



Paper: "Tail-Risk Perspectives"

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What You Can't See *Can* Hurt You

Enterprise Risk Management: A Tail-Risk Perspective

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Recent developments have highlighted the dangers of large risks with very small probabilities of occurrence. These catastrophic events are easily ignored by companies, thereby weakening the effectiveness of risk management. This article discusses the psychological phenomena at work when decision makers deal with these risks and how **Enterprise Risk Management (ERM)** can help overcome the psychological biases that hinder conceptualizing, interpreting, and dealing effectively with these risks.

When planning for the future, it is easy to turn a blind eye to risks that are highly unlikely to occur. Managers ignore them too often, whether to save money or avoid planning for a highly unlikely occurrence, and undervalue future risk. Ignoring these extreme risks may threaten the continuity or sustainability of an organization. However, with the implementation of an Enterprise Risk Management (ERM) framework, organizations can refine their thinking and reduce future hazards and in turn, better manage income.

Flawed risk management exposes the need for ERM

After the turn of the millennium, several giant corporations experienced avoidable disasters, exposing flawed ERM processes. The events that transpired with Fukushima Daiichi's nuclear power plant embodied this concept—disaster struck because of a questionable risk management system. When a tsunami hit, destroying three of Fukushima's nuclear reactors, one of the world's largest nuclear disasters unfolded. Although Fukushima could not have prevented the tsunami, its means of protecting its equipment from one was far from sufficient, admittedly because its disaster plan "didn't envision something this big." Had Fukushima Daiichi planned well for the unlikely tail risk, it might have avoided catastrophe. Just as Fukushima could have benefitted from

the enhanced communications and planning that comes with ERM, General Motors could have avoided the damage it experienced due to failures of an ignition-switch cover-up that cost at least 13 lives—an oversight that could have been avoided with proper ERM.

Some probabilities are too small to perceive

Tail risks are sometimes so difficult to perceive that they seem impossible, although we know this is not the case. However, with an ERM system in place, a well-established procedure for monitoring risks protects institutions from ignoring highly unlikely tail risks. When applying ERM concepts in an organization, more resources will be devoted to monitoring extreme risks that threaten the sustainability of the organization. While identifying and planning for risks, including tail risks, inevitably raises present operating costs, the impact it can have on the future of the organization by reducing the probability of tail risks is accretive. By subsuming all material risks, ERM accounts for previous challenges in risk management and focuses more narrowly on risks that may jeopardize operations. Because existential risks, and especially tail risks, are often subtle and nuanced, it becomes necessary to use a tool to magnify, amplify, and clarify. ERM does this by providing a clearer picture and path to eliminate obliviousness to risk.

Psychological barriers to risk perception

If these risks are so perilous, why do they continue to go undetected by managers? Nassim Nicholas Taleb's *Black Swan* and Daniel Kahneman's *Thinking Fast and Slow*, together with cognitive biases that impact managerial tendencies, start to shed some light on this behavior. While Taleb argues that risks are underestimated because they are unprecedented, Kahneman sees them as overpriced because they can hurt an organization more than equivalent successes can mitigate. Regardless of the approach, both agree that hazards are skewed owing to psychological biases or to neglect.

The behavioral side of risk management lends more insight on why organizations tend to ignore seemingly imperceptible risks, which can be devastating. Cognitive biases, including overconfidence, anchoring, and groupthink, get in the way of objective decision making. Overconfidence, a trait commonly associated with decision making, can lead to unwarranted optimism and an inflated sense of feeling immune to negative events. With anchoring bias, or focalism, the way in which information is presented influences decision making. For instance, if an organization recently incurred a large loss, it would likely overestimate the probability of a current loss. Unprecedented risks are ignored, and unless an extreme event has recently occurred, it will most likely be ignored. Finally, with groupthink, group dynamics show a major effect on decision making as members tend to abandon their independent voices. This can create a tendency to overestimate group power, vulnerability, morality, pressures toward uniformity of viewpoint, and closed-mindedness. We see this phenomenon among boards of directors, who often allow groupthink to divert their focus from the importance of small yet extreme risks.

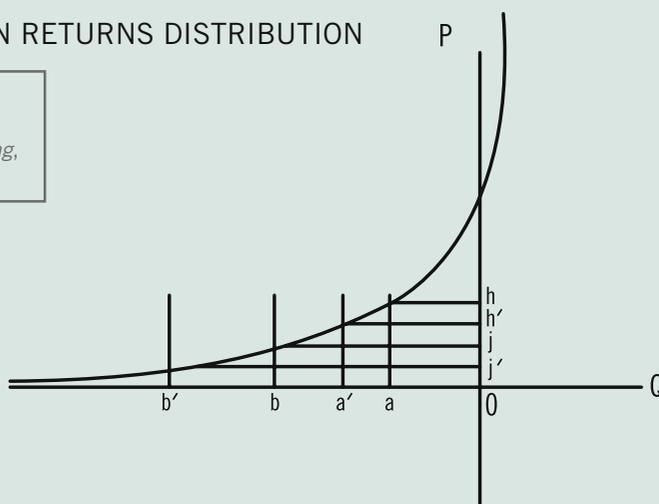


Plotting remote probabilities too small to be perceived

Consider that the most commonly used returns distributions—the Gaussian and power functions—are asymptotically zero in the negative quadrant. This trait has not been fully exploited in thinking about tail risks, and indeed, it holds the key to reconciling Kahneman and Taleb. Exhibit 1 depicts the power function returns distribution with probability (P) on the Y axis and outcome or quantity (Q) on the X axis. Notice that the negative tail is divided into three intervals: 0 to a , a to b , and b to minus infinity. From 0 to a , that containing the largest probabilities ($P \geq h$) is the Kahneman domain. These probabilities are readily observable, and attendant risks can be subject to overpricing owing to the Kahneman-Tversky loss aversion. The interval to the left of b contains remote probabilities ($P < j$), which are too small to be perceived without amplification and/or clarification. The notion of being too small to be perceived is quite natural and has numerous analogs. Molecules, atoms, and nanoparticles are all too small to be perceived without special instruments such as microscopes, telescopes, or particle accelerators. Likewise, sounds of sufficiently high frequency, audible to some animals, are inaudible to humans without special assistance. High-frequency trading provides yet another analogy where transactions are effected at speeds unaided humans find imperceptible. In all these examples, phenomena are indiscernible absent special instruments.

Exhibit 1 POWER FUNCTION RETURNS DISTRIBUTION

Source: "Tail-Risk Perspectives,"
The Journal of Investing,
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The region of the power function in Exhibit 1 to the left of b contains positive probabilities that are simply too small to be perceived. Thus, without the assistance of special instruments, these hazards will be ignored or assigned zero probability.

This region is described by Taleb's *Black Swan*, but the hazards described may or may not be unprecedented. Unprecedented events neither imply imperceptibility nor are they implied by imperceptibility; that is, unprecedented events are neither necessary nor sufficient for imperceptibility. Imperceptible hazards are naturally assigned zero probability and will therefore be underpriced. Unprecedented events may or may not be assigned zero probability. Similarly, preceded events may be so improbable as to be effectively imperceptible, for example, a pandemic exterminating a large fraction of the human population. Nevertheless, most preceded events are likely to be perceptible and most unprecedented events will either be imperceptible or perceived with large errors. For example, in the case of Fukushima-Daiichi, a tsunami in excess of 15 feet was unprecedented but hardly unimaginable. Scientists had warned TEPCO that climate change was producing ever more violent climatic events and recommended a 30-foot seawall instead of the 15-foot version management chose to build. The tsunami that devastated Fukushima Daiichi was therefore perceived, albeit unprecedented. The imperceptibility of small probabilities to the left of b in Exhibit 1 thus subsumes Taleb's *Black Swan*, but is more general.

Perceived hazards fall to the right of b in Exhibit 1, but we define the interval a to b as the range of hazards perceived with large potential errors. Thus, the introduction of ERM has the effect of shifting a to a' and b to b' , leaving the interval between the clearly perceptible and the imperceptible (a' to b') possibly smaller or larger. But the set of hazards clearly perceived is increased, as is the set that is perceptible at all. Therefore, the set of hazards subject to Kahneman-Tversky overpricing is expanded and those subject to Taleb underpricing is diminished with the innovation of ERM.

Begin by adopting an ERM mind-set

Even without the resources necessary to implement a full ERM system, the concept has takeaways important for businesses of all sizes. While it might not be possible to bring in a complete task force of risk managers to monitor potential risks and analyze their costs, the first step is overcoming neglect and acknowledging that while some events are unlikely, they shouldn't be ignored. Planning for tail risks may be costly up front, but as seen with Fukushima and General Motors, underestimating tail risks can be hazardous to an organization. The first step is to align with best practices and improve communications when it comes to recognizing risks. Once communication is improved, a systematic approach to monitoring risks can reduce the likelihood of ignoring them, enhance information and improve decision making.

Greenbaum on reducing the possibility of ignoring small probabilities

"ERM is about all risks, or all risks that are significant enough to threaten the existence of the organization. The comprehensive definition is difficult to operationalize. The alternative is material risks people tend to ignore for a variety of reasons, and this tendency is what ERM addresses.

The question is how do you conceptualize this risk? How do you give it interpretation? That's what this paper has described. The ERM program is a little bit like introducing a microscope. A certain class of these probabilities now becomes visible. Why? Because you're looking for them regularly; you have specialists who are looking for these kinds of things. So the possibility of ignoring these small probabilities is reduced somewhat. I argue that the protocols of ERM are like instruments in physics and chemistry: they tend to enhance the visibility of these very small particles. Part of the ERM is an improved communication within the organization. For example, ERM requires that every unit in the organization reports to the chief risk officer every month or week on anything they see that might be threatening. Just the fact that every unit has to report reduces the probability that you'll ignore certain events."

**Cognitive biases
in human behavior
lead to ignoring
perilous risks.**

