus a coin flip giving 50% chance of getting \$10 million and 50% odds of receiving nothing, and the person accepted the certain option compared to the random one, the person is deemed to be risk averse (for such a sum): you need a premium for risk, that is ask for more than \$10 million upside to accept the gamble. This risk aversion leads to stiff avoidance of the uncle point, the fact that bankruptcy has a severe penalty.⁸

This is called the utility approach –which is both complicated and eventually inconsistent. It requires something called a “premium for risk”, which nobody knows how to compute. Our approach of “no going bust” is more robust as it does not make any other assumption than the need to just not go bust.

But of course, economic theory has not gotten the idea that if you accept that going bust is an infinitely undesirable proposition, then there are policies you personally should take to remain consistent. I keep noticing violations in real-life among nonprofessional decision-makers. It is not uncommon to observe economists totally oblivious to the logical conclusion of the point of undesirability of going bust, namely the principle of precaution and the notion of survival –the simple idea of *path dependence* and retain all others niceties. For, as the reader can see where I am going, this will lead us to the *Precautionary Principle*.

So we saw that risk and benefits are not *separable* entities benefits are conditional on risk, not netted against them.

The idea of utility was adumbrated by the Bernoulli brothers, Nicolas and Daniel, in the early 18th Century, connected with what is known as the *Saint Petersburg paradox*. If I gave you the chance to enter a gambling strategy of coin flipping that pays what can be expected to be,

⁷ Technical point: I am simplifying a bit here. We get the same result with any function that has a marginal, not just absolute utility of negative infinity. But it is easy to understand the exercise that way.

⁸ We can more technically explain HARA and conditions in simplest terms, how we get to log utility, or to infinite second derivative, etc.

in the long term, an infinite amount, how much would you pay to get in? Up to an infinite amount? No, much, much less, a disproportionately small sum. You discount the stream of payoffs with the logarithm or some similar function that puts an increasingly smaller weight on larger values.

Now, it necessarily follows that if you put smaller weights on larger values, two million gains are not twice as good as one million, hence (by translation) one million gain is not as good as a million loss is painful, gains are necessarily less desirables than losses are undesirable, which leads us to the risk aversion argument.

If we don't hear much about the utility and risk-aversion business while discussing business life, this notion has disappeared analytically, or had to hide in order to lower confusion. We really needed to get rid of it in order to do research. How? Because if you have a million dollars capital, a million loss for you is negative infinity and a hundred thousands is a hundred thousands, and if I only have a hundred thousands, for me a hundred thousand loss would be infinity. If you use as a metric the percentage of wealth, some are more willing to lose half their wealth than others -- we may have different degrees of risk aversion. So we cannot use the same units for two different persons. We can only use the transformations for intertemporal comparisons for a single person. But research is about the general, not the particular like you and I. Hence to generalize and do things cleanly, our tools of analysis are called “risk neutral”, as if we lived in a world in which everyone would have infinite capital. In my field of mathematical finance, we call this the “Q world” in which, sort of, everyone is symmetric in perception of losses and gains, knowing that the results derived there cannot be transferred outside that “Q world” without some modification.⁹

So the fact that we work outside the “Q World” for decisions and risk taking analysis, people fuhgotabout the ruin. We sort of fuhgot to translate back into the real world when making casual statements about research and risk. Let us work in establishing the implications of such omission.

⁹ A technical comment for those who are curious. To translate results between the two worlds we need something mathematically powerful called a “change of probability measure”, a unique mapping between the real world, called “P World” and the “Q” one, between the empirical world and the “risk-neutral” one. It has been a great contribution of probability theory that such mapping is unique – meaning results in one world have one and only one in the other –as we have a contraption called the “Radon-Nikodym derivative” that allows us to see how results in one world correspond to the other.

LOVING RISK, BUT NOT ALL RISKS

We saw that there are two approaches to get to the same point. The first is the “no ruin” approach. The second is utility and risk aversion.

I am personally not crazy about the notion of “utility” –as a matter of fact I am allergic to it as it smells of economists in dark suit who talk without doing. It is uselessly complicated. I have never really seen it used in practice –and to my knowledge No risk taker has ever used it. I mean no risk taker.

It is quite useless *if the only point is to avoid ruin*. So there are classes of models that just focus on “ruin” avoidance, in different disciplines. For instance, the two main models used in practice are the Camér model of insurance and the Kelly criterion after the information theorist J.L. Kelly. For instance, the barbell strategy outlined in *Antifragile*, which we formalized mathematically in a paper with Don and Hélyette Geman, implies taking maximum risks in everything that does not entail ruin. More technically it is called maximizing entropy under tail risk constraints – that is maximizing the uncertainty that does not kill you.

Actually the reasoning behind the Saint Petersburg offered by the Bernoullis and later economists isn’t the most rigorous: it assumes that you have enough funds to sustain a strategy of betting until the magic moment when you win big –and not go bankrupt in between. What holds you up is utility not ruin and insolvency. As the information theorist Kelly has shown, if you want to “stay in the game” until you win, you also need to view things in a logarithmic format, and bet accordingly, that is, put only a proportion of your funds at risk, until you win big. This is the strategy of almost every risk taker I know. While 99% of the economics literature is on utility approaches, 99.99% of practice is Kelly based. Talking about skin in the game.

The Kelly approach is considerably simple: all it takes is know how much you are willing to lose per bet, some proportion of your total capital and the attractiveness of the bet. You start with \$100, you bet \$1. You lose, now you bet \$.99. If you win, you bet \$1.01. With such a strategy you never ever hit 0, never ever face ruin. And every period you may change your mind as to the attractiveness of the bet. This is called a dynamic strategy –my first book, *Dynamic Hedging* was about the subject and twenty years later it doesn’t look like academics are getting the point, or actually worse, going further in the wrong direction. For if you have a finite bet or alternatively a stop-loss then all the statistical properties are cancelled. At the time of writing, Ole Peters and the great physicist Murray Gell-Mann have realized the idea that all approaches other than Kelly are nonsense and shown the same fundamental flaws in the economics literature.

PASCAL’S WAGER

Now someone may ask: what if I have an *infinite* potential benefit as well? Unfortunately, under our logic, the infinities do not cancel out each other. The absorbing barrier doesn’t allow it. Besides, infinity is a mathematical contraption and we interpreted it here as “stay away”. And write down that regardless of benefits, infinite and shminfinite, an infinite loss makes the entire package undesirable.

Many have mistaken the reasoning here for another application of Pascal’s wager, by which someone who otherwise would be agnostic takes the position that God exists because such a stance has no or a small downside if wrong, and an enormous reward if it is right and God happens to exist. The great Johnny von Neumann on his hospital bed, facing premature death, converted to Catholicism and had a priest ticking all the right boxes –von Neumann came from a Jewish family but Catholicism appeared to have the largest such benefits. The idea is that, if a believer, von Neumann would then have a nice desk in paradise with an infinite supply of mathematical problems for him to solve, and a no less infinite one of Hungarian goulash during breaks.¹⁰

Pascal’s wager has theological flaws as it includes belief without skin in the game. But if you look carefully, our statement is vastly more critical than Pascal’s wager because it concerns an absorbing barrier. Ruin is not the negative side of Pascal’s wager, just as losing a lot of money is not the opposite of making a lot of money.

*Pascal’s wager is an option, survival is not.
Systemic ruin is no option.*

PLANE VERSUS BROCCOLI

Now let us discuss the extensions of risk logic. If I told you that *eating broccoli (or some such inedible food) improves your blood pressure with 95% confidence level*, you would be impressed with my result. This is how testing of statements is usually done in applied science.

Now what if I told you, as you are about to board a plane heading to Ulan Bator: *the plane is deemed scientifically safe*, exercising the same result: 95% confidence level that the plane will not crash. How impressed will you be?

This is where statements about science are different from statements about ruin, or why risk needs to rely on a more

¹⁰ Another problem with the notion of “expectation”. If you have an absorbing barrier and keep playing you will eventually go bust –a theorem about the fact that a one-dimensional stochastic process always revisits every state. This point presented by Dilip Madan in 1996 was rediscovered –sort of –by Peters and Gell-Mann.

potent class of statistical tests, and more rigor in the statements. If we used a 99% confidence level for safety, there would be only a tiny minority of pilots and flight attendants left alive today. The risk of fatality we currently have can be estimated empirically to be less than one in one hundred million of hours flown and the aim is to exceed a billion.

Simply, a statement about the equivalent of ruin for an individual, namely, a terminal event is not equivalent to a statement about effectiveness or *non-ruin*. The same failure of symmetry we saw earlier applies here.

Statements about risk are not the same as statements about safety.

For instance, a low-grade British GMO peddler, the *bul***** vendor Mark Lynas, has been selling the statement that consensus on GMO safety is equivalent to the consensus on global warming (a statement that is, in effect, false, but let us assume it is true), say more than eighty percent. Let us also ignore the fact that polls of the so-called experts (but not experts in tail risk) are not the way to determine risk. This is a wholesale marketing of a logical defect. The *risk* to the planet from manmade emissions is deemed to be more than eighty percent and the *safety* of GMOs are deemed more than eighty percent. Are these two comparable? To see clearly, assume I told you that the consensus about the *safety* of the plane ride is the same as that on the *risk* of global warming, about eighty percent. If you are of the type to buy such logic, you will exit the gene pool at some point in the future. But outside plane rides, with modification of domains, people buy the statement about GMOs. The way to correct the statement is to consider the complement of the consensus (the other fifteen to twenty percent) maps to statements about the risk of ruin. Hence you can reformulate the very statement by Lynas to “something has perhaps 15% or 20% risk of ecocide”, which would lead you to stay away from it.

We already see that wherever we have the smallest notion of ruin, the small defects in the analysis –ignoring the asymmetry –lead to terminal consequences.

SEPARATION AND ABSORPTION

What we have been discussing so far is the notion of ruin as a distinct category, the uncle point-absorbing barrier of life. Hence we can make a statement as follows. Since one (benefit) is conditional on absence of the other (ruin), it logically follows that, according to a broad definition of rationality:

It is irrational to separate risk taking from the risk management of ruin

I am not joking: the way business is currently managed by banks bureaucrats is as follows. It can help explain why they blow up without ever understanding the root causes. Some people in organizations are responsible for risks, others for decisions. There are risk managers and risk takers –but typically the risk managers are just clerks who communicate with regulators, that is, other clerks. Sometimes you hear such absurdity as “Max is excellent at managing risk but he is not good at generating returns”. From my experience, no person with skin in the game has made such statement; it is only bureaucrats who do so.

NEXT

The present chapter developed the idea of path dependence and the irrecoverable. But we needed some stretching; as I said in the beginning, we made many simplifications, some of which need to be reversed. So we will make the bridge from individual to collective, and from the collective to the systemic and focus on explaining how people can gladly kill themselves for the sake of the collective –debunk the fiction that you are a single unit. This will take us into the notion of rationality.

The Irrational Discussion of Rationality

*When you cross the street – What you wish for your enemy –Precaution and scale –You only live one, perhaps a maximum of twice –
Reconciling Aristotle with Aristotle*

The main simplification we made for the example of the gamble at the beginning of last chapter is that a loss of a million dollars has an infinitely negative utility or effect on someone whose capital is only one million. Is that really infinitely negative? Can't we have worse? What about his loss of life? Shouldn't we rank scenarios?

Our starting statement is:

Unless you are perfectly narcissistic and psychopathic –even then –your worst case scenario is never limited to the loss of your life.

Let us see how the loss of your life is not the worst that can happen, using the ordering of your own preferences. Consider that there is a worse outcome than your loss of life: that, *in addition*, of another member of your family. By how much it is considered worse is irrelevant: the point proves that your death is not the worst case scenario.

And there is a worse outcome than that one, the loss of additional members of the community, which includes more family and friends. And there is a worse outcome than that, the loss of members of the extended tribe –however you define it, ethnically, culturally, or other members of your commando team and their children, mistresses and wives. And there is worse outcome than that, the termination of humanity. And there is an even worse outcome, the loss of your dog, cat, canary, hamster, horse, and the squirrels in your backyard. And there is a worse outcome than that.

It is called ecocide.

We can add a few niceties to the argument that *you are not alone*. You may prefer that some other people do not survive your death. If you happen to be a human and like almost all other humans have hatreds, enemies that add a spice to your life, our reasoning can also apply to accommodate them in your preferences. Pick a person you truly feel should not be

operating on the planet, say, that fellow at the public relation firm Ketchum who, in addition to destroying our method of doing science, is running an overactive internet smear campaign against you, the CEO of Monsanto, or the head of the execution committee in Saudi Arabia. You prefer that both you and that nefarious person dies to the scenario in which you die *and* the evil person stays alive, with, say, the Ketchum fellow free to go smear someone who is still alive, or to smear your memory.

If someone tells me: “no, you idiot, my death is really the worst case, worse than that of me *plus* the rest of my family”, then he would be implicitly telling me that he would be delighted if these other persons die today and he stayed alive –unless he doesn't understand his own preferences. It is in fact wishing for all other people's death, with nobody spared, to stay the least.

Let's take stock. So far we have managed to prove that your worst case scenarios are like circles, with a hierarchy of worst cases.

We have also proved the *logical necessity* of some degree of altruism in society. This is not mere empiricism. (Note that the logic is vastly more robust than the empirical statements as a logical argument cannot be possibly wrong unless logic itself is wrong, or some assumption was poorly phrased). But, most of all, he have shown the notion of scale and unit. The unit can be the self, the extended family, the community... and nature.

YOU ONLY

This creates a hierarchy of ruin. And when we talk about ruin, absorbing barriers, and such things, the ranking of the ruins in desirability is in proportion to the hierarchy. So the probability of ruin for you as an individual can be tolerated so long as it ranks low in the hierarchy of harm – and, critically,

so long as it doesn't correlate with that of others. In fact correlation makes anything systemic.

At the top of the hierarchy is the ecosystem. But there are another way to view things: your life has an upper bound, whether we know exactly what it is or not. Humanity doesn't –hence the need for “sustainable” strategies.

Some ruin are local and sustainable, others aren't.

Further:

Correlated risks induce systemic effects.

We can layer these degrees. Let us now look at the layers in Table 1:

Table 1- Layers and Sustainability

Layer	Systemic	Sustainability
You	Idiosyncratic if uncorrelated	Renewable
You plus your closed ones	Weakly systemic	Renewable
The tribe	Weakly systemic	Renewable (sort of)
Humanity	Systemic	Nonrenewable (absorbing barrier for the species)
Ecosystem	Systemic ecocide	Nonrenewable (systemic absorbing barrier)

So we can see that we should treat the nonrenewable in a different way from others.

Let us now look at probabilistic renewability. Recall from our discussion last chapter that life is dynamic, never static.

Things that have repeated exposure should never be analyzed as a single event.

Mountain climbers, motorcycle riders, and other people on a death wish have a small probability of death per episode. But their life expectancy is shortened as they are never limited to one episode and it is ludicrous to consider the risk statically not dynamically. If you incur a tiny probability of ruin as a "one-off" risk, survive it, then do it again (another "one-off" deal), you will eventually go bust with probability one hundred percent. Confusion arises because it may seem that the "one-off" risk is reasonable, but that also means that *an additional one* is reasonable. This can be quantified by recognizing that the probability of ruin approaches 1 as the number of exposures to individually small risks, say one in ten thousand, increases. For this reason a strategy of risk taking at the systemic is not sustainable and we must consider any genuine risk of total ruin as if it were inevitable.

The good news is that some classes of risk can be deemed to be practically of probability zero: the earth survived trillions of natural variations daily over 3 billion years, otherwise we would not be here. By recognizing that normal risks are not in the category of ruin problems, we recognize also that it is not necessary or even normal to take risks that involve a possibility of ruin.

COURAGE AND PRECAUTION AREN'T OPPOSITE

Let us also stop here and redefine virtue the way Aristotle attempted to do in his *Nichomachean Ethics* : *sophrosyne* (*σωφροσύνη*), prudence, a form of sound judgment he called more broadly *phronesis* were required –though people through the centuries have been confused as to why Aristotle included both courage and prudence as part of the same virtue. Aren't they inconsistent?

In our framework, they are not. I can exercise courage to save a collection of kids from drowning, and it would also correspond to some form of prudence.

For courage, according to the Greek ideal that Aristotle inherited—say the Homeric and the ones conveyed through Solon, Pericles, and Thucydides, is never a selfish action:

Courage is when you sacrifice your own wellbeing for the sake of the survival of a layer higher than yours.

As we can see it fits into our table of preserving the sustainability of the system.

A foolish gambler is not committing an act of courage, especially if he is risking other people's funds or has a family to feed. And other forms of sterile courage aren't really courage.¹¹

THE OVER(UNDER)EDUCATED PUNDIT

Now, about every time I discuss a precautionary principle, some overeducated pundit suggests that “we cross the street by taking risks”, so why worry so much about the system. Only recently a prominent economist-psychologist candidly put to me such a question, causing a bit of anger on my part.

Table 1 allows an immediate answer. Aside from the fact that the risk of being killed as a pedestrian is one per 47,000 years, the point is that my death is never the worst case scenario *unless* it correlates to that of others.

I have a finite shelf life, humanity should have an infinite duration.

¹¹ To show the inanity of social science, they have to muster up the sensationalism of “mirror neurons”

Or

I am renewable, not humanity or the ecosystem.

Even worse, as I have shown in *Antifragile*, the fragility of the components is required to ensure the solidity of the system. If humans were immortals, they would go extinct from an accident, or from a gradual buildup of misfitness. But shorter shelf life for humans allows genetic changes to accompany the environment.¹²

MEDIOCRISTAN AND EXTREMISTAN

Never compare a multiplicative, systemic, fat tailed risk to a non-multiplicative, idiosyncratic thin-tailed one.

Recall that I worry about correlation between the death of a person and that of another. This, simply is the systemic effect. So we need to be concerned with things that can affect more than one person should they happen.

There are two types in which random events fall: Mediocristan and Extremistan. Mediocristan is thin-tailed and affects the individual without correlation to the collective. Extremistan, by definition, affects many people. Hence Extremistan has a systemic effect that Mediocristan doesn't. Multiplicative risks –such as epidemics—are *always* from Extremistan. They may not be lethal (say, the flu), but they remain from Extremistan.

More technically:

Mediocristan risks are subjected to the Chernoff bound.

The Chernoff bound can be explained as follows. The probability that the number of people who drown in their bathtub in the United States doubles next year –assuming no changes in population or bathtubs –is one per several trillions lifetimes of the universe. This cannot be said about the doubling of the number of people killed by terrorism over the same period.

Your grandmother knows that. But a little bit of education is destructive. Journalists and social scientists are pathologically prone to such nonsense –particularly those who think that a regression and graph is a sophisticated way to approach a problem. Simply, they have been trained with fools for Mediocristan. So we often hear the nonsense –with a headline –that many more American citizens slept with Kim

Kardashian than died of Ebola. Or that many more people died killed by their own furniture than from terrorism. Your grandmother's logic would debunk these claims: just consider that: it is impossible for a billion people to sleep with Kim Kardashian (even her), but that there is a non zero probability that a multiplicative process causes such number.

I was wondering why the point appears to be unnatural to many “scientists” (say the verbalistic fellow Cass Sunstein on whom a bit later) but natural to some other people, such as the probabilist Paul Embrechts. Simply, Embrechts looks at things from the tail. Embrechts studies a branch of probability called extreme value theory and is part of a group we call “extremists” –a narrow group of researchers who specialize as I do with extreme events. Well, Embrechts and his peers look at the difference between processes for extremes, never the ordinary. Do not confuse with Extremistan: they study what happens for extremes, which includes both Extremistan and Mediocristan –it just happens that Mediocristan is milder than Extremistan. They classify what can happens “in the tails” with the generalized extreme value distributions, which falls into three categories: the Gumbel, Fréchet and Weibull distributions or type I, II and III extreme value distributions. Extremistan risks go to Fréchet. Things are a lot, a lot clearer in the tails. And things are a lot, a lot clearer in probability than they are in words.

RATIONALITY

Which brings us to rationality: there are many people who pathologize you for worrying about, say Ebola based on past incidence of Ebola compared to death from bathtubs. In that category I put may people who go all the way to find the precautionary principle “unscientific”, and use “evidence” without proper understanding of statistical theory.

Particularly dangerous is Cass Susstein's approach, particularly that he advocates “nudging” people into some course of action.

These hold “irrational” worries of the type that allowed us to survive.

Which allows us to state:

It is never irrational to worry about absorbing barriers at a systemic level.

It is in fact irrational to ignore an absorbing barrier when doing any form of projection through time.

¹² A question. Why is it that education muddles brains? Simply knowing too much without the ability to *eliminate* modern junk degrades knowledge –the brain of that economist –otherwise intelligent –resembles that of a studio apartment in which the contents of my house with its entire library were crammed. Now try to find your way in it.

A DEEPER DISCUSSION ON UTILITY

This is hard to get for many but The Kahneman-Tversky curve seems “irrational” compared to the “normative”. All these differences go away once we look at our gradation individual-collective.

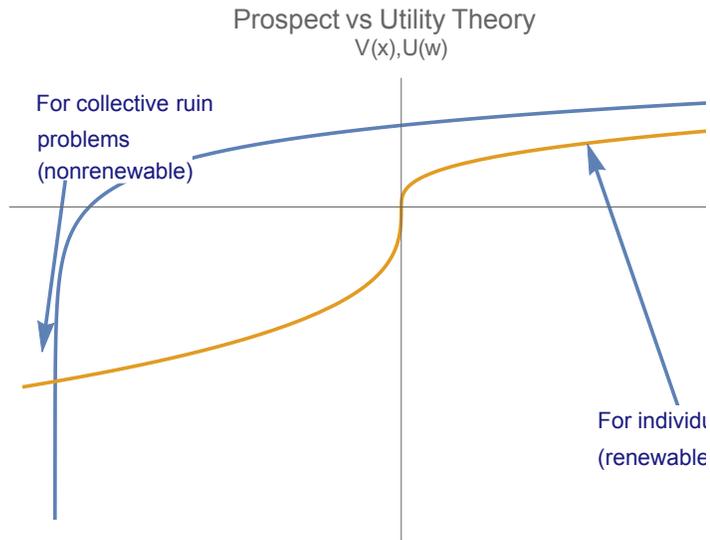


Figure 3 Comparison of the shapes of Kahneman-Tversky Prospect theory to standard utility theory. It seems that K-T is entirely “rational” for the individual and entirely irrational for the collective or when it comes to ruin problems.

GROUP VS. INDIVIDUAL

Discussion of E.O. Wilson’s group selection.