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Intellectual Hazard: How Conceptual Biases in Complex Organizations Contributed to the Crisis of 2008

Geoffrey P. Miller¹ and Gerald Rosenfeld²

Abstract: This paper 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 9:06 a.m. UCT and was expected to re-establish signal at 9:27.³ It never reappeared. An investigation revealed that one of the two navigation teams assigned to the mission had been using metric system units and the other was using the imperial system. In

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² Distinguished Scholar-in-Residence and Senior Lecturer, New York University Law School, Clinical Professor of Business, NYU Stern School of Business, and Deputy Chairman, Rothschild North America. This paper could not have been written without the outstanding research of Deidrie Stone, Fellow at NYU's Center for the Study of Central Banks and Financial Institutions. Many people in academics and financial markets contributed to the ideas in this book. We particularly thank Henry Kaufman, Paolo Pelligrini, and James Sterngold

³ UCT is the universal time used by astronomers in order to avoid complexities introduced by time zones.

consequence of the difference between measurement units, the spacecraft entered orbit at too low an altitude and failed due to atmospheric stress and friction.⁴

On February 20, 1995, Dr. Rolando R. Sanchez, a surgeon in Tampa, Florida, scrubbed and entered the operating room for a routine leg amputation. A blackboard in the operating room specified the leg that was to be amputated, as did the operating room schedule and the hospital's computer system. 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.⁵

Each of these disasters resulted from a common, dangerous, but little-recognized phenomenon. The events in question took place within complex organizations – a bureaucratic agency with numerous teams and subcontractors working on the same project, a hospital with its network of physicians, nurses, equipment, and systems for medical and financial record-keeping and control. The mistakes that occurred 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

⁴ See CNN.com, Metric Mishap Caused Loss of NASA Orbiter (Sept. 30, 1999), <http://www.cnn.com/TECH/space/9909/30/mars.metric.02> (last visited Oct. 6, 2009); Douglas Isbell et al., Mars Climate Orbiter Team Finds Likely Cause of Loss (Sept. 30, 1999), <http://marsprogram.jpl.nasa.gov/msp98/news/mco990930.html> (last visited Oct. 6, 2009); Douglas Isbell & Don Savage, Mars Climate Orbiter Failure Board Releases Report (Sept. 30, 1999), <http://marsprogram.jpl.nasa.gov/msp98/news/mco991110.html> (last visited Oct. 6, 2009).

⁵ See <http://www.nytimes.com/1995/09/17/us/doctor-who-cut-off-wrong-leg-is-defended-by-colleagues.html>; Leland Gregory, Hey Idiot! Chronicles of Human Stupidity 50-51 (2003). The patient reportedly received an award of more than one million dollars.

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 2008⁶ – events we will refer to hereafter as the “Crisis of 2008” – 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 not able to have 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 paper is that the Crisis of 2008 was partially caused by a problem with the processing of risk-related information in complex organizations.⁷ In the Crisis of 2008, as in

⁶ These events have sparked a burgeoning literature. Leading treatments include Viral Acharya & Matthew Richardson, eds., *Restoring Financial Stability: How to Repair a Failed System* (2009); 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: The 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); Robert J. Shiller, *The Subprime Solution: How Today’s Global Financial Crisis Happened, and What to do About it* (2009); 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 Robert Z. Aliber & Charles P. Kindleberger, *Manias, Panics and Crashes: A History of Financial Crises* (6th ed. 2010); Roger Lowenstein, *When Genius Failed: The Rise and Fall of Long Term Capital Management* (2000); Henry Kaufman, *On Money and Markets: A Wall Street Memoir* (2000).

⁷ This paper is thus a contribution to the growing literature on the psychological determinants of the financial crisis. For other work dealing with the general topic, I Claire A. Hill, *Investor Psychology and the Financial Crisis* (2009) (manuscript on file with the authors).

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 within an organization and between an organization and external parties. Intellectual hazard, as we define the term, has not to the best of our knowledge 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 that future disasters.

This paper is structured as follows. Part I discusses the concept of intellectual hazard. Drawing on research in psychology, behavioral finance, and behavioral economics, we identify three general types of intellectual hazard: (a) complexity bias, (b) incentive bias, and (c) 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 some thoughts about possible reforms that take account of the risk of intellectual hazard.

We emphasize, at the outset, that the analysis in this paper is preliminary. Any comprehensive analysis of the problem of intellectual hazard in financial markets would require a much more extensive treatment than is possible in a paper such as this. However, we hope that the ideas put forward here may contribute to the debate on financial market reform, and may stimulate greater concentration on the problems of information processing in complex organizations of the financial market.

I. Intellectual Hazard

The concept of intellectual hazard can be understood in reference to the better-known problem of moral hazard. Moral hazard is 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 would go down in a storm, that the cargo would be eaten by rats, that the vessel would be captured by pirates, and so on. Each of these risks would be given a value for purposes of calculating the premium. But in addition, actuaries recognized a special kind of hazard – the risk created by the insurance contract *itself*. If the policyholder is insured against a risk, he or she loses much of the incentive he would otherwise have to avoid that 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 burn down their houses or commit suicide with the intention of collecting the insurance benefit. In the insurance industry the risk created by the insurance policy itself became known as the “moral hazard”.⁸

The term “moral hazard” later became associated with financial markets. The problem here is that governments provide implicit or explicit insurance against failure of financial firms. Deposit insurance is the obvious example. When depositors are insured against losses due to the failure of their bank, they lose the incentive to monitor their banks in order to prevent failure. Freed from this form of market discipline, bankers have less incentive to avoid risks and in fact gain an incentive to undertake socially undesirable levels of risk.⁹ While deposit insurance is an

⁸ See Paul Milgrom & John Roberts, *Economics, Organization and Management* 195 (1992) (moral hazard defined 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 contracting terms”).

⁹ Mark E. Van Der Weide & Satish M. Kini, *Subordinated Debt: A Capital Markets Approach to Bank Regulation*, 41 B.C. L. REV 195, 207-208 (2000).

obvious example of moral hazard, 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 deemed to be 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 by policymakers and scholars has gone into identifying its incidence and designing strategies to reduce its effects.¹⁰

Intellectual hazard is similar to moral hazard in the following respects. Like moral hazard, it is a problem that results from structural features of markets that are in other respects highly beneficial: the shifting of risk to more efficient risk-bearers, in the case of moral hazard, and the division of responsibility to specialized instrumentalities, in the case of intellectual hazard. 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 very large, very interconnected, or linked to a great many other similarly situated organizations, intellectual hazard can pose a threat to the stability of an entire system of markets or institutions.¹¹ In particular, intellectual hazard poses a threat to the smooth, orderly and efficient functioning of the world's financial markets.

¹⁰ 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, (2006); Christine Hurt, *Moral Hazard and the Initial Public Offering*, 26 CARDOZO L. REV. 711, (2005); Jonathan P. Thomas & Tim Worrall, *Unemployment Insurance Under Moral Hazard and Limited Commitment: Public Versus Private Provision*, 9 J. PUB. ECO. THEORY 75 (2007).

¹¹ On systemic risk, see Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193 (2008).

Aspects of intellectual hazard in financial markets have already been identified by scholars and astute market participants.¹² The examples which concern us here can be grouped into three broad categories, which we call complexity biases, incentive biases, and asymmetry biases. We emphasize that these categories, while 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, appears to be a helpful means for organizing the different manifestations of intellectual hazard, even if the category system is not always perfectly clear-cut.

Complexity Bias. A first type of intellectual hazard arises from the propensity of an actor to wrongly analyze a situation due to inherent limitations on the actor's ability to interpret complex sets of information within the time period needed for decision.

An example of complexity bias is tunnel vision. An actor tasked with carrying out a particular function within a complex organization tends to see only the information conventionally deemed 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 specifically on the task at hand. The term "tunnel vision" is often used derogatorily, but in fact the type of 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).

Comment [D1]: NO LUCK FINDING A BEHAVIORAL FINANCE RELATED DEFINITION.

¹² 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 RICHARD H. THALER, QUASI RATIONAL ECONOMICS (Russell Sage Foundation 1994) (1991); MICHAEL M. POPIAN, BEHAVIORAL FINANCE AND WEALTH MANAGEMENT: HOW TO BUILD OPTIMAL PORTFOLIOS THAT ACCOUNT FOR INVESTOR BIASES (John Wiley & Sons, Inc. 2006); RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS (Penguin Books 2008); CASS R. SUNSTEIN, BEHAVIORAL LAW & ECONOMICS (Cambridge University Press 2003) (2000); ADVANCES IN BEHAVIORAL FINANCE (Richard H. Thaler ed., Russell Sage Foundation 1993); HENRY KAUFMAN, ON MONEY AND MARKETS; A WALL STREET MEMOIR (McGraw-Hill 2000).

Another complexity bias is confirmation bias.¹³ When the world presents a welter of information to an actor, he or she needs to make sense of it within the context provided by the assigned role. The actor, examining the information set available, will tend to see a confirmation of his or her previous expectations – even if the evidence is more consistent with a different state of affairs.¹⁴

Representative bias is another response to the problem of complexity.¹⁵ This occurs when a person wrongly assumes that a sample is a reliable measure of an unobserved population variable. An actor in a complex organization may have only a limited exposure to a particular problem or issue. He or she may assume based on an experience of a few months or years that the sample limited in time is an accurate estimate of how the phenomenon in question will behave going forward – when in fact the sample may be too small to support reliable population inferences, or may have been drawn from the population in a non-random way.¹⁶

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 the information presented to them. 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. However, because rules of

¹³ See MICHAEL M. POPIAN, *BEHAVIORAL FINANCE AND WEALTH MANAGEMENT: HOW TO BUILD OPTIMAL PORTFOLIOS THAT ACCOUNT FOR INVESTOR BIASES* 187 (John Wiley & Sons, Inc. 2006) (describing confirmation bias as a type of selective perception that emphasizes ideas that confirm beliefs while devaluing whatever contradicts these beliefs).

¹⁴ Confirmation bias is similar to “conservatism bias” in behavioral finance, which refers to the tendency of investors to under-react to new information, maintaining impressions derived from a previous estimate rather than acting on updated information. See MICHAEL M. POPIAN, *BEHAVIORAL FINANCE AND WEALTH MANAGEMENT: HOW TO BUILD OPTIMAL PORTFOLIOS THAT ACCOUNT FOR INVESTOR BIASES* 187 (John Wiley & Sons, Inc. 2006).

¹⁵ See Michael M. Popian, *Behavioral Finance and Wealth Management: How to Build Optimal Portfolios that Account for Investor Biases* 62 (2006). A related phenomenon, “recency bias,” refers to the fact that people tend to recall and emphasize recent events more prominently than events that have occurred in the past. See *id.* at 216.

¹⁶ Some evidence on recency bias is found in Paul A. Weller et al., *Price Trends and Patterns in Technical Analysis: A Theoretical and Empirical Examination*, 33 *J. BANKING FIN.* 1089 (2009) (concluding that investors’ interpretation of signals with relatively low information content tends to be biased by the recently observed large signals).

thumb *are* simplified, they introduce error. They are often based, for example, on information readily available to the actor, which may be an inaccurate sample of the phenomenon at issue.¹⁷ 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 over-value information provided by authoritative sources.¹⁸ The role of an actor in a complex organization is inevitably defined by hierarchies of authority, formal or informal, that define the scope of an actor's autonomy. In some cases the authority will be within the organization – the actor reports to a supervisor who has the power to instruct her on how to carry out her 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 case 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.

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 want to see the world in a particular way – and wanting to do so, they tend to analyze information in accordance with their self-interest.

¹⁷ This bias is similar to the “availability bias” recognized in behavioral finance. See Michael M. Popian, Behavioral Finance and Wealth Management: How to Build Optimal Portfolios that Account for Investor Biases 94 (2006).

¹⁸ See ROBERT J. SHILLER, IRRATIONAL EXUBERANCE 158-159 (Princeton University Press 2005).

An example of incentive bias is herding behavior.¹⁹ 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 for them is to conform to the consensus opinion. If they do so they are unlikely to be criticized, even if the conventional view turns out to be erroneous, because nearly everyone else was making the same mistake. On the other hand if they dissent they call potentially unfavorable attention to themselves. Even if they turn out to be right they may suffer adverse consequences in the short term, and the long-term rewards they can anticipate from being proved right may well be outweighed by the sanctions they can anticipate from being wrong.²⁰

Another example of incentive bias is cognitive dissonance.²¹ 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 creates cognitive dissonance in that the actor finds it uncomfortable to see things in a way that potentially threaten her 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

¹⁹ See ROBERT J. SHILLER, *IRRATIONAL EXUBERANCE* 157 (Princeton University Press 2005) (2000); Timothy E. Lynch, *Deeply and Persistently Conflicted: Credit Rating Agencies in the Current Regulatory Environment*, 59 CASE W. RES. 227, 284 (2009); 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 (2009); Sanford M. Jacoby, *Finance and Labor: Perspectives on Risk, Inequality, and Democracy*, 30 COMP. LAB. L. & POL'Y J. 17, 21 (2008); see generally CHARLES MACKAY, *EXTRAORDINARY POPULAR DELUSIONS AND THE MADNESS OF CROWDS* (Random House 1980) (1841).

²⁰ Herding can also reflect self-serving bias, to the extent it induces a sense of superiority in the collective judgment of the group. See CASS R. SUNSTEIN, *BEHAVIORAL LAW AND ECONOMICS* 76 (Cambridge University Press 2000) (herding behavior can "unconsciously generate shared illusions of superiority that hinder reflection and reality testing."

²¹ See Michael M. Popian, *Behavioral Finance and Wealth Management: How to Build Optimal Portfolios that Account for Investor Biases* 83 (2006); Geoffrey C. Friesen & Paul Weller, *Quantifying Cognitive Biases in Analyst Earnings Forecasts*, 9 J. FIN. MARKETS 333, (2006); William N. Goetzmann & Nadav Peles, *Cognitive Dissonance and Mutual Fund Investors*, 20 J. FIN. RES. 145, (1997).

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.²²

Loss-aversion may also be considered a form of incentive bias.²³ Loss-aversion occurs when an actor wishes to avoid the recognition by others 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 hoped-for stroke of good fortune prevents that day from ever happening. Loss-aversion bias can be a key factor in situations involving rogue traders, where an actor who has incurred a loss due to 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.²⁴ We conceptualize this as a case where the actor knows or has good reason to know that the facts are a certain way, but deliberately elects to ignore that fact or even to suppress information or distort analysis out of a conscious intention to promote the actor's own interests.

Asymmetry Bias. Asymmetry bias appears when actors in a complex organization bring preformed and fixed ideas, judgments, or attitudes to bear in the analysis of information. The

²² 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 Michael M. Popian, Behavioral Finance and Wealth Management: How to Build Optimal Portfolios that Account for Investor Biases 51 (2006). On overconfidence bias generally, see Cass R. Sunstein, Behavioral Law & Economics 149 (2000).

²³ See Michael M. Popian, Behavioral Finance and Wealth Management: How to Build Optimal Portfolios that Account for Investor Biases 208 (2006) (referring to the tendency of investors to feel a stronger impulse to avoid losses than to acquire gains).

²⁴ On self-serving bias in financial markets, see Thomas 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); Edward Teach, *Avoiding Decision Traps*, CFO MAGAZINE, June 2004; Hugh P. Gunz & Sally P. Gunz, *Client Capture and the Professional Service Firm*, 45 AM. BUS. L.J. 685, 697 (2008).

biases that concern us influence market participants to act in ways that give inappropriate and unequal weighting to information and analysis created in support of certain types of conclusions. Thus, these biases have influenced the actions flowing there from, due to these preformed ideas.

A common form of asymmetry bias is status quo bias, first identified in seminal work by Samuelson and Zeckhauser.²⁵ Actors have a tendency to overvalue the present state 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.²⁶ Endowment effect is reflected in an individual's asymmetric unwillingness to sell an asset already owned, and 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 which would result in a loss compared to actions which would result in a comparable (or greater) gain. Taken together, these biases impair the ability of organizations to appropriately process and act on information and analysis. This is particularly true, as in many of our identified instances of intellectual hazard, in times of market stress and significant downward market movements when undue attraction to the status quo, endowment effect, and loss aversion bias inhibit the organization from taking actions that are in its economic best interest. Thus, these biases are pro-cyclical.

There are other behavioral biases, which we classify as asymmetrical, that contribute to intellectual hazard. The first is known as the ostrich effect.²⁸ This is the tendency for market

²⁵ William Samuelson & Richard Zeckhauser, *Status Quo Bias in Decision Making*, 1 J. RISK & UNCERTAINTY 7, 7-59 (1988).

²⁶ Daniel Kahneman, Jack Knetsch & Richard Thaler, *The Endowment Effect, Loss Aversion, and Status Quo Bias: Anomalies*, 5 J. ECON. PERSP. 193, 193-206 (1991).

²⁷ See Kathryn Zeiler & Charles R. Plott, *The Willingness to Pay/Willingness to Accept Gap, the Endowment Effect, Subject Misconceptions and Experimental Procedures for Eliciting Valuations*, 95 AM. ECO. REV. 3, (2005); Brett Inder & Terry O'Briend, *The Endowment Effect and the Role of Uncertainty*, 55 BULL. ECO. RES. 289, (2003).

²⁸ Niklas Karlsson, George Loewenstein & Duane J. Seppi, *The 'Ostrich Effect': Selective Attention to Information about Investments*, 38 J. RISK & UNCERTAINTY 95, 95-115 (2009).

actors to ignore news, data or analysis that imply negative outcomes. This ostrich effect is a specific instance of positive outcome bias or optimism bias. These biases result in the systemic overvaluation of data and analysis, which fall in the “right-hand” tail of outcomes and result in sub-optimal actions being taken (or not taken) by organizations. Another identified bias is regret aversion bias,²⁹ which again leads to asymmetric behavior.

We believe asymmetry bias often manifests itself in the selection of optimistic actors for responsibility within organizations. These actors may enjoy inherent advantages in advancement in such settings. Once an organization is populated with optimistic actors the phenomenon of herding behavior can come into play. Herding is the tendency to adopt the opinions and follow the behaviors of the majority in order to avoid conflict within the group. When the majority of the influential actors are subject to the asymmetries we have identified here, herding will only further magnify this asymmetry.

* * *

The various biases discussed above 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 thought about and analysis of the information presented to them 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 and review by third parties and scrutiny by government regulators.

²⁹ MICHAEL M. POMPIAN, BEHAVIORAL FINANCE AND WEALTH MANAGEMENT 227 (John Wiley & Sons, Inc. 2006).

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 as a result of checks and balances, complex organizations get it right most of the time. It is not acceptable that they get it wrong even once. Probably Dr. Sanchez’s patient felt that way upon waking up in recovery with the wrong leg missing; it would not have been particularly comforting to be informed 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 paper – is when the ordinary safeguards of checks and balances break down because of unusual conditions affecting the entire organization or system of organizations. 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 the councils of 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) but also phenomena such as herding, self-serving bias, policy bias, confirmation bias, tunnel vision, and authority bias.³⁰

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 are likely to have to engage in crisis management that allows little time for thought or re-evaluation of fundamental assumptions. Being unprepared for the sudden change, they may handle things poorly, or may give way to panic in the face of the information overload.³¹ The panic, moreover, can further exacerbate the problem by eliminating the healthy diversity of viewpoint that tends to keep intellectual hazard in check in normal times. The very definition of a panic is that everyone, or nearly everyone, comes to evaluate market conditions in the same way and

³⁰ See ROBERT J. SHILLER, *IRRATIONAL EXUBERANCE* (Princeton University Press 2005); Oren Bar-Gill, *The Law, Economics and Psychology of Subprime Mortgage Contracts*, 94 CORNELL L. REV. 1073, 1077-1079, 1120-1121 (2009); Christine A. Klein, *Perspective on the New Regulatory Era: 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, 1237-1239 (2009);

³¹ A point nicely illustrated in Bear Stearns's quarterly filing with the SEC in the quarter following its failure in March 2009. 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." The Bear Stearns Companies Inc. Form 10-Q for the Quarterly Period Ended February 29, 2008, p.80.

therefore rushes to reduce their exposure to risk, creating a vicious cycle in which losses of liquidity trigger even more panic and greater turmoil.³²

The fact that intellectual hazard is a special problem during periods of unusual asset price increases implies that intellectual hazard 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.³³ Intellectual hazard is therefore more than a pervasive but low-grade problem for financial markets in ordinary times. It can metastasize into a serious threat to the stability of the system as a whole in unusual times. This is, we believe, what happened during the mid-2000s, when a housing bubble gripped U.S. financial markets and created profound threats to systemic stability in the form of subprime mortgage-backed securities, collateralized debt obligation securities, credit default swaps, and other instruments born of the credit boom. For this reason intellectual hazard is an important topic of study for scholars and policymakers who are interested in preventing a recurrence of the turbulent market conditions of 2008 and the severe economic downturn that followed.

II. Intellectual Hazard and the Crisis of 2008

We turn now to the application of the idea of intellectual hazard to the Crisis of 2008. It is impossible to provide a full description of all the ways intellectual hazard contributed to or exacerbated the market turmoil of that year. In the pages that follow, however, we will attempt

³² For a formal model, see Rodrigo Cifuentes, Gianluigi Ferrucci, & Hyun Song Shin, *Liquidity Risk and Contagion*, Bank of England Working Paper No. 264 (2005), available at <http://www.bankofengland.co.uk/publications/workingpapers/wp264.pdf>.

³³ *See generally* Ben S. Bernanke, Chairman, Fed. Reserve, *At the Council on Foreign Relations: Financial Reform to Address Systemic Risk* (Mar. 10, 2009); Dwight Cass, *Retro-prospective*, BREAKINGVIEWS, Mar. 10, 2009, http://money.cnn.com/2009/03/10/news/economy/breaking_views.breakingviews/index.htm.

to provide some examples, with a view to encouraging further and more detailed investigation in other work.

Banks. An important source of intellectual hazard in the crisis was the over-reliance by investment banks on mathematical or computer models.³⁴ The models themselves are potentially very useful tools. But like all tools, they can be misused or applied to the wrong job. In the case of the financial system, the models were employed uncritically by traders and others who had little if any clue about the assumptions that went into their formation or the inherent limitations on their predictive power. The models assumed a life of their own and ordinary judgment and common sense was forgotten.³⁵

Three main problems impair the accuracy of financial models. First, they are inevitably based on assumptions about the behavior of markets and prices drawn from history. While historical data can be extremely useful in ordinary times, they are not necessarily reliable predictors of how prices and markets will behave in crisis times. The models must extrapolate from the ordinary to the extraordinary based on 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 disastrous trading strategies based on models that broke down in unstable markets).³⁶ In the case of subprime mortgage securities, for example, the models used on Wall Street tended to accurately predict the disastrous effects of a significant downturn in housing prices, but few took these predictions seriously because most considered a housing

³⁴ For review of the costs (and benefits) of economic models in addressing real-world economic problems, see, e.g., David Colander, *Economics* (2007).

³⁵ For criticism of excessive reliance on models, see, e.g., Steve Lohr, *Wall Street's Extreme Sport*, N.Y. TIMES, Nov. 5, 2008, at B1.

³⁶ See ROGER LOWENSTEIN, *WHEN GENIUS FAILED: THE RISE AND FALL OF LONG TERM CAPITAL MANAGEMENT* (2001).

collapse to be extremely unlikely.³⁷ A second problem with models is that they deal with complex dynamic systems in which outcomes may be highly path-dependent and sensitive to differences in initial conditions.³⁸ Such systems – the weather being a classic example – turn out to be extremely 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 economic actors who are likely to behave strategically in response to changes in incentives and risk – a factor which makes the task of prediction even more daunting by introducing game-theoretical behavior into the mix.³⁹

Sometimes the developers of these models understood the inherent limitations on their use.⁴⁰ But sometimes the temptation to replace reality with the models was irresistible. Professors of finance, in particular, may have sometimes 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.⁴¹ Their confidence in model-building was

³⁷ See Kristopher S. Gerardi, Andreas Lehnert, Shane M. Sherland, and Paul S. Willen, Making Sense of the Subprime Crisis, Brookings Papers on Economic Activity, Fall 2008 (finding that “analysts, on the whole, understood that a fall in prices would have disastrous consequences for the market but assigned a low probability to such an outcome.”).

³⁸ Such systems are studied mathematically in the discipline of chaos theory. See JAMES GLEICK, CHAOS: MAKING A NEW SCIENCE (Penguin Books 1987). For an application to behavioral finance, see DIMITRIS N. CHORAFAS, CHAOS THEORY IN THE FINANCIAL MARKETS (Irwin 1994). Implications for legal regulation of financial markets are studied in Steven L. Schwarz, Regulating Complexity in Financial Markets, 87 WASH. U. L. REV. (forthcoming 2009-2010), available at <http://ssrn.com/abstract=1240863>.

³⁹ See, e.g., Uday Rajan, Amit Seru & Vikrant Vig, The Failure of Models that Predict Failure: Distance, Incentives and Defaults, Chicago GSB Research Paper No. 08-19, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=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.).

⁴⁰ 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 (John Wiley & Sons, Inc. 2004).

⁴¹ A point recently stressed by Paul Krugman. See Paul Krugman, *How Did Economists Get It So Wrong?*, N.Y. TIMES MAG., Sept. 6, 2009, at 36 (“As I see it, the economics profession went astray because economists, as a group, mistook beauty, clad in impressive-looking mathematics, for truth. . . . the central cause of the profession’s failure was the desire for an all-encompassing, intellectually elegant approach that also gave economists a chance to

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 of, 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).

Even when the potential shortcomings of models were understood by the developers of economic models in academics, or their counterparts at investment banks who devised or adapted models for use on the street, those implications tended to be ignored by the actors charged with implementing them. Investment banks made heavy use of financial models for a number of purposes, including valuation of securities, formulating trading strategies, measuring aggregate risk to the institution, and asserting compliance with accounting and capital rules.⁴² When actors at investment banks utilized the models, they hardly ever took account of the assumptions and inherent limitations built into the products. They had neither the time nor the expertise to do so, even if they were interested. Subtleties like this 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; but 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

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.”)

⁴² 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).

bias also played a role: the models used in investment banks were often created by PhD's in math of 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 odd 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.⁴³ 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, that it had been dealt with through technological means, and therefore that the exercise of judgment could be subsumed to the careful implementation of strategies spit out by the computers. Meanwhile, because risk had been controlled, bank managers came to see any capital not required to be held under the risk-management system as an idle asset that needed to be put to work⁴⁴ -- thus potentially 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).

⁴³ For an insightful commentary, see Hyun Song Shin, *Risk and Liquidity*, Clarendon Lectures in Finance (forthcoming 2008).

⁴⁴ 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.”)

In addition to problems of using models, intellectual hazard manifests itself in another way in financial institutions. 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 management and thought. The problem is especially pronounced during boom times when big profits are to be earned through strategies that in retrospect – after the bust – look foolhardy. In such an environment, bank managers face hydraulic pressures to follow the crowd. If they do not do so they are likely to be penalized for achieving less-than-stellar results in the short term – a phenomenon illustrated by former Citicorp CEO Chuck Prince, who famously commented in 2007 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’ve got to get up and dance.”⁴⁵ The suggestion was that Prince foresaw the problems that sparked into 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 that once held \$60 billion in assets.⁴⁶ This fund was the brainchild of Bruce Bent, one of the giants of the mutual fund industry. Bent had long been 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

⁴⁵ Quoted in John Cassidy, *Rational Irrationality: The Real Reason that Capitalism is so Crash-Prone*, NEW YORKER, Oct. 5, 2009, at 32.

⁴⁶ See Eamonn K. Moran, *Wall Street Meets Main Street: Understanding the Financial Crisis*, 13 N.C. BANKING INST. 5, 74 (2009).

after the latter's bankruptcy in September 2008, causing the Reserve Primary Fund to "break the buck" (report a net asset value of less than \$1 per share). This in turn caused a massive run by institutional investors and a destabilization of the entire money market mutual fund industry.

These competitive pressures reflect intellectual hazard. Firms facing pressure from investors or shareholders to generate profits have an enormous 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 are deemed to have prestige or influence in the industry).

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 intervene to pop an asset bubble.⁴⁷ Weighty arguments of policy supported this view: among other things, it is difficult in the early days to distinguish an asset bubble from ordinary market fluctuations or from changes in prices due to market fundamentals; and the policy tools available to the central bank are so broad-ranging that they are likely to affect all economic markets, not just the market where the asset bubble is occurring.⁴⁸ The Fed also had historical reasons not to attempt to pop an asset bubble: the few times central banks had intervened 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, while the Fed's decision *not* to pop the tech bubble of the late 1990s had apparently

⁴⁷ See DAVID WESSEL, IN FED WE TRUST: BEN BERNANKE'S WAR ON THE GREAT PANIC 61 (Crown Publishing 2009).

⁴⁸ See Geoffrey P. Miller, *The Role of a Central Bank in A Bubble Economy*, 18 CARDOZO L. REV. 1053 (1996).

worked out well, with the economy lapsing only into a shallow recession followed by robust economic recovery.

The Fed's unwillingness to pop asset bubbles became a fixed policy at that institution, one which arguably impaired the ability of the Fed to fully appreciate the consequences in the run-up in housing prices in the United States and many other countries during the 2000s. Since popping the bubble was not in the cards, the Fed didn't 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.⁴⁹ Not having to worry about asset prices, moreover, suggested that the Fed didn't need to worry overmuch about the massive amounts of credit it was pouring into the economy with its low-interest rate policies of the mid-2000s – an oversight that arguably exacerbated the collapse of the subprime market and the ensuing financial crisis in 2007 and 2008.⁵⁰

Another fixed attitude at the Fed was the belief, on the part of Chairman Greenspan and others, that the self-interest of lending institutions was an adequate check against excessive risk-taking. Believing 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."⁵¹ The Fed's commitment to free-market ordering arguably interfered with its ability to understand that free

⁴⁹ See Paul Krugman, *How Did Economists Get It So Wrong?*, N.Y. TIMES MAG., Sept. 6, 2009, at 36 ("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.")

⁵⁰ There is consensus today that in the mid-2000s the Fed kept interest rates at too low a level and maintained the low interest rates for too long. See David Wessel, *In Fed We Trust: Ben Bernanke's War on the Great Panic* 61 (2009).

⁵¹ David Wessel, *In Fed We Trust: Ben Bernanke's War on the Great Panic* 65-66 (2009).

markets do not always function perfectly, and in particular may have blinded the central bank to the 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 doctrine at the Fed, during the 2000s, was the notion of the “great moderation.” Ben Bernanke gave voice to this idea in a speech delivered to the Eastern Economic Association on February 20, 2004: “One of the most striking features of the economic landscape over the past twenty years has been a substantial decline in macroeconomic volatility.”⁵² Bernanke painted a rosy picture of an economy basking in the benefits of low inflation, stable employment, and stable output. While not ruling out the possibility that the observed effects might be due to luck, Bernanke speculated that a principal cause of this great moderation was good monetary policy by his own institution. 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 severe 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, since it allowed the Fed to take credit for the benign economic

⁵² See <http://www.federalreserve.gov/BOARDDOCS/SPEECHES/2004/20040220/default.htm>

conditions of the early to mid-2000s. It manifests authoritarian bias, since the idea was being 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 the Fed's research department would take 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 which pre-committed 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 benefits to inflation but there are 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, they are more likely to deliver stable prices.⁵³ 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 – a view that fit nicely in the idea, discussed above, of the great moderation: good monetary policy generated stable prices which in turn contributed to a reduction in volatility everywhere in the economy. 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

⁵³ A classic exposition is ALEX CUKIERMAN, *CENTRAL BANK STRATEGY, CREDIBILITY AND INDEPENDENCE: THEORY AND EVIDENCE* (Massachusetts Institute of Technology Press 1992).

2000s, central banks did not worry overmuch about the destabilizing effects of asset bubbles or about the risks that the financial system could fall prey to a liquidity crisis rather than to problems caused by inflation.

Rating Agencies. Rating agencies also appear to have been subject 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 their enterprise. Their whole 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 which 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 and Alt A backed securities.⁵⁴ Perhaps most significantly, as has been pointed out by many critics, ratings agencies were subject to possible 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 assigned by credit rating agencies created intellectual hazard of their own. Other actors in the financial sector relied on these ratings in performing their job.

⁵⁴ See Phil Gramm, *Deregulation and the Financial Panic*, WALL ST. J., Feb. 20, 2009, at A17.

The reliance – or perhaps overreliance⁵⁵ – 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: as Claire A. Hill has argued, investors may have continued to rely on ratings because they were displaying an adaptive trait of “incorporating new data that potentially conflicts with one’s pre-existing worldview so as to preserve as much of that worldview as possible.”⁵⁶

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 a very influential forces in banking regulation during the past twenty years.⁵⁷ The Basel I Capital Adequacy Guidelines are among the most successful regulatory initiatives in the history of global finance; and the Basel II guidelines introduced in June 2004 promised, at one time, to be even more influential. These guidelines are not hard law, but their prestige has contributed to their being implemented in many countries around the world. The Crisis of 2008, however, forced a reassessment of the Basel Committee’s contribution and raised

⁵⁵ See Frank Partnoy, *Overdependence on Credit Ratings was a Primary Cause of the Crisis*, Proceedings of the 2008 International Banking Conference: "The First Credit Market Turmoil of the 21st Century", San Diego Legal Studies Paper No. 09-015, available at LSN Corporate Law: Law & Finance APS Vol. 8 No. 12, 08/04/2009.

⁵⁶ Claire A. Hill, *Why Did Anyone Listen To The Rating Agencies After Enron?*, 4 J. BUS & TECH. L. 283 (2009)..

⁵⁷ For a discussion of the prestige of the Basel Committee and the influence of its output, see Michael Barr & Geoffrey Miller, *Global Administrative Law: The View from Basel*, 17 EUR.J. INT’L L. 15, 15-46 (2006).

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 are fundamentally concerned with *capital*. The Basel I guidelines were entirely concerned with capital adequacy at banking firms; the Basel II guidelines were principally focused on capital, although they bowed also to the objectives of market discipline and banking supervision. 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 prior to their failure. Arguably 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 50%, in contrast with all commercial lending, which had a 100% risk weighting. 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,⁵⁸ was based on two well-understood historical patterns. First, as a historical

⁵⁸ Basel Committee on Banking Supervision, *Basel II: International Convergence of Capital Measurement and Capital Standards: a Revised Framework Paragraph 72* (June 2004) (under standardized approach to risk-weighting, “Lending 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%.”)

matter people did not, in general, default on their mortgages. No one wanted to lose their 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 faulted for drawing on history here; but the problem was that the guidelines treated default probabilities as fixed and did not take account of the possibility that home prices would not remain stable and that borrowers would depart from their historical pattern of paying off their mortgages. Beyond this, the guidelines implicitly conveyed the message that home loans were the gold standard: 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 which 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 were instructed to use ratings from “external credit assessment institutions” (i.e., credit rating agencies) in determining the amount of capital to hold against loans to particular borrowers.⁵⁹ The Basel Committee thus implicitly endorsed the opinions of credit rating agencies and gave the imprimatur to their operations. In the wake of the financial crisis, the reputation of credit rating agencies has been tarnished by their failure to accurately assess 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 utilize their “own internal estimates of risk components in determining the capital

⁵⁹ For discussion, see, e.g., Patrick Van Roy, *Credit Ratings and the Standardised Approach to Credit Risk in Basel II*, European Central Bank Working Paper No. 517, August 2005.

requirement for a given exposure.’⁶⁰ The theory is that banks know much more about the actual risk profile of their assets than regulators know, and also 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 piggy-back 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, can be seen as 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 process of 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 an imprimatur of credibility and technical brilliance similar to the *éclat* that characterized economic models utilized by financial firms. Naturally, government agencies charged with implementing the guidelines and banks tasked with complying with them tended to defer to their wisdom in a way which in retrospect appears to have been misguided.

The Basel II process also arguably manifested complexity bias. Given the complex and demanding, but also very specific calculations required under the guidelines, actors of complex organizations charged with risk-control and compliance naturally faced the temptation to display

⁶⁰ Basel Committee on Banking Supervision, *Basel II: International Convergence of Capital Measurement and Capital Standards: a Revised Framework* Paragraph 211 (June 2004).

tunnel vision – to do what is demanded of them and to not 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-to-hand rule of thumb as a means for making sense of the environment in which they operate. Even though the Basel guidelines are themselves complicated, once someone learns how to operate within them, the natural tendency is to allow the guidelines to take the place of reality: to see a bank that is in compliance with regulatory capital requirements as a safe bank, regardless of its actual risk profile.

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, like the capital adequacy guidelines, have the appearance of scientific validity and precision.⁶¹ 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. The appearance of precision and the comfortable set of mandatory 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 financial 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.⁶² The exaggerated

⁶¹ For an introduction, see Richard Scott Carnell, *A Partial Antidote to Perverse Incentives: The FDIC Improvement Act of 1991*, 12 ANN. REV. BANKING L. 317 (1993).

⁶² Indymac Bank, a very large California thrift institution (\$32 billion in assets) was closed by the regulators in July 2008. See <http://www.fdic.gov/news/news/press/2008/pr08056.html>. Only a few weeks before it was closed,

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 Bernard Madoff scandal. In retrospect, many observers have concluded that the returns Madoff purported to generate for his investors were too good to be true. No one could so consistently generate returns of more than 10 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 appears to lie partly in intellectual hazard. Madoff was a prestigious, powerful member of the securities industry. He was one of the founders of NASQ and a former member of its board of directors. His firm was well-known in the financial world. The regulators who failed to identify his fraud may have been victims of authoritarian bias – they were bedazzled by Madoff's reputation and failed to see the signs of fraud.⁶³ They also displayed confirmation bias: when examining Madoff's operations they expected to find a reputable firm; they interpreted the evidence in front of them as indicating that Madoff was operating a legitimate enterprise and so failed to identify the pattern of fraudulent behavior that only became evident after Madoff's confession.

III. Possible Reforms

Indymac reported adequate regulatory capital. Office of Inspector General, Department of the Treasury, Safety and Soundness: Material Loss Review of IndyMac Bank, FSB, OIG-09-032 (Washington, D.C.: Feb. 26, 2009).

⁶³ 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.").

The discussion 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 about 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 in terms of public policy.

In addressing this question, it is important to recognize that intellectual hazard is a pervasive and unavoidable feature of financial markets – and indeed in 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 effort is enlisted 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 incorporate greater attention to the findings of behavioral finance when they evaluate or formulate proposals for reform.⁶⁴ The following suggestions for reform are advanced, not as fully developed policy recommendations, but rather as invitations for thought and debate about how intellectual hazard might be better managed and controlled in the future.

⁶⁴ See generally Emiliou Avgouleas, *Behavioural Finance and Financial Regulation: In Search of a New Orthodoxy*, 9 J. CORP. L. LAW STUD. (2009) (proposed actions by governments worldwide will be less effective than expected because they lack a focus on behavioral finance).

Complexity bias. The discussion above has suggested that complexity is a fertile source for intellectual hazard.⁶⁵ In some cases, the level of complexity chosen by an institution may exceed what appears reasonably necessary in order to achieve the desired outcome. Enron is a prime example: its financing structure, replete with special purpose entities and complex asset transfers, was beyond the ken of virtually everyone.

Recognizing that different forms of complexity bias are pervasive in complex organizations, corporate directors and external regulators might demand that the relevant actors to provide simple, cogent answers to complex questions about the underlying assumptions and how those simple answers would change in unusual circumstances. A mild response 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 which they apply to a given firm.

Corporate Governance Reforms. Given the problems of complexity bias, self-serving bias and other intellectual hazard noted above, 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

⁶⁵ See, e.g., Vasiliki Skreta and Laura Veldkamp, *Ratings Shopping and Asset Complexity: A Theory of Ratings Inflation* (Oct. 24, 2008), available at <http://ssrn.com/abstract=1295503> (suggesting that when a firm's assets are complex, risk assessments by rating agencies tend to diverge, resulting in the potential for ratings shopping and a resulting increase in risk in financial markets).

who oversee accounting, internal controls, and financial reporting.⁶⁶ A 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 independent, to manifest independent thought in practice. Regulators could also make sure to understand more clearly the motivations of the presenters of analyses or the advocates for corporate policies so that these recommendations can be weighed with 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.

Education. Some of the problems of intellectual hazard might be addressed through education.⁶⁷ Educators could clarify and assess the applicability of complex models in ways which address complexity biases. Educators could also focus more of their professional responsibility or ethics training courses to expose and discuss aspects of intellectual hazard for future practitioners. Economics and business courses can – and undoubtedly will – highlight issues that heretofore have often been ignored or assigned to higher level courses: the institutional basis for finance, the role of speculation, asset price bubbles, and economic crises; the uses and abuses of economic modeling; and the pros and cons of leverage in a firm's financial structure. While not discounting the fundamental importance of quantitative analysis, business school courses can focus more on qualitative factors such as the application of judgment and common sense. Continuing education at the workforce, either formal or informal, might also

⁶⁶ Sarbanes Oxley Act § 301, 15 U.S.C.A. § 78j-1.

⁶⁷ We thank Henry Kaufmann for suggesting this reform in private conversation.

stress these matters and also encourage the application of independent judgment by managers at all levels of the organization.

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, asked for an entity – a systemic risk council – that would be tasked with this function. 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,⁶⁸ an operation established to “address vulnerabilities and to develop and implement strong regulatory, supervisory and other policies in the interest of financial stability.”⁶⁹ The European Commission has also entered the debate, issuing a communiqué calling for the creation of a European Systemic Risk Board charged with the task of “monitor[ing] and assess[ing] risks to the stability of the financial system as a whole” and providing “early warning of systemic risks that may be building up and, where necessary, recommendations for action to deal with these risks.”⁷⁰

Ideally, the leadership and staff of such an agency would be composed of individuals who are not directly affiliated with the very institutions that breed intellectual hazard. To date, unfortunately, these proposals fail to accomplish the desirable separation: the personnel of the agencies charged with monitoring systemic stability are 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

⁶⁸ See http://www.g20.org/Documents/Fin_Deps_Fin_Reg_Annex_020409_-_1615_final.pdf.

⁶⁹ See <http://www.financialstabilityboard.org/>.

⁷⁰ See <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/836>;
http://ec.europa.eu/internal_market/finances/docs/committees/supervision/20090923/com2009_499_en.pdf.

crisis (presumably this would be the Fed, but other agencies such as the FDIC and the Comptroller of the Currency might seek a role in the executive authority). 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.⁷¹ The Financial Stability Board, likewise, is staffed by government officials and chaired by Mario Draghi, Governor of the Bank of Italy.⁷²

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 come as advocates for their agency’s positions and as defenders of their agency’s turf and power. These people will be subject to 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; authoritarian bias in the form of deference to the agencies which have delegated personnel to these new monitoring bodies.⁷³

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

⁷¹ See

http://ec.europa.eu/internal_market/finances/docs/committees/supervision/20090923/com2009_499_en.pdf.

⁷² See http://www.financialstabilityboard.org/press/pr_090925c.pdf.

⁷³ It is noteworthy that the predecessor of the Financial Stability Board, the Financial Stability Forum, had a similar mandate of monitoring for systemic risks to 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 generally* Cally Jordan, Does ‘F’ Stand for Failure: The Legacy of the Financial Stability Forum, University of Melbourne Legal Studies Research Paper No. 429 (available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1478527).

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.

Stress Tests. In the wake of the Crisis of 2008, the Fed subjected 19 large banks to “stress tests” intended to assess whether their levels of capital were adequate to cope with serious downturns in economic conditions.⁷⁴ 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 they utilize which, 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 form of stress test to evaluate how it would function if the basic economic assumptions on which it is based no longer hold. The institutions would not have to report proprietary information about their models, but would have to disclose how the models or assumptions performed under different and less favorable economic conditions.

These are only some of the ideas that might be worth exploring as devices to mitigate intellectual hazard. Many others could be imagined. We advance them in the interest of advancing debate on this interesting and important question of financial institution regulation.

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,

⁷⁴ See Hal S. Scott, *The Global Financial Crisis* 52 (2009). 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. *Id.*

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 – 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 conjectures about 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.