

The Fundamental Law of Risk Evaluation (FLoRE)

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Presented at
2010 Enterprise Risk Management Symposium
Society of Actuaries
April 12-15, 2010

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Abstract

The paper argues that Risks Evaluation at its core is a psychological process that can lead to the special type of chaos described in modern Chaos Theory. It will argue that quantification and scientific modeling does not exempt risk assessment from the potential for deep biases.

Quantification and scientific analysis of the assumptions can lead to narrowing of the objectives and focus. Further, it can lead to an appeal to authority, instead of an appeal to observable facts. It will argue that ignoring the psychological aspects to risks evaluation can create a neurotic environment for risk management. The paper will argue that understanding the psychological process can help risk management obtain a more accessible, flexible, holistic view of risks. It will suggest ways to prevent and avoid overreach in quantifying risks.

The Fundamental Law of Risk Evaluation: recognizes the tendency for individuals, businesses and economies to gravitate towards risks that are underestimated/underemphasized and away from those that have been overestimated/overemphasized. These misallocations often create temporarily-distorted risk/reward feedback loops. Short term gains may reinforce faulty risk evaluation and (paradoxically) cause an increased commitment to the model. Moreover, preferential allocation of limited resources can create a strong disincentive to incorporating different ideas and adjusting methods of evaluation.

1. Introduction

Risk evaluation can become a dysfunctional or even counterproductive process. A significant contributing factor in this regard relates to what are called cognitive (thinking) biases. Cognitive biases are subconscious psychological processes that distort our view of reality. Everyone possesses one or more of these biases, and they can produce neurotic outcomes. When taken to extremes, they may lead to outright psychosis.

Unacknowledged cognitive biases, many of which are related to perception of risk, are likely one major cause of failures in the insurance industry. Further, as recent bubbles suggest, flawed risk evaluation tendencies can occur throughout the economy. Analysis that is cognizant of, and proactive about, these subconscious psychological biases can strengthen the outcome of risk-taking prospects of an organization.

Chaos theory posits that, in a chaotic world, risk evaluations are always going to miss something. Being mindful of the limitations of risk-evaluation systems can prevent overreliance on its results.

2. Fundamental Law of Risk Evaluation

The Fundamental Law of Risk Evaluation¹ (FLoRE) states there is a natural tendency for individuals, businesses and economies to gravitate inefficiently toward risks that have been underestimated or underemphasized—and gravitate away from risks that have been overestimated or overemphasized. The dangerous effects of such misallocations are then amplified through resonation of temporarily distorted risk/reward feedback loops that support the faulty risk-evaluation process.

This simple law (FLoRE) has many sophisticated ramifications for individuals managing their lives, businesses managing their risks, evaluation of a company's risks, and for macro evaluation of an economy's risks. FLoRE implies that, absent awareness of certain underlying psychological biases, risk measurement can increase the risks rather than contain them. FLoRE also implies that bubbles and panics develop from uncontrolled, ineffective analysis of risks.

Evaluation of risk, no matter how rigorous, is a psychological process of interpreting its relevance to reality. FLoRE implies that errors and omissions in the risk process, if not corrected naturally, tend to be compounded into extreme allocations. Recognizing the basic psychological biases that occur with skewed risk analysis can help identify when flawed analysis has occurred, prevent its deleterious effect, and avoid further damaging analysis. Predictive application of FLoRE, by acknowledging the shortfall in a risk- assessment process, can make the unintended consequences of regulating risks more apparent. Acknowledgment of the errors and limitations of risk analysis can help predict and thereby mitigate or avoid completely the misallocation of resources.

The current fiscal crisis has many second guessing their risk analysis parameters. Retroactive analysis of faulty feedback loops can strengthen current risk assessment processes. Unfortunately, such analysis often results in something akin to devising a new risk analysis system to win the last war's battles. This might be analogous to hindsight bias—the inclination to see past events as being predictable and extrapolating that they will repeat. Risk analysis incorporating FLoRE can help recognize and prevent this pattern of faulty risk evaluation.

Risk evaluation at its best is an effort to eliminate, as much as possible, cognitive biases, and acknowledge the ambiguities within complex models. Risk analysis at its best recognizes these tendencies and corrects for them. Modeling of risks has evolved from simply rating the fiscal health of companies to a much more chaotic disintermediation risk embedded deeply within insurance and securitized products. Modern risk evaluation must recognize its limitations as regards predicting these risks.

The application of scientific modeling and quantification of risks through models enables people to be judged by the models. This drives a tendency to “game” the system. While manipulating the models certainly can be intentional, it is often the unintended subconscious consequence of regulating risks with a simplistic model. The implied objectivity and apparent

¹ This paper is an expansion of the article “Commentary: A Fundamental Law of Risks Evaluation” by Russell Sears with Janice Dorn, M.D., Ph.D., pages 10–13 in the January/February 2010 edition of *Contingencies*.

precision of a quantified risk model can enable manipulation and overconfidence of the results (overconfidence bias).

First, focusing on one risk (selective perception or base-rate fallacy) will often lead to ignoring the long-term or more subtle risks. Second, there is a strong tendency to overextend the usefulness of the model. Such bias blind spots can often lead to concentration of risks. Often it is better NOT to use models than to use them to develop blind spots. Risk evaluation, at its worst, is allowing psychological biases to drive the analysis.

To illustrate this, let us first examine some neurotic risk-evaluation models. Then, we will demonstrate how similar neuroses may develop in an investment-oriented company. We will also show how neurosis has spread to the broader economy as regards creation of the current financial crisis. Finally, we will examine how to prevent neurosis from controlling a risk-evaluation process.

3. Mysophobia and the Fear of Credit Risks

From inception, scientific studies of behavioral psychology have shown that risk-evaluation processes in individuals can be highly counterproductive. A casual study of phobia and anxiety disorders demonstrates that biases to systematically overestimate risks develop into feedback loops.

The manifestation of a phobia and its effects on an individual runs a wide gamut. If such analysis becomes too dysfunctional, it can result in severe consequences, specifically, obsessive, overemphasized risks that displace appropriate concerns for other risks.

A person with mysophobia (fear of germs) develops an overtly conservative approach to the risk of exposure to “germs.” These can be viruses, bacteria, fungi or anything that the phobic considers a contaminant. This phobia is the result of indiscriminate simplification, misunderstanding and misinterpretation of the scientific model of germs. This leads to obsessive-compulsive behaviors, including quasi-pathological avoidance of germs and repetitive behaviors to attempt to rid themselves of germs they believe they may have encountered or avoid germs they think they may encounter.

Extensive scientific investigation into germs, sanitation, sterilization and disinfectants clearly has expanded life expectancy. Few hyperboles would overstate the effect this scientific model has had. It has changed medicine and significantly impacted modern life through the discovery of vaccines, antibiotics and numerous disinfecting and sterilization techniques. These ideas are easily understood by the layman as regards the development and maintenance of good hygiene.

Nonetheless, the germophobe makes drastic life changes to try to avoid what are perceived as unavoidable risks.

Howard Hughes’ hermitic and self-destructive behavior in the latter part of his life is said to have been caused by his fear of germs. This fear can cause the phobic to miss many aspects of social life that serve to bond with others and develop networks of human relationships. Germophobes also sacrifice activities that would strengthen their bodies (such as fear of going to gyms and touching machines or weights that they believe to be contaminated).

However, many bacteria are beneficial—one might even say critical—to a person’s health. Strange dietary habits can develop, that often omit the “good” bacteria to avoid the bad. Immunity develops from mild exposure to harmful germs, and low-level exposure produces a more alert, battle-ready immune response. Lack of exposure to germs may lead to a weakened immune system. Ironically, all this can lead to increased vulnerability to illness. Inevitably, the dreaded exposure will happen, causing far greater consequences for the germophobe than a more prudently clean individual.

Widespread indiscriminate use of antibiotics causes bacteria to mutate. Despite repeated health guidelines re: overuse of antibiotics as causing resistant strains of bacteria, nothing seems to change. Why? Patients demand them and put considerable pressure on doctors and health professionals to overprescribe antibiotics. Lawyers often have the ability (in hindsight) to pinpoint the time, place and organization responsible for a disabling infection. This fear of lawsuits drives the health care industry to overemphasize the more tractable individual's risk at the expense of the general public.

4. Credit Risk is Always Too Risky

The simplification of the credit risks into ratings has largely been successful in enabling the layperson to understand and control credit risks. However, overreliance on rating agencies can lead to inefficient risk taking with overly simplistic views of credit risks.

The regulatory process puts substantial reliance on rating models. The three rating agencies—S&P, Moody’s and Fitch—were effectively granted an oligarchy when the SEC created the “National Recognized Statistical Rating Organization” (NRSRO).²

The investment policies of many companies are built on simplistic fiduciary models. Each individual credit risk is given a rating. This rating is the basis for risk assessment. Often, the decision is to avoid all credit risks, and each individual decision is held to this standard. Once a credit is downgraded below AAA it must be sold.

Other investment policies allow for some credit risks, but the risks must be at least “investment grade” or a more restrictive policy.

Finally, throughout the financial industry, credit risks are frequently quantified and ranked using a simple factor approach based on the three agencies and their ratings. Such models generally ignore diversification, and understate the risks of investment grade credits to encourage only those top-rated credits.

The legal and political ramifications of a failed investment can make investment policies extremely risk averse. The NRSRO has effectively given many of the “buy and hold” fixed income investors a “safe harbor.”

Thus many investors take an overly conservative approach without the benefit of knowledge or guidance re: sufficient rewards or the ability to independently analyze credit risks associated with these supposed conservative sterilized portfolios.

Rating agencies have historically been predictive of default rates. However, they lack the diversity of unbiased opinion found in the marketplace to scrutinize them properly. The credit markets have reacted ahead of the rating agencies in spotting increase of credit risks prior to the rating agencies’ actions.

The securitization process has further separated the market’s ability to objectively review a rating by increasing the complexity of the security. The vast data collection of any individual securitized pool has made the investor more reliant on the wisdom of the rating agency. Because of the value of a rating, the rating agency can demand compliance to data requests. Further, the rating agencies are uniquely positioned to render superior analysis because of the degree of complexity in the products, the volume, experience and presumed expertise. However, as the crisis has shown, they did not have an unbiased viewpoint in giving ratings. At some point, discovery process in lawsuits will reveal the conflict of interest to increase their market share and

² Rating the Rating Agencies and Securitization by Michael S. Rozeff:
<http://www.lewrockwell.com/rozeff/rozeff250.html>.

rate the troubled securitized assets. Many of these errors stemmed from reliance on the past data; to wit, they did not ask the right questions. They did not understand sufficiently the mutation of the mortgage and housing industry. The disintermediation risk within the mortgage industry, especially the subprime and Alt-A, was evolving rapidly. This made most of the other securitized products and the whole system vulnerable to infection.

The story of Goldman Sachs' risk assessment of the subprime and mortgage situation illustrates that objectivity with internal risk analysis can be invaluable. Their value at risk (VAR) analyses did not anticipate the extent of the subprime crisis. They appeared to be unable to quantify a situation that was careening out of control; rather, they used it to directly alert them to the direction things were heading. Then their independent analysis directed their response.³

Likewise John Paulson's record hedge fund profits were due to understanding that the FLoRE process was driving the mortgage bubble. His analysis of the process enabled him to successfully short the mortgage bubble.

While the regulating of any single entity, with a conservative approach to credit risks, probably prevented several failures due to foolish risk taking, it fostered an environment that overvalued the opinions of the rating agencies. The acceptable portfolio became standardized. Whole new industries sprang up, such as the structured investment vehicles (SIV) industry, to take advantage of this apparent risk arbitrage in securitized assets—investing especially in mortgages. This created the pressure to obtain access to these conservative, underdeveloped immune systems. Once the risks mutated, the entire financial system was susceptible to contamination and infection.

³ Risk Management, *New York Times*, Jan. 2, 2009, Joe Nocera.

5. Anorexia and Maintaining a Low RBC Number

A simplistic judgment of society, such as focusing on a number, makes perfectionism both alluring and appealing. This can lead to controlling one's weight—the reported number—instead of considering the risks due to weight or even controlling the social acceptance due to appearances.

Obesity in America is a large health risk. Overweight and obesity have significantly increased. This has caused many chronic conditions, such as diabetes, to the point where a new term has entered the vernacular—diabesity.⁴ With obesity comes the increased risk of diseases such as high blood pressure, Type II diabetes and heart disease, as well as breast, colon and prostate cancer. In addition, obesity has been linked to mental health conditions such as depression or feelings of shame and low self-esteem, and many obese people are discriminated against and targets of insults and other verbal abuse.

The social pressure to change the appearance of this risk factor creates many examples of imprudent, untested or fad methods taken to lose weight. These measures often hide the obvious risks for a more private, but in many cases even more risky, approach to overall health and appearance.

An extreme example: the anorexic is focused solely on body weight. The psychic underpinning of the anorexic is complex because it often involves two or more components. One is disgust at the thought of being overweight. Another is what is called body dysmorphic disorder. In this condition, the anorectic individual may be pure skin and bones, yet look in the mirror and see a fat person. Glossy magazine ads, fashion designers and certain television and Web promotions set opinions and are often obsessed with judging people solely on their weight. A low number can become the goal, rather than visual beauty or healthy body. Teenage girls and boys are increasing reporting “body image disturbances,” and people are literally killing themselves by starvation in order to emulate their movie star idols. Manipulating “the number” becomes the “Holy Grail.” The anorexic becomes an expert in lowering weight rather than becoming healthy.

Doctors, however, take a much more individualized approach to weight. Many factors, and the interactions of these factors, should be considered. Appreciation of body type, muscle mass, exercise and eating habits all have considerable impact on healthy weight.

A second tendency that often will develop by using a risk model is to focus only on a singular number (focusing bias). Risk by its very definition is impossible to quantify accurately. Chaos theory makes clear that small imperceptible events can have surprisingly large effects. Weather forecasting is a good example of both the ability and futility of quantifying risks. However, the quantification process gives us some illusion of infallibility in controlling the outcome. The perfectionist or perfectionist organization can focus only on perfecting “the number.”

⁴ *Diabesity: A Global Epidemic*, Janice Dorn, M. D., Ph.D. www.thetradingdoctor.com . 2009.

The insurance industry has used many risk measures and “rules of thumb”(heuristics) to gauge risks, including: factor-based approaches, risk-based capital (RBC) requirements, VAR, and now C3 testing and economic capital modeling.

However you do the analysis, it can be relatively easy to lower the risk metric, rather than lower the risks actually taken. Models are simplifications of the real world. Using the shortcomings of the evaluation methods to hide or stuff risks into its unmeasured corners can imply that the company is healthier than it is. Managing “the number” rather than managing the risks becomes the objective. Risk managers can find a weakness in the risk rating system to exploit, rather than find an actual risk niche that they manage well.

6. Risk-Based Capital as “The Number”

The state insurance departments adopted a factor approach to determine RBC that conservatively rewarded avoidance of credit risks. Stock investors rely heavily on the capital-to-RBC ratio to determine the risk of a business. A.M. Best developed their Best Capital Adequacy Ratio (BCAR), another simple factor approach, which is used extensively in their ratings process.

Credit risks and exposure to markets risk analysis have been simplified for RBC ratio requirements. The credit risk has been simplified into a “C1” factor, and the market risk exposure has been simplified into a “C3” factor.

The timing of the development of the RBC requirements for insurers implies it may have been a response to the junk bond fiascos of the ‘80s. The recognition of interest rate exposure risks in RBC factors was much more simplistic. The interest factor was based largely on the amount of deferred annuities and their remaining surrender charge period; the market risk to the bond markets was modeled through credit risks and some of the interest rate risks; and the market exposure risks to the broader stock market were not generally recognized except if directly exposed in invested assets.

The analysis of credit and of these risks in the simple factor-based approaches created a FLoRE response bubble within the industry. The credit risk RBC numbers were too conservative and the market exposure rate factors were too liberal due to ease of getting around meaningful market exposure analysis. Compared to reality, often one of the simplest factors used in factor-based approaches is the C3 factor.

7. Market Exposure Risk and Low RBC Requirements

First, in defense of the insurance regulators and industries, it was recognized early that interest rate risks were not adequately analyzed within RBC “C3” factors. Cash flow testing and asset-liability management were implemented in most companies so the actual risks would at least be considered, even if not well managed. It was not recognized early enough that the total market (not just interest rates) exposure should be included in this factor.

In the ‘90s, the variable annuities guarantees and equity-indexed based products created many under-reserve situations once the boom years burst. Many of the interest risks were hidden by the simple factor (C3) approach of RBC requirements. What became clear was that C3 risk factors, based on simple industry average only, on historical deferred annuities could be manipulated by designing products with higher actual C3 risks than the industry’s average. Taking more risks simply because required capital is inadequately adjusted is not a niche that will survive an actual stress test.

For example, the failure of General American resulted from a run on the bank of its guaranteed interest contracts due to a rating downgrade provision allowing waiver of surrender charges. The factor-based approach did not fully recognize the liquidity risks for the credit rating downgrade triggers.

Many other examples occurred with product ties to the equity markets. Variable annuity products and equity-indexed products became caught in a pricing battle. Equity-indexed products competed for the most exotic and valuable exposure during the raging bull market. Then the variable annuity markets were in a race to see who could give the best guarantees. Exotic embedded options were used on the first generation of most of these products. When the stock markets changed from a low-volatility regime to a high-volatility regime, most of these products were not hedged properly. Since pricing models with constant volatility were used, products were therefore chosen with the most exposure to that blind spot.

As is often the case in insurance pricing wars, the “winners” in the race for market share were those who least understood and consequently underpriced the risks. Sales ramped up and companies boomed and then bombed.

The industry response has been to implement “C3 testing” in steps. This process makes the company model its exposure to interest rates and the markets. To prevent manipulation and overcapitalization, the results are then compared against a simple factor approach as a floor and a multiple as a maximum.

However, FLoRE suggests that this process may be overstating the needed capital. During a crisis, when capital levels are stressed by losses, the stress testing requires that capital levels be adequate enough to withstand another crisis. During a bubble, market values are inflated, the embedded options are often worth little, and C3 testing would lower the capital required and cause another rise in sales and exotic embedded options products.

In a FLoRE-compatible world, economic downturns can become self-fulfilling prophecies turning into panics, and rising markets can become irrationally exuberant bubbles. Increasing the RBC requirements during a panic and lowering them during a bubble would amplify this effect.

8. AIG and Model Weakness

AIG has a particularly interesting past. The AIG Financial Product (AIGFP) division was founded by Howard Sosin in 1987. From the outset, it was very secretive about the risks it was taking. After large profits and high bonuses, Hank Greenberg's AIG sent a team to investigate and reconstruct the trades of AIGFP. In 1993, Howard Sosin was let go at the cost to AIG of a reported more than \$150 million severance settlement.

In February 2008, five AIG and four General Re executives were found guilty of security fraud, stemming from 2000 and 2001 accounting entries that were restated in 2005. The case involved secret side agreements that neutralized reinsurance arrangements. This reinsurance lowered AIG's RBC requirements. RBC requirements and reinsurance arrangements are key considerations that rating agencies and other analysts use to advise bondholders and stockholders. Whereas the side agreements made the real risk, the company appeared basically unchanged. This lowered the RBC between the risks displayed to the public versus actual risk taken.

Their finite reinsurance arrangement with General Re had undisclosed side agreements effectively turning the reinsurance into a loan. The court ruled that both companies were guilty of manipulating the numbers used to determine risks. They had taken advantage of the weakness in their model to hide risks. Though it was a relatively small part of their overall business risks, it had large ramifications throughout the company. The company's CEO, Hank Greenberg, was replaced but not prosecuted.

However, in September 2008, it appears AIG itself became a victim of manipulation of the risk metrics of the subprime mortgage markets. Again, it was exposed that key executives did not fully disclose the risks to the corporate head.

AIG had, like General American, written into insurance contracts a credit rating downgrade trigger. It had enjoyed a big advantage to its competitors, an AAA rating. This enabled AIG to write credit default swap (CDS) contracts without posting collateral.⁵ However, the risk of credit downgrade would trigger posting collateral.

Internally, AIG's VAR approach to measuring risks did not measure the true risk: the credit rating triggers.⁶ Externally, like General American, the RBC factors did not require additional capital for these triggers.

The way AIG measured risks internally, using a VAR approach, did not adequately capture the risks in the contracts even without the collateral triggers. A pure VAR approach allows one to take unlimited concentration of risks by "stuffing the tail." As long as that risk is assumed to have a remote possibility of occurring, it will not increase your VAR. Instead, it allows you to concentrate risks into the "tail" low probability of the distribution.

⁵ "Credit Rating Downgrade, Real Estate Collapse Crippled AIG," Jan. 2, 2009, Robert O'Harrow Jr. and Brady Dennis: <http://www.latimes.com/business/la-fi-aig2-2009jan02.0.1111632.story>.

⁶ Risk Management, New York Times, Jan. 2, 2009, Joe Nocera.

Further, it often assumes risks follow a Gaussian distribution, which often is not the case for the tail ends of the distribution. Reality will often throw unexpected surprises, making the tail much “fatter” than normal. When this occurs, what was once considered improbable to impossible can quickly become possible or even likely.

This is, of course, what happened in hindsight. The \$562 billion CDS⁷ written market prices shot up. This caused a massive need for cash for collateral on billions of dollars. These CDS derivatives caused a liquidity crisis. Once a rating downgrade was imminent, AIG needed immediate cash and sought government guaranteed loans to get it.

The CDS markets are relatively new, and sales ramped up exponentially. AIG models were based largely on the consideration that payoff probability or claims were the main determinant of value; whereas the purchaser considered the value that these probabilities of payoff were not constant and were highly correlated to one another. The purchasers had considerable differences in value from AIG, even as they were demanding collateral. The internal capital required for the CDS, using a VAR approach, was relatively small. Hence, ramping up writing CDS inflated the return on capital (ROC) for the business unit.

The internal controls apparently did not recognize these risks. After the departure of Hank Greenberg, the CDS underwriting increased five times and had significant exposure to subprime.

AIG effectively “stuffed the tail” in their internal analysis of CDS. Their internal analysis, using VAR, did not properly alert management to the growing risk whereby a relatively small division would bring them to their knees.

They failed to understand and appreciate the risks of underwriting CDS. Many others also failed because their models did not incorporate the overallocation that was occurring in housing: mortgage-backed securities, alternative mortgage financing and the many companies tied to similar analysis. The irony is that overallocation was occurring because the models were blind to the real risks of overallocation or a bubble. The models continued to suggest these were relatively high-yield, low-risk allocations, well after the market’s swap prices were pricing them below junk.

⁷ “Why Wasn’t AIG Hedged?” Sept. 28, 2009, Robert Lenzner, *Forbes*: http://www.forbes.com/2008/09/28/croesus-aig-credit-biz-cx_rl_0928croesus.html.

9. Overextended Models Lead to Overallocation Lead to High Risks

Famous failures due to risk models leading to overallocation:

- First Executive of California—junk bonds
- LTCM—correlation of currencies
- Black Monday stock market October 1987
- Equity-indexed annuity and volatility exposure
- Subprime mortgages or securitized mortgage markets
- Variable annuities.

There are three consistent fallacies of all these examples. First, while there is risk analysis, the analysis is not considered a simplification of reality. It is considered complete. Second, perfecting the model often necessitates marginalizing weaknesses in the model or scoring system. Finally this enables an extreme position in the risks marginalized or ignored.

Risk analysis is considered all-encompassing, broad and unbiased. In particular, risk analysis often is the standard or generally accepted method. While sometimes these individual decision makers will deliberately make decisions that enrich them at the expense of the whole, it is—more often than not—simply the result of trying to optimize the risk models. The challenge is that the resulting analysis leads to an apparent arbitrage where a particular type of risk mitigation is favored consistently over the marginalized or ignored risks. A feedback loop occurs, leading to extreme positions.

10. Maladaptive Perfectionism and Risk Modeling

Reverberating loops from excessive reliance on simple risk analysis can lead to many other neurotic systemic risks, including depression and anxiety in people. Often the critical illogical jump for a corporation is to assume the model is complete. This leads to running the business by the “numbers” or by the model rather than common sense. In other words, it leads to perfecting the scorecard rather than managing the total results.

To quantify broad, complex systems, such as a financial company, into a simple score or scorecard, many important elements must be ignored or generalized.

Models, by definition, superimpose artificial constructs on reality. Therefore, models can be used to create the illusion of a perfectible reality. In the case of risk modeling, this illusion implies that all the risks are controllable and that numerical results give a concrete target to improve or perfect.

The vigorous process of thorough risk analysis creates the illusion that the risk model is complete. Good risk analysis gathers abundant diverse information and then processes that information thoroughly into numeric results. However, even following rigorous tenets of the scientific method to develop thorough risk assessment, the assessment is dependent on a controlled simplified environment.

Only at the more granular level, when the model is being built, is it clear what compromises are being made at each level of development.

It is not the doctor or the coach that elevates these simplistic models into utopian ideal goals, such as always avoiding germs or unhealthy weight loss methods or goals. Often, it is maladaptive perfectionism, using the models as substitutions for reality, which develops these idealized goals. The simplification process allows for a more controllable world and suggests a risk score is controllable or perfectible. It is the quantification and use of the scientific method that suggests these models are adequate substitutions for reality. Controlling the assessment of risks (rather than the risks) can become the goal. Fully exploiting the weakness of the model to control the assessment can lead to taking more risks. If these adverse risk effects are not immediate, then resources and rewards often go to those taking these risks

What frequently separates overachieving success and spectacular failure is focusing on the “record” or “scorecard,” rather than the end results. Both the overachiever and the maladaptive perfectionist can be focused, ambitious and hardworking. Both records initially appear to be great; often the perfectionist will appear even better than the overachiever. Bernard Madoff’s “too-good-to-be-true record” was a telling sign to those who detected his fraud. Not allowing his fund to suffer normal small losses and the size of the fund were both unbelievably too good (Ostrich effect). As eating disorders and germophobes demonstrate, fraud or cheating is not the only sign of excessive self-criticism and maladaptive behavior. Enterprise-wide risk evaluation can be a significant target for maladaptive perfectionists to exploit because of its judgmental significance, its quantifiable analysis and its simplification of complex reality. Quantifying risks and enterprise risk management (ERM) in general enable judgment and

comparison of risks. It should come as no surprise then that those most skilled at avoiding fair comparison and honest judgment would focus on exploiting the weaknesses and hidden corners to their advantage.

The financial crisis has exposed several layers of how these feedback loops can spiral out of control. Both models and regulations can be exploited to make the risks taken appear better than they are. The boundary of these layers overlaps in application, but the justification and willingness of the participants in the faulty reasoning vary at differing levels. Below are degrees of participation in faulty reasoning.

1. Focusing solely on what is internally controllable—investors' faith in black box models of structured products; AAA ratings bias.
2. Pushing model's boundaries or model is complete and infallible—rating agencies structured products; overleveraged banks; VAR—monolines, CDS and guaranteed benefits; the SIV industry.
3. Pushing the boundaries or rules—underwriting standard deterioration; subprime and Alt-A underwriting; playing the system for rating or grade.
4. Fraud or deception—Madoff and other Ponzi schemes; fraudulent mortgage originators and applicants.

As this paper has anecdotally shown, these problems can develop in the financial sector, industry, company level and the individual.

11. How This Improves Risk Management

Considerable effort and study have been done by highly skilled and trained psychologists and psychiatrists with knowledge of complex adaptive systems to improve the decision-making capacity of individuals. Much of this enormous success has been by showing individuals how to gain insight into the subconscious cognitive biases that previously underpinned their errors in making decisions. Thus, there exists the exciting possibility of using the same techniques to greatly enhance the quality of decision-making in organizations, industries and sectors of the entire global economy. Time does not permit an extensive discussion of this process, but there are a few basic starting points:

1. Recognize there is a problem.

- a. Because problems often develop from fear of judgment, individuals do not typically seek professional help when they need it the most. Often, only after a crisis do individuals turn to skilled psychologists and psychiatrists. In addition to the issues of shame and pride, there is considerable “measured” success and power from those most capable of manipulating the current system. There is often considerable resistance to change, and they have used the achieved power to resist and prevent change. However, alertness, awareness and concerned intervention from those close to them before the crisis may be preferable to seeking outside help. If such proactive intervention is not taken, the condition will progress and outside help will be needed.
- b. Chief risk officers (CROs) and their deputies must be afforded the authority and respect to counsel and set boundaries at all levels. Moreover, the organization must diligently, quickly and proactively seek out the faulty thinking before it becomes an entrenched problem. This requires the CRO to be clearly aware and thoroughly understand model weaknesses on a philosophical level as well as a technical level. It must be acknowledged that the true experts, the modelers, are best equipped to recognize when results are being used too broadly and with too much authority. For actuaries and other modelers, FLoRE presents a potential conflict of interest or potential destructive feedback loop. Allocating more power and authority to the numerical output makes it difficult for those producing the numbers to objectively critique their model’s weaknesses. It is especially difficult to admit the work is irrelevant to a compounding risk when those in authority may also want to ignore the omitted risk.
- c. Understand “predictive markets”: Too high of sales may mean selling underpriced products. High expected ROC and high sales may mean that “C” (capital) is modeled too low and that “R” (returns) could have unexpected delayed losses. The shortcomings of the model may be why sales are high. High sales often are a signal of poor risk analysis. Following the herd on product design, because of high sales, may mean it’s an industry issue (bandwagon effect, herd behavior or the Jungian “collective unconscious”).

2. Recognize the “trigger points” and avoid them.

- a. Know what in your model is not quantifiable. Spot the chaotic elements of models:
 - i. Potential run on the banks
 - ii. Overallocation risks, “tail stuffing” or “black swan” risks
 - iii. Reliance on people behaving rationally.
- b. Often the best way to avoid risks is to see mistakes others are making or could make and avoid the faulty thinking.

3. Disrupt the feedback loops: Stability, objectivity and consistency allow focus and concentrated effort to achieve goals, but also encourage tunnel vision of risk management, as well as static, manipulative thinking (deformation professionnelle).

- a. Broaden the scope of how success is measured.
- b. Reward and punish performance not in a perfectible model; rather include subjectivity in assessments. Such things as customer satisfaction, reputation, creativity and sales integrity are vital but not perfectible.
- c. Design a flexible and dynamic incentive system. Allow recognition of too much of a good thing. Allow new restrictions and new incentives and incentive limits. Design or align these restrictions with model weaknesses. For example, in new product lines or untested products, expect hedging cost and reinsurance to go up as sales increase.
- d. Similarly for “fat tail risks” or “black swans,” products concentration cost to offload risks increases. Life and annuity companies can learn from P&C companies. Very high sales may mean underpriced risks or compensation. Allow risk tolerance to be incorporated into incentive design. Incorporate a speed or velocity of risk acceptance. (Take into account the planning fallacy bias.)
- e. Further “black swan” product sales and capital required need to be countercyclical to industry and to economy. Design incentives to achieve this.
- f. Set up review processes that admit errors and spot issues early. Power to stop or raise prices and slow sales or growth should be recognized and defined by risk tolerance.

4. Encourage flexible thinking.

- a. Consider using multiple models of risks with differing ways of combining results. For example, attention should be given to both a factor approach to RBC and VAR or C3 risks and liquidity tests. Risk models and methods each have their strengths and weaknesses. Reframing your assumptions often shows the duplicity inherent in the model.

- b. Allow and encourage skepticism of the risk measure and diverse thinking. Reward skeptics, especially if their analysis proves right.
 - c. Have a process to incorporate changing environment and economic cycle into your risk assessments.
 - d. Good judgments beyond the scorecard should be encouraged.
- 5. Separate the results from the judgment:** Explicitly recognize the weaknesses of a model and the method being used.
- a. Ask, “Am I taking this risk because I have a real comparative advantage, or simply a modeled comparative advantage?” “Am I taking the risks simply because the model did not adequately judge the risks?”
 - b. Highlight or reward decisions made that are against the simple scorecard or model, but are the right decisions.
- 6. Controlled acceptance of model’s weakness:** Controlled exposure to focus on risks allows one to accept that there are some risks that cannot be modeled or controlled.
- a. There are myriad risks; many like weather are chaotic in nature. Acceptance of this incompleteness and lack of control over critical elements can prevent us from ignoring more controllable risks.
 - b. Interest rate risks are only one component of disintermediation risks. People shift money quickly for real and perceived losses. Credit ratings are only one component of credit spreads. Consider overexposure to nonmodeled, nonquantifiable risks, such as rumors, runs on the banks, fraud, regulatory changes and shifting correlations of risks.
- 7. Set limits on many “good activities”:** Where can you have too much of a good thing?
- a. Allow for flexible limits—sale of certain products, commissions and competitiveness should be allowed to control risks.
 - b. What is too rapid growth? Encourage discussion on new and sophisticated modeled products.
 - c. “Black swan” susceptible products—products using VAR-modeled products and “dynamic hedging”—discourage “tail stuffing.”

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