

INTELLECTUAL HAZARD: HOW CONCEPTUAL BIASES IN COMPLEX ORGANIZATIONS CONTRIBUTED TO THE CRISIS OF 2008

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INTRODUCTION

This Article identifies an important but previously unrecognized systemic risk in financial markets: intellectual hazard. Intellectual hazard, as we define it, is the tendency of behavioral biases to interfere with accurate thought and analysis within complex organizations. Intellectual hazard impairs the acquisition, analysis, communication, and implementation of information within an organization and the communication of such information between an organization and external parties. We argue that intellectual hazard was a cause of the Crisis of 2008 and suggest that this risk may be an important factor in all financial crises. We offer tentative suggestions for reforms that might mitigate intellectual hazard going forward.

NASA's Mars Climate Orbiter, launched from Cape Canaveral with great expectations in December 1998, reached Mars on September 23, 1999. The spacecraft passed behind the planet and out of radio contact at 9:04 UTC¹ and should have re-established contact twenty-one minutes later. It never reappeared.² An investigation revealed that one of the two navigation teams assigned to the mission had been using metric system units and the other had been using the English system. Because of the difference between measurement units, the spacecraft entered orbit at too low an altitude and failed due to atmospheric stress and friction.³

On February 20, 1995, Dr. Rolando R. Sanchez, a surgeon in Tampa, Florida, scrubbed and entered the operating room for a routine leg amputation.⁴ A blackboard in the operating room specified the leg to be amputated, as did the operating room

1. UTC is the universal time astronomers use to avoid the complexities of time zones. See U.S. Naval Observatory, *Systems of Time*, <http://www.usno.navy.mil/USNO/time/master-clock/systems-of-time> (last visited Feb. 17, 2010).

2. MARS CLIMATE ORBITER MISHAP INVESTIGATION BD., PHASE I REPORT 13 (1999).

3. See Robin Lloyd, *Metric mishap caused loss of NASA orbiter*, CNN.COM, Sept. 30, 1999, <http://www.cnn.com/TECH/space/9909/30/mars.metric.02>; Press Release, NASA, Mars Climate Orbiter Failure Board Releases Report (Nov. 10, 1999), available at <http://marsprogram.jpl.nasa.gov/msp98/news/mco991110.html>; Press Release, NASA, Mars Climate Orbiter Team Finds Likely Cause of Loss (Sept. 30, 1999), available at <http://marsprogram.jpl.nasa.gov/msp98/news/mco990930.html>.

4. *Doctor Who Cut Off Wrong Leg Is Defended by Colleagues*, N.Y. TIMES, Sept. 17, 1995, at 28 (reporting that the patient received an award of more than one million dollars); see also LELAND GREGORY, *HEY IDIOT!: CHRONICLES OF HUMAN STUPIDITY* 50–51 (2003).

schedule and the hospital's computer system.⁵ When Dr. Sanchez entered the room the patient had already been prepped for surgery, with one of her legs draped and sterilized. The doctor performed the surgery, only to learn that he had cut off the wrong leg. It turned out that other paperwork available in the operating room, including the patient's consent form and medical history, specified the proper leg. Dr. Sanchez had apparently relied on the more commonly used sources of information about the procedure and never consulted the materials that could have prevented the mistake.⁶

Each of these disasters resulted from a common, dangerous, but little-recognized phenomenon. These events took place within complex organizations—a bureaucratic agency with numerous teams and subcontractors working on the same project, and a hospital with its network of physicians, nurses, equipment, and systems for medical and financial record-keeping and control. The mistakes were elementary—so elementary that if a single person had been carrying out the task, rather than a complex team, they never would have happened. Yet the consequences of those mistakes were devastating. The problem in both cases was the failure of the complex organization to properly acquire, communicate, analyze, and implement information pertinent to risk and crucial to the success of the operation.

The catastrophic events in financial markets during the fall of 2008⁷—events we will refer to hereafter as the “Crisis of 2008”—

5. *Doctor Who Cut Off Wrong Leg Is Defended by Colleagues*, *supra* note 4.

6. *Id.*

7. These events have sparked a burgeoning literature. For leading treatments of the subject, see GEORGE A. AKERLOF & ROBERT J. SHILLER, *ANIMAL SPIRITS: HOW HUMAN PSYCHOLOGY DRIVES THE ECONOMY, AND WHY IT MATTERS FOR GLOBAL CAPITALISM* (2009); WILLIAM D. COHAN, *HOUSE OF CARDS: A TALE OF HUBRIS AND WRETCHED EXCESS ON WALL STREET* (2009); PAUL KRUGMAN, *THE RETURN OF DEPRESSION ECONOMICS AND THE CRISIS OF 2008* (2009); RICHARD A. POSNER, *A FAILURE OF CAPITALISM: THE CRISIS OF '08 AND THE DESCENT INTO DEPRESSION* (2009); *RESTORING FINANCIAL STABILITY: HOW TO REPAIR A FAILED SYSTEM* (VIRAL V. ACHARYA & MATTHEW RICHARDSON EDS., 2009); ROBERT J. SHILLER, *THE SUBPRIME SOLUTION: HOW TODAY'S GLOBAL FINANCIAL CRISIS HAPPENED, AND WHAT TO DO ABOUT IT* (2008); DAVID WESSEL, *IN FED WE TRUST: BEN BERNANKE'S WAR ON THE GREAT PANIC* (2009); THOMAS E. WOODS JR., *MELTDOWN: A FREE-MARKET LOOK AT WHY THE STOCK MARKET COLLAPSED, THE ECONOMY TANKED, AND GOVERNMENT BAILOUTS WILL MAKE THINGS WORSE* (2009). Other relevant materials include HENRY KAUFMAN, *ON MONEY AND MARKETS: A WALL STREET MEMOIR* (2000); CHARLES P. KINDLEBERGER & ROBERT Z. ALIBER, *MANIAS, PANICS, AND CRASHES: A*

were more complicated than these disasters, but there are also significant parallels. Financial markets today are among the most sophisticated, well-funded, well-informed, and technologically advanced institutions in the world. They process trillions of dollars in transactions each year. Many highly trained, hard-working, brilliant people work in the industry. Yet these markets and their regulators suffered an astonishing breakdown in 2008. Few people fully appreciated the implications of the housing market bubble or understood the risk that the burgeoning market in subprime mortgage-backed securities posed for the world's financial system. Those who did understand were unable to make their voices heard. When the storm made landfall, in September 2008, financial markets and their regulators were as woefully unprepared as the City of New Orleans in the face of Hurricane Katrina. What went wrong?

The thesis of this Article is that the Crisis of 2008 was partially caused by a problem with the processing of risk-related information in complex organizations.⁸ In the Crisis of 2008, as in the Mars mission and the leg amputation, actors in complex organizations failed to properly acquire, process, transmit, and implement key information pertinent to risk. We call this problem "intellectual hazard." Intellectual hazard, as we define it, is the tendency of behavioral biases to interfere with accurate thought and analysis within complex organizations, thus interfering with the acquisition, analysis, communication, and implementation of information both within an organization and between an organization and external parties. Our conception of intellectual hazard, to the best of our knowledge, has not been previously identified as a systemic problem in financial markets, although astute commentators have pointed to many specific examples without recognizing that all are part of the same general phenomenon. We suggest that efforts to reform financial markets should address the problem of intellectual hazard in order to mitigate the risk of future disasters.

HISTORY OF FINANCIAL CRISES (5th ed. 2005); ROGER LOWENSTEIN, WHEN GENIUS FAILED: THE RISE AND FALL OF LONG-TERM CAPITAL MANAGEMENT (2000).

8. This Article is thus a contribution to the growing literature on the psychological determinants of the financial crisis. For other work dealing with the general topic, see Claire A. Hill, *Investor Psychology and the Financial Crisis* (unpublished manuscript), available at <http://ssrn.com/abstract=1407138>.

Part I of this Article discusses the concept of intellectual hazard. Drawing on research in psychology, behavioral finance, and behavioral economics, we identify three general types of intellectual hazard: complexity bias, incentive bias, and asymmetry bias. Part II illustrates how intellectual hazard manifested itself in some of the key institutions of financial markets before and during the Crisis of 2008. Part III offers possible reforms that take account of the risk of intellectual hazard.

The analysis in this Article is preliminary. Any comprehensive analysis of the problem of intellectual hazard in financial markets would require a much more extensive treatment than is possible here. We hope that these ideas may contribute to the debate on financial market reform and stimulate greater concentration on the problems of information processing in complex organizations of the financial market.

I. INTELLECTUAL HAZARD

One should understand the concept of intellectual hazard in reference to the better-known problem of moral hazard, a term drawn from historical practices in the insurance industry. Actuaries who set premiums would assign values to known hazards. So, for example, an ocean voyage by a merchant might carry the risk that the ship will go down in a storm, that the cargo will be eaten by rats, that the vessel will be captured by pirates, and so on. The actuary will give each of these risks a value for purposes of calculating the insurance premium. But in addition, actuaries recognized a special kind of hazard—the risk created by the insurance contract *itself*. An insured policyholder loses much of the incentive he would otherwise have to avoid risk. Even worse, if the value of the property falls below that of the policy, the policyholder gets an affirmative incentive to cause the very harm against which he has obtained insurance. People may thus burn down their houses with the intention of collecting the insurance benefit. In the insurance industry, the risk from the insurance policy itself is the “moral hazard.”⁹

9. See PAUL MILGROM & JOHN ROBERTS, *ECONOMICS, ORGANIZATION AND MANAGEMENT* 195 (1992) (defining moral hazard as “any behavior under a contract that is inefficient, arises from . . . differing interests . . . and persists only because one party to the contract cannot tell for sure whether the other is honoring the contract terms”).

The term “moral hazard” later became associated with financial markets. The problem arises when governments provide implicit or explicit insurance against the failure of financial firms. Deposit insurance is the obvious example. When depositors are insured against losses from the failure of their bank, they lose the incentive to monitor their banks to prevent failure. Freed from this form of market discipline, bankers have less incentive to avoid risks, and instead gain an incentive to undertake socially undesirable levels of risk.¹⁰ Deposit insurance is an obvious example of moral hazard, but it is not unique. As the events of 2008 illustrate, governments are often unwilling to allow any financial firm to fail, whether or not it has insured deposits, if that firm is either so large or so interconnected to others that its failure would jeopardize the stability of financial markets as a whole. Moral hazard is a well-known phenomenon, and a great deal of work has gone into identifying its incidence and designing strategies to reduce its effects.¹¹

Intellectual hazard is similar to moral hazard in the following respects. Moral hazard is a problem that results from a structural feature of markets that is in other respects highly beneficial: the shifting of risk to more efficient risk-bearers. Similarly, intellectual hazard results from the otherwise beneficial division of responsibility among specialized instrumentalities. Like moral hazard, intellectual hazard is pervasive. Just as moral hazard exists whenever risk is shifted away from an actor whose actions may cause harm, intellectual hazard exists whenever production becomes segmented into complex organizational forms. And like moral hazard, intellectual hazard can present systemic risks: Because it affects organizations that are large, interconnected, or linked to many other similarly situated organizations, intellectual hazard can pose a threat to the stability of an entire system of markets or institutions.¹² In particular,

10. See Mark E. Van Der Weide & Satish M. Kini, *Subordinated Debt: A Capital Markets Approach to Bank Regulation*, 41 B.C. L. REV. 195, 207–08 (2000).

11. See, e.g., Lawrence A. Cunningham, *Too Big to Fail: Moral Hazard in Auditing and the Need to Restructure the Industry Before It Unravels*, 106 COLUM. L. REV. 1698, 1698–700 (2006); Christine Hurt, *Moral Hazard and the Initial Public Offering*, 26 CARDOZO L. REV. 711, 714 (2005); Jonathan P. Thomas & Tim Worrall, *Unemployment Insurance under Moral Hazard and Limited Commitment: Public versus Private Provision*, 9 J. PUB. ECON. THEORY 151, 151 (2007).

12. For a description of systemic risk, see Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193 (2008).

intellectual hazard poses a threat to the smooth, orderly, and efficient functioning of the world's financial markets.

Scholars and astute market participants have already identified aspects of intellectual hazard in financial markets.¹³ Useful examples fall into three broad categories: complexity biases, incentive biases, and asymmetry biases. These categories, although generally descriptive, are not necessarily exclusive: Some of the biases we identify as falling within one of the categories may also reflect elements of other categories as well, and sometimes a given bias will be the result of the simultaneous operation of two or more of these categories. The tripartite grouping, however, is a helpful way to organize the different manifestations of intellectual hazard, even if the category system is not always clear-cut.

A. Complexity Bias

The first type of intellectual hazard arises from an actor's tendency to analyze a situation wrongly because the actor has a limited ability to interpret complex sets of information within the time period needed for decision. An example is tunnel vision. An actor tasked with carrying out a particular function within a complex organization tends to see only the information apparently necessary to carry out that task. All other information is excluded, even if it is available. Like a horse with blinders, the actor is shielded from other information in order to allow that actor to focus on the specific task at hand. The term "tunnel vision" is derogatory, but the focus it implies is often beneficial because it enhances the efficiency of operations. But sometimes the limitation on the field of vision can be dangerous. A horse with blinders may not be able to see a train oncoming from the side.

Another complexity bias is confirmation bias.¹⁴ When the world presents a welter of information to an actor, he needs to

13. The field of behavioral finance is largely concerned with identifying biases of the sort we have classed under the general heading of intellectual hazard. For a good introduction, see *ADVANCES IN BEHAVIORAL FINANCE* (Richard H. Thaler ed., 1993); *BEHAVIORAL LAW & ECONOMICS* (Cass R. Sunstein ed., 2000); KAUFMAN, *supra* note 7; MICHAEL M. POMPIAN, *BEHAVIORAL FINANCE AND WEALTH MANAGEMENT: HOW TO BUILD OPTIMAL PORTFOLIOS THAT ACCOUNT FOR INVESTOR BIASES* (2006); RICHARD H. THALER & CASS R. SUNSTEIN, *NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS* (2008); RICHARD H. THALER, *QUASI RATIONAL ECONOMICS* (1991).

14. See POMPIAN, *supra* note 13, at 187 (describing confirmation bias as "a type of selective perception that emphasizes ideas that confirm our beliefs while devaluing whatever contradicts our beliefs").

make sense of it within the context of his assigned role. The actor, examining the information available, will tend to see a confirmation of his previous expectations, even if the evidence is more consistent with a different state of affairs.¹⁵

Representativeness bias is another response to the problem of complexity that occurs when a person wrongly assumes that a sample is a reliable measure of an unobserved variable.¹⁶ An actor in a complex organization may have only a limited exposure to a particular problem or issue. He may assume from past experience that the sample is an accurate estimate of the phenomenon in the future, when in fact it may be too small to support reliable population inferences, or may have come from the population in a non-random way.¹⁷

Oversimplification bias is a different response to the problem of complexity. People in complex situations do not have the time, energy, or capacity to analyze all of the available information. They need to use simplified rules of thumb to enable them to operate. Given bounded rationality, rules of thumb or heuristics are valuable resources for allowing actors with limited capacities to function efficiently in complex organizations. Because rules of thumb *are* simplified, however, they introduce error.¹⁸ And because rules of thumb tend, for obvious reasons, to be developed as means for coping with normal and expected situations, they are likely to operate poorly when an actor confronts abnormal or unexpected conditions.

Still another example of complexity bias is authoritarian bias, the tendency to overvalue information from authoritative

15. Confirmation bias is similar to “conservatism bias,” which refers in behavioral finance to the tendency of investors to under-react to new information, maintaining impressions from a previous estimate rather than acting on updated information. *See id.* at 119, 187.

16. *See id.* at 62. A related phenomenon, “recency bias,” refers to the tendency to recall and emphasize recent events more prominently than events that occurred long ago. *See id.* at 216.

17. For some evidence on representativeness bias, see Geoffrey P. Friesen et al., *Price trends and patterns in technical analysis: A theoretical and empirical examination*, 33 J. BANKING & FIN. 1089, 1099 (2009) (concluding that investors’ interpretation of signals with relatively low information content tends to be biased by the recently observed large signals).

18. *See POMPIAN, supra* note 13, at 94 (explaining a similar bias known in behavioral finance as the “availability bias”).

sources.¹⁹ Hierarchies of authority, formal or informal, inevitably define the scope of an actor's autonomy in complex organizations. In some cases the authority will be within the organization—the actor reports to a supervisor who has the power to instruct him on how to carry out his responsibilities. In other cases the authority will be someone from outside the organization whose opinion is used as a basis for decision (rating agencies, attorneys, auditors, and so on). In still other cases the authority will have no formal role in the actor's activities, but will nevertheless exercise influence because of the authority's prestige or position of power in some other organization. In any of these situations, the actor may tend to defer excessively to the authority without exercising independent thought or judgment as to whether the information received is actually reliable.

B. Incentive Bias

A different category of bias has to do with the self-interest of the actor. In many cases actors have a personal interest in the facts being one way rather than another. They thus want to see the world in accordance with their self-interest.

An example of incentive bias is herding behavior.²⁰ An actor in a complex organization observes other actors similarly situated interpreting the world in a particular way. The actor has a choice between following the crowd or dissenting and offering a different view of the situation. Often the actor might determine that the better course of conduct is to conform to the consensus opinion. If he does so he is unlikely to receive criticism, even if the conventional view turns out to be wrong, because nearly everyone else was making the same mistake. On the other hand, if he dissents, he calls potentially unfavorable attention to himself. Even if he turns out to be right, he may suffer adverse consequences in the short term, and the long-term

19. See ROBERT J. SHILLER, *IRRATIONAL EXUBERANCE* 158–59 (2d ed., Doubleday 2005).

20. See *id.* at 157–58; see also Deryn Darcy, *Credit Rating Agencies and the Credit Crisis: How the "Issuer Pays" Conflict Contributed and What Regulators Might Do About It*, 2009 COLUM. BUS. L. REV. 605, 637; Sanford M. Jacoby, *Finance and Labor: Perspectives on Risk, Inequality, and Democracy*, 30 COMP. LAB. L. & POL'Y J. 17, 21 (2008); Timothy E. Lynch, *Deeply and Persistently Conflicted: Credit Rating Agencies in the Current Regulatory Environment*, 59 CASE W. RES. L. REV. 227, 284 (2009). See generally CHARLES MACKAY, *EXTRAORDINARY POPULAR DELUSIONS AND THE MADNESS OF CROWDS* (Harriman House 2003) (1841).

rewards he can anticipate from being right may well be outweighed by the sanctions he can anticipate from being wrong.²¹

Another example of incentive bias is cognitive dissonance.²² An actor working in a complex organization may have an incentive to see things in a particular way. But the information available to the actor suggests a different interpretation, inconsistent with the actor's self-interest. This inconsistency creates cognitive dissonance in that the actor finds it uncomfortable to see things in a way that potentially threatens his interests. A solution to the problem is to see things in the more convenient, comfortable way and to put out of mind concerns about possible competing interpretations. Complacency effects could also be examples of cognitive dissonance. Actors in complex organizations, especially senior actors, want to believe that someone is minding the store, that risks are properly accounted for, and that proper checks and balances are in place to prevent things from getting out of hand. Wanting to believe these things, the actors are likely to consider the organization to be well organized to manage risk even when it is not.²³

Loss aversion is also a form of incentive bias.²⁴ Loss aversion occurs when an actor wishes to avoid the recognition of a loss for which the actor may have some responsibility. The actor wishes to cover up the loss, or to put off the evil day in which the loss is recognized, in hopes that some stroke of good fortune prevents that day from ever happening. Loss aversion bias can be a key factor in situations involving rogue traders,

21. Herding can also reflect self-serving bias to the extent it induces a sense of superiority in the collective judgment of the group. See Marleen A. O'Connor, *The Enron Board: The Perils of Groupthink*, 71 U. CIN. L. REV. 1233, 1238–39 (2003) (herding behavior can “unconsciously generate shared illusions of superiority that hinder critical reflection and reality testing”).

22. See POMPIAN, *supra* note 13, at 83; Geoffrey Friesen & Paul A. Weller, *Quantifying cognitive biases in analyst earnings forecasts*, 9 J. FIN. MARKETS 333, 333–35 (2006); William N. Goetzmann & Nadav Peles, *Cognitive Dissonance and Mutual Fund Investors*, 20 J. FIN. RES. 145, 145–46 (1997).

23. Complacency bias, in this sense, has certain features in common with overconfidence bias, a term in behavioral finance referring to the propensity of investors to underestimate the downside risks of their portfolios and to feel too certain of the correctness of their judgments. See POMPIAN, *supra* note 13, at 51–52. On overconfidence bias generally, see Donald C. Langevoort, *Organized Illusions: A Behavioral Theory of Why Corporations Misperceive Stock Market Investors (and Cause Other Social Harms)*, in BEHAVIORAL LAW & ECONOMICS, *supra* note 13, at 144, 149.

24. See POMPIAN, *supra* note 13, at 208 (referring to the tendency of investors to feel a stronger impulse to avoid losses than to acquire gains).

where an actor who has incurred a loss because of unauthorized activity engages in ever-riskier gambles in hopes of never being called to account for his or her misconduct.

Incentive bias is also manifested in self-serving behavior.²⁵ In this case, the actor knows or has good reason to know that the facts are a certain way, but deliberately ignores the facts, suppresses information, or distorts analysis out of a conscious intention to promote the actor's own interests.

C. Asymmetry Bias

Asymmetry bias arises when actors in a complex organization bring pre-formed and fixed ideas, judgments, or attitudes to bear in the analysis of information. The biases that concern us influence market participants to act in ways that give inappropriate or unequal weight to information and analysis supporting certain conclusions.

A common form of asymmetry bias is status quo bias, first identified in work by Professors Samuelson and Zeckhauser.²⁶ Actors have a tendency to overvalue the status quo even if evidence and analysis suggests another course of action more strongly. Other biases that relate closely to status quo are the endowment effect and loss aversion bias. The endowment effect is reflected in an individual's asymmetric unwillingness to sell an asset to purchase an asset of like (or even somewhat greater) value.²⁷ Loss aversion bias (which we also noted as a self-serving bias) is manifested in an actor's greater unwillingness to take actions that would result in a loss compared to actions that would result in a comparable (or greater) gain.²⁸ Taken together, these biases impair the ability of organizations to appropriately process

25. On self-serving bias in financial markets, see Hugh P. Gunz & Sally P. Gunz, *Client Capture and the Professional Service Firm*, 45 AM. BUS. L.J. 685, 697 (2008); Edward Teach, *Avoiding Decision Traps*, CFO MAG., June 2004, at 97; Thomas S. Ulen, *Human Fallibility and the Forms of Law: The Case of Traffic Safety*, in THE LAW AND ECONOMICS OF IRRATIONAL BEHAVIOR 397, 409 (Francesco Parisi & Vernon L. Smith eds., 2005).

26. William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7, 8 (1988).

27. See Brett Inder & Terry O'Brien, *The Endowment Effect and the Role of Uncertainty*, 55 BULL. ECON. RES. 289, 289-90 (2003); Charles R. Plott & Kathryn Zeiler, *The Willingness to Pay-Willingness to Accept Gap, the "Endowment Effect," Subject Misconceptions and Experimental Procedures for Eliciting Valuations*, 95 AM. ECON. REV. 530, 532 (2005).

28. See Daniel Kahneman et al., *Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias*, 5 J. ECON. PERSP. 193, 194, 197-99 (1991).

and act on information and analysis. These biases are particularly harmful in times of market stress, when undue attraction to the status quo, the endowment effect, and the loss aversion bias inhibit the organization from taking actions that are in its economic best interest. Thus, these biases tend to be pro-cyclical.

Other asymmetry biases contribute to intellectual hazard. The ostrich effect is the tendency for market actors to ignore news, data, or analysis that imply negative outcomes.²⁹ It is a specific instance of positive outcome bias or optimism bias. These biases result in the systemic overvaluation of data and analysis that fall in the “right-hand” tail of outcomes and result in suboptimal actions. Another form of asymmetry bias is regret aversion, the tendency to avoid making decisions that turn out badly.³⁰

D. Intellectual Hazards in Financial Markets

These various biases take different forms and manifest themselves in different ways, but all of them have the common feature that they reflect the failure of actors in complex organizations to engage in independent, unbiased analysis of information in carrying out their responsibilities. Intellectual hazard, in this sense, is present in all complex organizations at all times. Ordinarily, however, the negative aspects of intellectual hazard are managed at reasonable cost through systems such as cross-checking within organizations, independent auditing by third parties, and scrutiny by government regulators.

Intellectual hazard, however, becomes problematic in two situations. One of these is the “bet the ranch” scenario where a single decision can have profound consequences. In such a case it is no solace that complex organizations get it right most of the time; it is not acceptable that they get it wrong even once. Dr. Sanchez’s patient probably felt that way upon waking up in recovery with the wrong leg missing. It would not have been particularly comforting to know that most doctors cut off the proper leg most of the time.

The second situation where intellectual hazard is problematic—and the one most pertinent for purposes of this Article—is

29. See Niklas Karlsson et al., *The ostrich effect: Selective attention to information*, 38 J. RISK & UNCERTAINTY 95, 96 (2009).

30. See POMPIAN, *supra* note 13, at 227 (“People exhibiting *regret aversion* avoid taking decisive actions because they fear that, in hindsight, whatever course they select will prove less than optimal.”).

when the ordinary safeguards of checks and balances break down because of unusual conditions affecting the entire organization or system. In financial markets, this danger manifests itself particularly strongly in the case of asset bubbles. When asset prices experience an unusual and prolonged rise—say, four or five years of uninterrupted unusual growth—the usual checks and balances against intellectual hazard can be severely eroded.

In normal circumstances, financial markets are populated by a mix of optimists and pessimists—bulls and bears. If the market does better than expected in a single year, optimists will tend to receive rewards for having predicted outcomes correctly. They will receive bigger bonuses, be preferred for promotion, and so on. But because everyone knows that markets go up and down, the effect will not be pronounced. If, however, asset prices continue to surge for a number of years, the selection effects will become significant. Positive thinkers will come to dominate trading desks and management positions, bullish analysts will attract larger followings among investors, optimistic journalists will see their stories given greater prominence and read by more people, sunny thinkers will gain prominence in government. And because optimists value optimism, they will promote other optimists to positions of power and influence. The power of positive thinking will give further force to the market expansion. All this optimism triggers intellectual hazard—optimism bias (obviously) and also phenomena such as herding, self-serving bias, policy bias, confirmation bias, tunnel vision, and authority bias.³¹

Problems with intellectual hazard also manifest themselves at the point where the economic boom turns into a bust. At this point, complex organizations are likely to be poorly equipped to deal with the sudden changes. Actors who have grown accustomed to seeing things in a particular way cannot quickly readjust to the influx of new information. Meanwhile, they will probably need to engage in crisis management that allows little time for thought or reevaluation of fundamental assumptions. Being unprepared for the sudden change, they may handle decisions

31. See SHILLER, *supra* note 19; Oren Bar-Gill, *The Law, Economics and Psychology of Subprime Mortgage Contracts*, 94 CORNELL L. REV. 1073, 1077–79, 1120–21 (2009); Christine A. Klein, *The Environmental Deficit: Applying Lessons from the Economic Recession*, 51 ARIZ. L. REV. 651, 676 (2009); Lauren E. Willis, *Will the Mortgage Market Correct? How Households and Communities Would Fare If Risk Were Priced Well*, 41 CONN. L. REV. 1177, 1237–39 (2009).

poorly or panic in the face of information overload.³² The panic, moreover, can further exacerbate the problem by eliminating the healthy diversity of viewpoints that tends to keep intellectual hazard in check during normal times. The very definition of a panic is that everyone, or nearly everyone, comes to evaluate market conditions in the same way and therefore rushes to reduce their exposure to risk, creating a vicious cycle in which losses of liquidity trigger even more panic and greater turmoil.³³

Because intellectual hazard is a special problem during periods of unusual asset price increases, it is not just a general phenomenon of complex organizations. It is also a form of systemic risk. It is pro-cyclical—magnifying and extending the duration of asset price increases on the way up, and enhancing and extending asset price collapses on the way down.³⁴ Intellectual hazard is therefore more than a pervasive but low-grade problem for financial markets. It can metastasize into a serious threat to the stability of the system as a whole in unusual times.

II. INTELLECTUAL HAZARD AND THE CRISIS OF 2008

It is impossible to provide a full description of all the ways intellectual hazard contributed to the market turmoil of 2008. This Article will attempt to provide some examples, however, with a view to encouraging further investigation.

32. Bear Stearns's quarterly filing with the SEC in the quarter following its failure in March 2008 nicely illustrates this point. The company stated:

Human error in times of extreme difficulty and turmoil, such as the Company recently experienced and continues to experience, can occur. Moreover, control and process breakdowns may be more frequent when a company is operating under duress and its employees become distracted by crisis management and the uncertainty surrounding the viability of the enterprise. These events and potential impacts may have had and may have an adverse impact on the efficacy of our disclosure controls and procedures and our internal controls over financial reporting.

Bear Stearns Co., Quarterly Report (Form 10-Q), at 80 (Feb. 29, 2008).

33. For a formal model, see Rodrigo Cifuentes et al., *Liquidity risk and contagion* (Bank of England, Working Paper No. 264, 2005), available at <http://www.bankofengland.co.uk/publications/workingpapers/wp264.pdf>.

34. See Ben S. Bernanke, Chairman, Bd. of Governors of the Fed. Reserve Sys., Speech at the Council on Foreign Relations: Financial Reform to Address Systemic Risk (Mar. 10, 2009), available at <http://www.federalreserve.gov/newsevents/speech/bernanke20090310a.htm>; Dwight Cass, *Bernanke gives hope for a real plan*, BREAKINGVIEWS.COM, Mar. 10, 2009, http://money.cnn.com/2009/03/10/news/economy/breaking_views.breakingviews/index.htm.

A. Banks

An important source of intellectual hazard in the crisis was the over-reliance of investment banks on mathematical or computer models.³⁵ The models themselves are potentially useful tools. But like all tools, they can be misused. In the case of the financial system, traders and others employed the models uncritically, while having little if any clue about their inherent limitations. The models assumed a life of their own, and ordinary judgment and common sense were forgotten.³⁶

Three main problems impair the accuracy of financial models. First, they are inevitably based on historical assumptions about the behavior of markets and prices. Although historical data points can be useful in ordinary times, they are not necessarily reliable predictors during a crisis. The models must extrapolate from the ordinary to the extraordinary by using assumptions that may not be accurate, as the founders of Long Term Capital Management discovered to their dismay when that firm failed in 1998, largely because of trading strategies based on models that broke down in unstable markets.³⁷ In the case of subprime mortgage securities, Wall Street's models tended to predict accurately the effects of a significant downturn in housing prices, but few took these predictions seriously because most considered a housing collapse to be unlikely.³⁸

A second problem with models is that they deal with complex dynamic systems in which outcomes may be path-dependent and sensitive to differences in initial conditions.³⁹

35. For a review of the costs and benefits of economic models in addressing real-world economic problems, see, for example, DAVID C. COLANDER, *ECONOMICS* (5th ed. 2004).

36. For criticism of excessive reliance on models, see, for example, Steve Lohr, *Wall Street's Extreme Sport: Modeling Risk, Financial Engineers Didn't Account for Human Factor*, N.Y. TIMES, Nov. 5, 2008, at B1.

37. See LOWENSTEIN, *supra* note 7, at 233–34.

38. See Kristopher S. Gerardi et al., *Making Sense of the Subprime Crisis*, in BROOKINGS PAPERS ON ECONOMIC ACTIVITY: FALL 2008, at 69, 69 (Douglas W. Elmendorf et al. eds., 2009) (finding that “analysts generally understood that falling prices would have disastrous consequences but assigned that outcome a low probability”).

39. For insight into how such systems are studied mathematically in the discipline of chaos theory, see JAMES GLEICK, *CHAOS: MAKING A NEW SCIENCE* (1987). For an application to behavioral finance, see DIMITRIS N. CHORAFAS, *CHAOS THEORY IN THE FINANCIAL MARKETS* (1994). Implications for legal regulation of financial markets are studied in Steven L. Schwarcz, *Regulating Complexity in Financial Markets*, 87 WASH. U. L. REV. 211 (2009).

Such systems—the weather being a classic example—turn out to be difficult to model in a way that yields reliable forecasts over the medium to long term.

A third problem with economic models is that they deal with the behavior of actors who are likely to behave strategically in response to changes in incentives and risk. This factor makes the task of prediction even more daunting by introducing game-theoretical behavior into the mix.⁴⁰

Sometimes the developers of these models understood their inherent limitations.⁴¹ But sometimes the temptation to replace reality with the models was irresistible. Professors of finance, in particular, may have been beguiled by the beauty of the mathematics and the purity of the intellectual constructs into believing that the models were true and accurate representations of the real world.⁴² Their confidence in model-building was supported by self-serving bias (that was what they did, so they wanted to promote it), authoritarian bias (most of the leading finance economists in the world shared similar views), complacency bias (because many in the profession believed the essential problems had been solved, at least in terms of the proper methodology, and they did not probe deeply into the possible shortcomings of the technique), and recency bias (the benign behavior of financial markets during the first part of the 2000s suggested that the assumptions of market efficiency and rational behavior were correct).

40. See Uday Rajan et al., *The Failure of Models that Predict Failure: Distance, Incentives and Defaults* (Stephen M. Ross Sch. of Bus. at the Univ. of Mich., Research Paper No. 1122; Chi. Graduate Sch. of Bus., Research Paper No. 08-19), available at <http://ssrn.com/abstract=1296982> (concluding that lenders are likely to collect less soft information about borrowers as securitization becomes common, resulting in worse loans being issued to borrowers with similar hard information characteristics, and concluding that regulations that rely on conventional default models may be undermined by strategic actions of market participants).

41. For an entertaining inside account by one of these modelers, a physicist who became a managing director at Goldman Sachs, see EMANUEL DERMAN, *MY LIFE AS A QUANT: REFLECTIONS ON PHYSICS AND FINANCE* (2004).

42. Paul Krugman recently stressed this point. See Paul Krugman, *How Did Economists Get It So Wrong?*, N.Y. TIMES, Sept. 6, 2009 (Magazine), at 36, 37 (“As I see it, the economics profession went astray because economists, as a group, mistook beauty, clad in impressive-looking mathematics, for truth . . . [T]he central cause of the profession’s failure was the desire for an all-encompassing, intellectually elegant approach that also gave economists a chance to show off their mathematical prowess. Unfortunately, this romanticized and sanitized vision of the economy led most economists to ignore all the things that can go wrong.”).

Even when the academics who developed economic models and their counterparts at investment banks understood the potential shortcomings of their models, actors charged with implementing the models tended to ignore the implications. Investment banks made heavy use of financial models for a number of purposes, including valuing securities, formulating trading strategies, measuring aggregate risk to the institution, and asserting compliance with accounting and capital rules.⁴³ When actors at investment banks used the models, they hardly ever took account of the assumptions and inherent limitations. They had neither the time nor the expertise to do so, even if they were interested. Subtleties were forgotten in the hurly-burly of operations.

The process of translation from model-builders to operators resulted in several forms of intellectual hazard. The operators, not understanding the models, manifested oversimplification bias, using the models as rules of thumb or heuristics to aid them in carrying out their day-to-day tasks in a way that was not sensitive to possible limitations on their validity. These traders manifested tunnel vision, seeing only the model and not the limitations on its use. Authoritarian bias also played a role, as the models were often created by PhDs in math or finance, people of frightening intelligence whose technical expertise was beyond question. The models also generated output with an impressive level of precision, discouraging people who used them from questioning their basic assumptions.

A related phenomenon at investment banks has to do with the irony that the Crisis of 2008 erupted in the very institutions for which the quantification and management of risk had become a central aspect of business strategy.⁴⁴ Risk-management strategies—often employing the type of sophisticated financial models just described—created the impression, both in banks and among their regulators, that the problem of risk had been controlled through technological means and therefore that judgment could be subsumed to the careful implementation of strategies spat out by the computers. Meanwhile, because risk

43. See generally John C. Coffee, Jr. & Hillary A. Sale, *Redesigning the SEC: Does the Treasury Have a Better Idea?*, 95 VA. L. REV. 707 (2009); Erik F. Gerding, *Code, Crash, and Open Source: The Outsourcing of Financial Regulation to Risk Models and the Global Financial Crisis*, 84 WASH. L. REV. 127 (2009).

44. For an insightful commentary, see Hyun Song Shin, *Risk and Liquidity* (unpublished manuscript), available at <http://hyunsongshin.org/www/riskliquid0.pdf>.

was controlled, bank managers came to see excess capital reserves as an idle asset that needed to be put to work,⁴⁵ thus increasing rather than reducing risk. The intellectual hazard here takes several of the forms we have identified above: authoritarian bias (undue deference to the models), complacency bias (loss of critical judgment based on the assumption that risk-management systems are handling the problem), asymmetry bias (uncritical carrying out of policies adopted by the organization without a thorough analysis of their potential defects), and confirmation bias (seeing the results of operations and changes in markets through the lens of the risk-management protocols).

In addition to problems of using models, intellectual hazard manifested itself in another way. Banks and other financial institutions are subject to dynamic pressures that make it difficult for the senior managers of these institutions to adopt policies reflecting independent thought. The problem was especially pronounced during the boom times of the 2000s when banks earned big profits through strategies that in retrospect look foolhardy. In such an environment, bank managers faced hydraulic pressures to follow the crowd. If they did not do so they were likely to be penalized for achieving less-than-stellar results in the short term—a phenomenon former Citicorp CEO Chuck Prince famously described in 2007 when commenting that despite the risks of a collapse in credit markets, he did not intend to back off from subprime and other risky but profitable activities: “When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you got to get up and dance.”⁴⁶ The suggestion was that Prince not only foresaw the problems that sparked full-blown panic in 2008, but also recognized that he had no choice but to stay in the game.

A similar story occurred in the case of the Reserve Primary Fund, one of the oldest and best-established money market mutual funds. This fund was the brainchild of Bruce Bent, one of the giants of the mutual fund industry. Bent had long been

45. *See id.* at 8 (“In the eyes of the bank’s top management, a bank with surplus capital is like a manufacturing plant with idle capacity. Just as good managers of the manufacturing plant will utilise surplus capacity to expand their business, so the bank’s top management will expand its business.”).

46. John Cassidy, *Rational Irrationality: The Real Reason that Capitalism is so Crash-Prone*, NEW YORKER, Oct. 5, 2009, at 30, 32 (quoting Henry Kaufman, *Watch your step in the liquidity polka*, FIN. TIMES (London), July 31, 2007, at 11).

an apostle of caution in the industry, sharply criticizing competitors who invested in higher-yielding but higher-risk paper. But when his own fund began to lose investors to funds offering higher return, Bent capitulated to market forces and began to purchase subprime-related securities, including \$785 million in securities issued by Lehman Brothers. The consequence was that the Reserve Primary Fund was forced to mark its Lehman Brothers investments to zero after the latter's bankruptcy in September 2008, causing the Reserve Primary Fund to "break the buck" (that is, to report a net asset value of less than \$1 per share). This markdown in turn caused a massive run by institutional investors and a destabilization of the entire money market mutual fund industry.⁴⁷

These competitive pressures reflect intellectual hazard. Firms facing pressure from investors or shareholders to generate profits have an incentive to rationalize the decisions they make in seeking to meet these expectations. They manifest herding bias (following the practices used by others in the industry), self-serving bias (promoting interpretations of information that justify this behavior), cognitive dissonance bias (rationalizing and justifying their actions), and authoritarian bias (following the lead of others who have prestige or influence in the industry).

B. *The Fed*

The Fed manifested intellectual hazard in several different ways. It displayed asymmetry bias in the form of a fixed policy about asset bubbles. The view, championed by now-Chairman Bernanke, was that a central bank should not try to pop an asset bubble.⁴⁸ Weighty arguments of policy supported this view, including that it is difficult to distinguish an asset bubble from ordinary market fluctuations or changes in prices due to market fundamentals. In addition, the central bank's policy tools are so broad-ranging that they are likely to affect all economic markets, not just the market in which the asset bubble is occurring.⁴⁹ The Fed also had historical reasons not to attempt to pop an asset bubble. The few times central banks had intervened

47. For a description of these events, see Eamonn K. Moran, *Wall Street Meets Main Street: Understanding the Financial Crisis*, 13 N.C. BANKING INST. 5, 74 (2009).

48. See WESSEL, *supra* note 7, at 60.

49. See Geoffrey P. Miller, *The Role of a Central Bank in a Bubble Economy*, 18 CARDOZO L. REV. 1053, 1055 (1996).

against bubbles (during the stock market boom of the 1920s and in the Japanese “bubble economy” of the 1980s), the results had not been satisfactory. In contrast, the Fed’s decision *not* to pop the tech bubble of the late 1990s had apparently worked out well, with the economy lapsing only into a shallow recession followed by robust recovery.

The Fed’s unwillingness to pop asset bubbles became a policy at that institution, one that arguably impaired the ability of the Fed to appreciate fully the consequences of the run-up in housing prices in the United States and many other countries during the 2000s. Because popping the bubble was not in the cards, the Fed did not need to pay that much attention to housing price increases. Leading Fed officials raised doubts about whether a housing bubble was even underway, notwithstanding plentiful evidence that price increases were above historical trend lines.⁵⁰ Not having to worry about asset prices, moreover, suggested that the Fed did not need to worry much about the massive amounts of credit it was pouring into the economy with its low-interest rate policies of the mid-2000s. This oversight arguably exacerbated the collapse of the subprime market and the ensuing financial crisis.⁵¹

Another fixed attitude at the Fed was the belief that the self-interest of lending institutions was an adequate check against excessive risk-taking. Assuming that markets would check themselves, the Fed did little to prevent the excesses of credit that poured into subprime real estate mortgages during the 2000s. Chairman Greenspan later issued an uncharacteristic *mea culpa* on this score: “I made a mistake in presuming that the self-interest of organizations, specifically banks and others, were such that they were best capable of protecting their own shareholders and their equity in the firms.”⁵² The Fed’s commitment to free-market ordering arguably interfered with its ability to understand that markets do not always function perfectly, and in particular may have blinded the central bank to the

50. See Krugman, *supra* note 42, at 36 (noting that at the Fed there was “a general belief that bubbles just don’t happen. What’s striking, when you reread Greenspan’s assurances, is that they weren’t based on evidence—they were based on the a priori assertion that there simply can’t be a bubble in housing.”).

51. There is consensus today that in the mid-2000s the Fed kept interest rates at too low a level for too long. See WESSEL, *supra* note 7, at 61.

52. *Id.* at 65–66.

possibility that agency costs and misalignments of incentives in financial firms would trump the ability of markets to align the behaviors of managers with the self-interest of shareholders.

Still another problematic doctrine at the Fed during the 2000s was the notion of the “great moderation.” Ben Bernanke gave voice to this idea in a speech to the Eastern Economic Association in 2004: “One of the most striking features of the economic landscape over the past twenty years or so has been a substantial decline in macroeconomic volatility.”⁵³ Bernanke painted a rosy picture of an economy basking in the benefits of low inflation, stable employment, and stable output. Although not ruling out the possibility that the observed effects might be the result of luck, Bernanke speculated that a principal cause was good monetary policy by his own institution.⁵⁴ The idea of a great moderation was an important part of the Fed’s self-concept during the 2000s. The idea had a seductive appeal—things were better, and not just better for a while, but better for the long run. The Fed and other central banks had figured out how to conduct monetary policy so as to promote healthy economic growth, low inflation, and stable markets. The bugaboos that had haunted developed economies in years past—and in particular the instability that led to market breaks such as the Great Depression of the 1930s—were no longer serious threats. Given this ideology, it is not surprising that the Fed manifested little concern about the housing market bubble, did nothing to limit the spectacular growth of subprime mortgage-backed securities, and continued to pump credit into financial markets long after the ostensible reason for doing so (softening the effects of the tech crash of 2000) had faded away.

The Fed’s notion of a great moderation manifests elements of intellectual hazard. It reflects self-serving bias, because it allowed the Fed to take credit for the benign economic conditions of the early to mid-2000s. It manifests authoritarian bias, because the idea was promoted by a Fed governor and a man who enjoyed influence with Chairman Greenspan. Given Bernanke’s endorsement of the idea, it is unlikely that anyone in

53. Ben S. Bernanke, Governor, Bd. of Governors of the Fed. Reserve Sys., Remarks at the meetings of the Eastern Economic Association: The Great Moderation (Feb. 20, 2004), available at <http://www.federalreserve.gov/BOARDDOCS/SPEECHES/2004/20040220/>.

54. *Id.*

the Fed's research department would have taken issue with the concept. Asymmetry bias is also present in this concept: The idea of a great moderation became a fixed star in the Fed's firmament, one that precommitted the agency to viewing the evidence at hand in a particular way (increases in housing prices were not a matter of real concern because the economy was in a period of great moderation in which volatility in prices and output was a thing of the past).

Another belief that enjoyed currency among central bankers is the notion that the fundamental job of a central bank is only to maintain stable prices. The idea that price stability should be the overriding objective at central banks was backed by the widespread belief that inflation offers no long-run economic benefits but imposes significant costs. Because inflationary policies cannot affect the employment rate over the long run, the primary objective of the central bank should be price stability. These ideas fit nicely into the case for central bank independence. Because independent central banks are less responsive to political influence than dependent central banks, they are more likely to deliver stable prices.⁵⁵ Central bankers naturally appreciated the idea that they should be independent of politicians. The result was the view that a central bank was doing its job well as long as it delivered price stability. We may conjecture that the focus on price stability as the overriding desideratum of good central banking could have caused a form of tunnel vision at the Fed and other major central banks. Because inflation was moderate during the 2000s, central banks did not worry much about the destabilizing effects of asset bubbles or about the risk that the financial system could fall prey to a liquidity crisis rather than to inflation.

C. *Rating Agencies*

Rating agencies also appear to have been vulnerable to intellectual hazard in a number of ways. These agencies use models to evaluate the default risk posed by the companies they evaluate. They faced the same risk of overreliance on models as was present in the case of banks and regulators, but in their case the risk may have been greater because of the limited nature of

55. A classic exposition is ALEX CUKIERMAN, *CENTRAL BANK STRATEGY, CREDIBILITY, AND INDEPENDENCE: THEORY AND EVIDENCE* (1992).

their enterprise. Their sole function is to identify the risk that a company will fail to pay off its debts when due. Models are arguably more important to this narrow question than to others that face financial institutions.

Ratings agencies also experienced complexity bias: They needed to sort through large amounts of information about the firms they were rating, and to do so they used simplifying heuristics that allowed them to derive the ratings quickly and at reasonable cost. They fell prey to recency bias to the extent that they took as fixed the behavior of home prices that, during the post-World War II period, had never declined year-to-year on a nationwide basis. With this input into their models, they greatly underestimated the risk profiles of subprime mortgage-backed securities.⁵⁶ Perhaps most significantly, ratings agencies were subject to self-interest bias. Because they were rating the securities of companies that were paying them to perform the service, they had an incentive to understate, at least to some extent, the risks of the securities they were evaluating.

Meanwhile, the ratings created intellectual hazard of their own. Other actors in the financial sector relied on these ratings in performing their job. The reliance—or perhaps overreliance⁵⁷—on credit ratings generated its own intellectual hazard: tunnel vision (looking only to the ratings without inquiring into the credibility of the agency's judgments), oversimplification bias (using the ratings as a proxy or shorthand for a more complex inquiry into risk), incentive bias (for many in the industry, reliance on the ratings served their self-interest in earning fees or other profits from deals), and asymmetry bias (the complex organization may have had a policy of relying on rating agency ratings in the performance of its job). Intellectual hazard also may have played a role in the ability of rating agencies to maintain credibility in the wake of previous failures, notably the Enron scandal. Professor Claire A. Hill has argued that investors may have continued to rely on ratings because they were displaying an adaptive trait of “incorporating new data that poten-

56. See Phil Gramm, *Deregulation and the Financial Panic: Loose money and politicized mortgages are the real villains*, WALL ST. J., Feb. 20, 2009, at A17.

57. See Frank Partnoy, *Overdependence on Credit Ratings Was a Primary Cause of the Crisis* (Fondazione Eni Enrico Mattei Working Papers, Paper 288, 2009), available at <http://www.bepress.com/feem/paper288>.

tially conflicts with one's pre-existing worldview so as to preserve as much of that worldview as possible."⁵⁸

D. The Basel Committee

The Basel Committee on Banking Supervision, a group of regulators that meets in Basel, Switzerland at the offices of the Bank for International Settlements, has been an influential force in banking regulation during the past twenty years.⁵⁹ The Basel I Capital Adequacy Guidelines are among the most successful regulatory initiatives in the history of global finance.⁶⁰ The Basel II guidelines introduced in June 2004 promised, at one time, to be even more influential.⁶¹ These guidelines are not law, but their prestige has contributed to their implementation in many countries around the world.⁶² The Crisis of 2008, however, forced a reassessment of the Basel Committee's contribution and raised questions about the utility of its project. The market turmoil highlighted four features of the Basel process that appeared questionable in light of the market breakdown.

First, the Basel guidelines were fundamentally concerned with *capital*. The Basel I guidelines were entirely concerned with capital adequacy at banking firms, and the Basel II guidelines were principally focused on capital, although they bowed also to the objectives of market discipline and banking supervision.⁶³ The dominating concept behind the Basel process is that capital adequacy is the benchmark of sound banking. A bank with good capital ratios is a sound bank; a bank with bad capital ratios is an unsound one. The focus on capital promoted by the Basel process proved to be misguided in 2008. The commercial banks that ran into trouble in that year did not have inadequate regulatory capital until a short time before their failure. Argua-

58. Claire A. Hill, *Why Did Anyone Listen to the Rating Agencies After Enron?*, 4 J. BUS. & TECH. L. 283, 283-84 (2009).

59. For a discussion of the prestige of the Basel Committee and the influence of its output, see Michael S. Barr & Geoffrey P. Miller, *Global Administrative Law: The View from Basel*, 17 EUR. J. INT'L L. 15 (2006).

60. *Id.* at 17.

61. BASEL COMM. ON BANKING SUPERVISION, INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND CAPITAL STANDARDS: A REVISED FRAMEWORK (2004) [hereinafter BASEL II].

62. Barr & Miller, *supra* note 59, at 17.

63. See Patrick Van Roy, *Credit Ratings and the Standardised Approach to Credit Risk in Basel II*, at 2 (European Cent. Bank Working Paper Series, No. 517, 2005).

bly, the Basel process contributed to complacency bias and tunnel vision by focusing the attention of regulators on a single feature—capital—and blinding them to other risks, most importantly the risk of a liquidity crisis in financial markets.

Second, the Basel process contributed to intellectual hazard because of its treatment of housing finance. Housing has long enjoyed favorable treatment under the Basel framework. Under the Basel I guidelines, first mortgage loans on residences were assigned a risk-weighting of fifty percent, in contrast with all commercial lending, which had a one-hundred percent risk weighting.⁶⁴ The implication seemed to be that a loan secured by a home mortgage—even a loan to a subprime buyer with poor credit and a questionable employment history—was safer than a line of credit to ExxonMobil or Microsoft. The favorable treatment of mortgage lending, carried forward in the Basel II guidelines,⁶⁵ was based on two well-understood historical patterns. First, as a historical matter people did not, in general, default on their mortgages. No one wanted to lose his house. Second, home prices around the world had generally been stable and rising. The collateral backing home mortgages was therefore deemed to be adequate to cover the loan even if the homeowner did default.

The Basel Committee could not be criticized for drawing on history here, but the problem was that the guidelines treated default probabilities as fixed and did not take account of the possibilities that home prices would not remain stable or that borrowers would depart from their historical pattern of paying off mortgages. The guidelines also implicitly conveyed the message that home loans were the gold standard, and that a bank would not be undertaking unacceptable risk by making home mortgage loans. In retrospect, these messages were inaccurate, and may have contributed to the collapse in the subprime mortgage-backed securities market that was the trigger for the broader market meltdown of 2008.

Third, the Basel II guidelines encouraged reliance on credit ratings. Banks using the “standardized” approach to credit risk

64. BASEL COMM. ON BANKING SUPERVISION, INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND CAPITAL STANDARDS ¶¶ 41–42 (1988).

65. See BASEL II, *supra* note 61, ¶ 72 (“[Under the standardized approach to risk-weighting] [l]ending fully secured by mortgages on residential property that is or will be occupied by the borrower, or that is rented, will be risk weighted at 35%.”).

were instructed to use ratings from “external credit assessment institutions” (that is, credit rating agencies) in determining the amount of capital to hold against loans to particular borrowers.⁶⁶ The Basel Committee thus implicitly endorsed the opinions of credit rating agencies and gave imprimatur to their operations. In the wake of the financial crisis, the reputation of credit rating agencies has been tarnished by their failure to assess accurately the risk posed by subprime mortgage and other securities.

Fourth, the Basel II guidelines drew heavily on banks’ own internal risk-weighting methodologies and strategies. Under the internal ratings-based approach to credit risk, banks are permitted to use “their own internal estimates of risk components in determining the capital requirement for a given exposure.”⁶⁷ The theory is that banks know much more about the actual risk profile of their assets than regulators, and that the larger banks that would be subject to the internal risk-weighting approach have the expertise and resources to develop sophisticated in-house methodologies to assess risk. Basel II sensibly attempted to piggyback on this expertise by using banks’ own internal risk assessment methodologies when assigning capital requirements. The problem with the theory is that it depends on the accuracy of banks’ internal methodologies, which in turn are based on models with all the problems previously mentioned. For some banks, those models proved grossly inaccurate during the Crisis of 2008.

The Basel process, in retrospect, was rife with intellectual hazard. The guidelines are almost poster child examples of authoritarian bias. They purport to be highly sophisticated and wonderfully precise. Basel II bristles with equations and terminology so arcane that a cottage industry has grown up to assist banks in figuring out how to comply with its requirements. The complex development of the guidelines also imbued the process with an aura of infallibility. Few if any initiatives in global finance have been vetted so thoroughly, by such sophisticated commentators, over so extended a length of time. The guidelines carried credibility and technical brilliance similar to that of the economic models used by financial firms. Naturally, government agencies charged with implementing the guidelines and banks tasked

66. See Patrick Van Roy, *Credit Ratings and the Standardised Approach to Credit Risk in Basel II* (European Cent. Bank Working Paper Series, No. 517, 2005).

67. BASEL II, *supra* note 61, ¶ 211.

with complying with them tended to defer to their wisdom in a way that in retrospect appears to have been misguided.

The Basel II process also arguably manifested complexity bias. Given the complicated and demanding, but also very specific calculations required under the guidelines, actors in complex organizations charged with risk-control and compliance naturally faced the temptation to display tunnel vision. That is, they faced pressure to do what was demanded of them and not to look beyond the four corners of the regulations. The guidelines also arguably introduced oversimplification bias because bankers and regulators faced with rapidly shifting information about performance and risk of financial institutions found it convenient to use a ready rule of thumb as a means for making sense of the environment in which they operated. Even though the Basel guidelines are themselves complicated, once someone learns how to use them, the natural tendency is to allow the guidelines to take the place of reality by seeing a bank that is in compliance with regulatory capital requirements as a safe bank, regardless of its actual risk profile.

E. Regulators

Regulators also manifested intellectual hazard. A principal example is the tendency—promoted by the Basel framework—to focus on capital adequacy as the benchmark for safe and sound banking. United States law enforces a system of prompt corrective action under which regulators are required to take a series of increasingly draconian steps as a bank's capital falls into the danger zone. The prompt corrective action rules,⁶⁸ like the capital adequacy guidelines, have the appearance of scientific validity and precision. Capital ratios are divided into tranches and precisely defined, and exacting mandatory administrative actions are specified as a bank falls below the required minimum levels.⁶⁹ The appearance of precision and the comfortable set of prescriptions contained in the prompt corrective action regime could lull the agency into losing track of the more fundamental questions going to the bank's solvency. Because U.S. banks—including banks that later ran into finan-

68. For a description of these rules, see Richard Scott Carnell, *A Partial Antidote to Perverse Incentives: The FDIC Improvement Act of 1991*, 12 ANN. REV. BANKING L. 317 (1993).

69. *Id.* at 331–33.

cial trouble—had adequate capital ratios under the prompt corrective action rules, the natural inference was that the industry as a whole, and these banks in particular, were not in grave danger. The exaggerated focus on capital adequacy reflects aspects of intellectual hazard such as tunnel vision (obsessive focus on capital), authoritarian bias (deference to the Basel Committee), availability bias (use of readily available data on capital ratios), and oversimplification bias.

Intellectual hazard also played a major role in the failure of regulators to identify the fraud perpetrated by Bernard Madoff.⁷⁰ In retrospect, many observers have concluded that the performance Madoff purported to generate for his investors was too good to be true; no one could so consistently generate returns of more than ten percent, year-in and year-out. An objective and dispassionate review of Madoff's operation might have stimulated regulators to question the accuracy of his financial reporting, even if they had not also been repeatedly alerted by a whistle-blower that Madoff was operating a Ponzi scheme. Why did the regulators not recognize the problem earlier? The answer lies partly in intellectual hazard. Madoff was a prestigious, powerful member of the securities industry. He was one of the founders of NASDAQ and a former member of its board of directors. His firm was well known in the financial world. The regulators may have been victims of authoritarian bias. They were bedazzled by Madoff's reputation and failed to see the signs of fraud.⁷¹ They also displayed confirmation bias: When examining Madoff's operations they expected to find a reputable firm, so they interpreted the evidence in front of them as indicating that Madoff was operating a legitimate enterprise. As a result, they failed to identify the pattern of fraudulent illegal behavior that only became evident after Madoff's confession.

70. For a summary of the Madoff story, see Diana B. Henriques, *Madoff Scheme Kept Rippling Outward, Across Borders*, N.Y. TIMES, Dec. 19, 2008, at A1.

71. Madoff himself recognized that his stature in the industry was an asset that tended to deflect regulatory suspicion. See Diana B. Henriques, *Lapses Kept Scheme Alive, Madoff Told Investigators*, N.Y. TIMES, Oct. 31, 2009, at A1 ("In fact, Mr. Madoff said in the jailhouse interview that, on two occasions, he was certain it was only a matter of days or even hours before he would be caught. The first time, in 2004, he assumed the investigators would check his clearinghouse account. He said he was 'astonished' that they did not, and theorized that they might have decided against doing so because of his stature in the industry.").

III. POSSIBLE REFORMS

This Article so far has argued that intellectual hazard is a systemic risk in financial markets, and one that is particularly problematic because it is most pronounced during boom times—exactly the period when the market most needs independent thought and judgment. We now turn to the question of whether the concept of intellectual hazard is anything more than a useful intellectual trope, a way of conceptualizing problems and organizing thought, but without concrete payoffs for public policy.

Intellectual hazard is a pervasive and unavoidable feature of financial markets—and indeed of all complex social systems. It is as impossible to eliminate intellectual hazard as it is to eradicate the agency costs of management in corporations. Inherent in the corporate form is the allocation of management responsibility to actors, and actors always have the incentive to favor their own interests over those of their companies, no matter how much one tries to prevent that from happening. By the same token, we cannot eliminate intellectual hazard from financial markets, nor should we wish to do so, because if we could perform that impossible feat, the costs of doing so would outweigh the benefits.

That being said, the identification of intellectual hazard as a systemic risk in financial markets suggests that policymakers would do well to pay greater attention to the findings of behavioral finance when they formulate or evaluate proposals for reform.⁷² The following suggestions for reform are not fully developed policy recommendations, but rather invitations for thought and debate about how intellectual hazard might be better managed and controlled in the future.

A. *Complexity Bias*

Complexity is a fertile source for intellectual hazard. In some cases, the level of complexity chosen by an institution may exceed what appears reasonably necessary to achieve the desired outcome. Enron is a prime example: Its financing structure, re-

72. See generally Emiliios Avgouleas, *The Global Financial Crisis, Behavioural Finance and Financial Regulation: In Search of a New Orthodoxy*, 9 J. CORP. L. STUD. 23 (2009) (arguing that proposed actions by governments worldwide will be less effective than expected because they lack a focus on behavioral finance).

plete with special purpose entities and complex asset transfers, was beyond the ken of virtually everyone.⁷³

Recognizing that different forms of complexity bias are pervasive in complex organizations, corporate directors and external regulators might demand that the relevant actors provide simple, cogent answers to questions about the underlying assumptions and how those simple answers would change in unusual circumstances. A mild approach could be that the regulator or corporate manager requests an explanation for why the relevant actor has opted for a byzantine structure. Alternatively, the regulators might require that firms engage in more extensive disclosures of their financing structure, and that they include in the disclosure documents a discussion by management as to why particular forms and structures were used. Regulators could also take the complexity of the financing structure into account when calibrating the intensity of scrutiny that they apply to a given firm.

B. Corporate Governance Reforms

Given the problems of complexity bias, self-serving bias, and other intellectual hazard, policymakers might also attempt to introduce greater skepticism and independent judgment into the processes by which firms in the financial sector evaluate information and make policies related to risk. Such independence is already mandated and encouraged, to some extent, under existing law. The Sarbanes-Oxley Act requires that publicly traded companies maintain audit committees comprised of independent directors who oversee accounting, internal controls, and financial reporting.⁷⁴ An office of independent evaluation, not part of a financial institution's general management and reporting directly to the board of directors, might provide greater independence of judgment, although we are somewhat skeptical of the ability of any in-house operation, however insulated, to manifest independent thought in practice. Regulators could also seek to understand more clearly the motivations of the presenters of analyses or the advocates for corporate policies so that they can weigh these recommendations with

73. For a summary of the Enron story, see Kurt Eichenwald & Diana B. Henriques, *Enron's Many Strands*, N.Y. TIMES, Feb. 10, 2002, at A11.

74. Sarbanes-Oxley Act § 301, 15 U.S.C. § 78j-1 (2006).

respect to their impact on the individuals themselves. Compensation policies are an obvious area where such investigation would be appropriate, but any policy or analysis that differentially and substantially impacts the interests of the relevant actor would be a subject of concern.

C. *Education*

Some of the problems of intellectual hazard might be addressed through education.⁷⁵ Educators could clarify and assess the applicability of complex models in ways that address complexity biases. Educators could also focus more of their instruction on questions of professional responsibility or ethics training courses. Economics and business courses could highlight issues that heretofore have often been ignored or assigned to higher level courses, such as the institutional basis of financial markets, the role of speculation, asset-price bubbles, economic crises, the uses and abuses of economic modeling, and the pros and cons of leverage in a firm's financial structure. Business school courses would not discount the fundamental importance of quantitative analysis, rather they could focus more on qualitative factors such as the application of judgment and common sense. Continuing education of the workforce, either formal or informal, might also stress these matters and encourage the application of independent judgment at all levels of management.

D. *Government Reforms*

Perhaps it would be useful to create a government agency specifically charged with assessing potential systemic risks to the financial system. President Obama has, in fact, called for an entity—a systemic risk council—that would be tasked with this function.⁷⁶ At the international level, the former Financial Stability Forum—an association of regulators that, like the Basel Committee on Banking Supervision, maintained its secretariat within the Bank for International Settlements in Basel—has been reconstituted by the G20 as the Financial Stability Board,⁷⁷ an operation established to “address vulnerabilities and to de-

75. We thank Henry Kaufman for suggesting this reform in private conversation.

76. See Sewall Chan, *Agreement is Near on New Overseer of Banking Risks*, N.Y. TIMES, Feb. 18, 2010, at A1.

77. See G20, DECLARATION ON STRENGTHENING THE FINANCIAL SYSTEM—LONDON, 2 APRIL 2009 (2009).

velop and implement strong regulatory, supervisory and other policies in the interest of financial stability.”⁷⁸ The European Commission has also entered the debate, issuing a communiqué calling for the creation of a European Systemic Risk Council charged with the task of “monitor[ing] and assess[ing] risks to the stability of the financial system as a whole” and “provid[ing] early warning of systemic risks that may be building up and, where necessary, recommendations for action to deal with these risks.”⁷⁹

Ideally, the leadership and staff of such an agency would be individuals who are not directly affiliated with the institutions that breed intellectual hazard. To date, unfortunately, the proposals fail to accomplish such a desirable separation. The personnel of the agencies charged with monitoring systemic stability are often incumbent government officials. The Obama Administration’s proposed systemic risk council would be made up of the main financial regulators in a consultative role, with a single, accountable authority that can act quickly in a crisis (the current proposal places the Treasury Secretary in this role).⁸⁰ The proposed European Systemic Risk Board would include a “significant representation of central Banks” and would operate with a secretariat provided by the European Central Bank.⁸¹ The Financial Stability Board, likewise, is staffed by government officials and chaired by Mario Draghi, Governor of the Bank of Italy.⁸²

Experience suggests that the problem of intellectual hazard will not be effectively addressed if the personnel in the agency charged with identifying systemic threats to financial stability are simply recycled regulators and central bankers. They will not bring new ideas to the table; on the contrary, they will

78. Fin. Stability Bd., Financial Stability Board, <http://www.financialstabilityboard.org> (last visited Mar. 1, 2010).

79. Press Release, EUROPA, Financial services: Commission proposes stronger financial supervision in Europe (May 27, 2009), available at <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/836>; see also COMM’N OF THE EUROPEAN COMMUNITIES, PROPOSAL FOR A REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON COMMUNITY MACRO PRUDENTIAL OVERSIGHT OF THE FINANCIAL SYSTEM AND ESTABLISHING A EUROPEAN SYSTEMIC RISK BOARD (2009).

80. See Chan, *supra* note 76.

81. See COMM’N OF THE EUROPEAN COMMUNITIES, *supra* note 79, at 4.

82. See Press Release, Fin. Stability Bd., G20 Leaders endorse the Financial Stability Board’s Charter (Sep. 25, 2009), available at http://www.financialstabilityboard.org/press/pr_090925c.pdf.

come as advocates for their agency's positions and as defenders of their agency's turf and power. These people will suffer from the forms of intellectual hazard we have already observed in regulators: asymmetry bias embodied in fixed positions on policy questions, self-serving bias in the form of turf protection and blame avoidance, and authoritarian bias in the form of deference to the agencies that delegate personnel to these new monitoring bodies.⁸³

A preferable solution would be to establish financial stability boards *not* dominated by existing regulators. A truly independent board, composed largely of people from outside the government, selected according to some principle of merit rather than political connections, and adequately funded and protected against retaliation for expressing unpopular views, would offer a potentially more efficacious approach to the problem of impartially and objectively identifying systemic threats to the financial system and proposing possible remedies or solutions.

E. Stress Tests

In the wake of the Crisis of 2008, the Fed subjected large banks to "stress tests" to assess whether their levels of capital were adequate to cope with serious downturns in economic conditions.⁸⁴ It might be possible to manage intellectual hazard by mandating a different kind of stress test. Systemically important institutions (large banks, insurance companies, and investment firms) could be required to identify models or policies that, if erroneous, could have a materially adverse effect on their safety or soundness. In such cases, the institution could be required to subject the model or policy to a stress test to evaluate how it would function if the basic assumptions on which it is based no longer hold. The institutions would not have to re-

83. It is noteworthy that the predecessor of the Financial Stability Board, the Financial Stability Forum, had a similar mandate of monitoring for systemic risks in the financial system. It egregiously failed in that function, never identifying the looming threat to the world's financial markets posed by the U.S. subprime securities until it was much too late to take action. There is, unfortunately, little reason to believe these new agencies will do a better job. See Cally Jordan, *Does 'F' Stand for Failure: The Legacy of the Financial Stability Forum* (Univ. of Melbourne Law Sch., Legal Studies Research Paper No. 429, 2009), available at <http://ssrn.com/abstract=1478527>.

84. The stress tests evaluated how the banks would respond under two scenarios, one being the consensus forecast at the time of the test and the other being a much worse scenario. See HAL S. SCOTT, *THE GLOBAL FINANCIAL CRISIS* 52 (2009).

port proprietary information about their models, but would have to disclose how the models or assumptions performed under different and less favorable economic conditions.

CONCLUSION

This Article has proposed the idea of intellectual hazard as an organizing principle for the conceptual biases that affect all complex organizations and systems of complex organizations. Intellectual hazard, as we define it, is the tendency of behavioral biases to interfere with accurate thought and analysis within complex organizations. Intellectual hazard impairs the acquisition, analysis, communication, and implementation of information within an organization and the communication of such information between an organization and external parties.

We have argued that intellectual hazard is a particular problem during times of economic stress, including asset-price bubbles and financial crises. Because of its importance during these times, intellectual hazard, like moral hazard, poses systemic risks to the financial system as a whole. We identified a variety of forms of intellectual hazard, falling in three “baskets” or categories: complexity bias, incentive bias, and asymmetry bias. We illustrated how different institutions in financial markets—banks, the Fed, rating agencies, the Basel Committee on Banking Supervision, and bank regulators—appear to have manifested intellectual hazard in connection with the Crisis of 2008. We concluded with possible reforms to mitigate intellectual hazard: corporate governance reforms, reforms to government supervision and oversight, stress tests to assess the robustness of models, and changes in education of financial market personnel. Overall, the purpose has been to stimulate thought and discussion about an important and interesting issue of regulatory policy in the financial services sector.