AN UNFORTUNATE "TAIL": RECONSIDERING RISK MANAGEMENT INCENTIVES AFTER THE FINANCIAL CRISIS OF 2007–2009

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In recent months, the legal academic community has taken a greater interest in the practice of risk management. Doubtless a response to the recent financial crisis, many have concluded that our current market structure allows for uninhibited risk taking and the pooling of systemic risk. Accordingly, most have suggested a regulatory response is necessary. This Comment, in unreserved agreement with these writers, attempts to contribute to this literature in two ways.

First, this Comment explains the development of quantitative risk management to fill in the gaps in the existing legal research. Though I present nothing groundbreaking, my purpose is to provide legal professionals with a brief but not overwhelming account of the industry's recent rise to power. Following this initial discussion, I then return to the current risk-management debate and, making a second contribution to the recent academic literature, I build on the incentive modeling and regulatory suggestions presented by Professor Karl Okamoto is his recent article, After the Bailout: Regulating Systemic Moral Hazard. *In pertinent part, I recommend that policymakers implement a new disclosure regime and a compensation clawback private right of action to realign informational incentives in risk-based decision making.*

In the end, this Comment in no way seeks to be the last word in this discussion. And, with luck, I hope that it will not be. The recent financial crisis has exposed more than a few

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shortcomings in our financial regulation latticework, and we would do well to honestly discuss these limitations. Though politically less palatable than the previous century's approach to financial regulation, it may be time to seriously consider regulating not only executive compensation, but secondary manager compensation. As this Comment suggests, much ill-advised wrongdoing can be captured by making these difficult decisions.

INTRODUCTION

It was late Sunday night on March 16, 2008; most were fast asleep, preparing to welcome the week ahead.[1] But unbeknownst to those in slumber, the Federal Reserve was in the final stages of a transaction that would soon find a home in the annals of financial tragedy: the fire sale of Bear Stearns, a weathered and failing investment bank, to J.P Morgan, a neighboring commercial institution.[2] This "unprecedented" event,[3] essentially a gift from the Federal Reserve to J.P. Morgan,[4] dramatically concluded a week of turmoil in the American financial markets[5]—a week the Wall Street Journal claimed "sh[ook] American Capitalism."[6]

The sequence of events that preceded the rescue of the nearly century-old Bear Stearns is surprisingly short—just under a year by most accounts.[7] The early tremors began in June 2007 as the United States secondary mortgage market began to

1. *See* Andrew Ross Sorkin & Landon Thomas Jr., *JPMorgan Acts to Buy Ailing Bear Stearns at Huge Discount*, N.Y. TIMES, Mar. 16, 2008, http://www.nytimes.com/2008/03/16/business/16cnd-bear.html.

2. Much was said on the day the transaction took place. *See, e.g.*, *id.* However, as the financial crisis continues, a host of business literature related to Wall Street's near collapse is beginning to surface. *See, e.g.*, WILLIAM D. COHAN, HOUSE OF CARDS: A TALE OF HUBRIS AND WRETCHED EXCESS ON WALL STREET (2009); LARRY ELLIOTT & DAN ATKINSON, THE GODS THAT FAILED: HOW BLIND FAITH IN MARKETS HAS COST US OUR FUTURE (2009); GEORGE SOROS, THE CRASH OF 2008 AND WHAT IT MEANS: THE NEW PARADIGM FOR FINANCIAL MARKETS (2008).

3. *See* Edmund L. Andrews, *Fed Acts to Rescue Financial Markets*, N.Y. TIMES, Mar. 17, 2008, http://www.nytimes.com/2008/03/17/business/17fed.html ("The moves [with regard to Bear Stearns] amounted to a sweeping and apparently unprecedented attempt by the Federal Reserve to rescue the nation's financial markets.").

4. Some have argued that the rescue of the Bear Stearns Cos. was a "[J.P. Morgan] bailout, not a bailout of Bear [Stearns]." David Evans, *Hedge Funds in Swaps Face Peril with Rising Junk Bond Defaults*, BLOOMBERG.COM, May 20, 2008, http://www.bloomberg.com/apps/news?pid=20601109&sid=aCFGw7GYxY14 (quoting Joseph Mason of the Graduate School of Banking at Louisiana State University and noting that a natural failure of Bear Stearns would have detrimentally affected J.P. Morgan). *But see* Felix Salmon, *CDS Counterparty Risk and the Bear Stearns Bailout*, FELIXSALMON.COM, May 20, 2008, http://www.felixsalmon.com/003355.html (questioning Mason's statement and arguing the Federal Reserve's motivation was in contracts written by Bear Stearns as a counterparty for the entire financial market—not in protecting any other specific firm).

5. *See* Andrew R. Sorkin, *JP Morgan Pays $2 A Share for Bear Stearns*, N.Y. TIMES, Mar. 17, 2008, http://www.nytimes.com/2008/03/17/business/17bear.html.

6. Robin Sidel et al., *The Week That Shook Wall Street: Inside the Demise of Bear Stearns*, WALL ST. J., Mar. 18, 2008, at A1.

7. For an insider's description of the failure, see BILL BAMBER & ANDREW SPENCER, BEAR TRAP: THE FALL OF BEAR STEARNS AND THE PANIC OF 2008 (2008).

weaken.[8] Bear Stearns, a significant provider of products and services to that market, reported a slump in quarterly earnings.[9] As fears grew, Merrill Lynch, a fellow investment bank, seized $850 million in collateral from Bear Stearns' asset management business.[10] In a matter of days, two Bear Stearns hedge funds were forced to secure a $3.2 billion loan from their parent company to remain afloat.[11] By August of 2007, the loan proved insufficient, and the hedge funds were forced into bankruptcy.[12] Those bankruptcies—the unofficial start of the "credit crunch"—raised serious concerns about the viability of the entire financial system.[13] Not surprisingly, most financial institutions began hoarding liquid capital to weather the impending storm.[14]

Then, on March 10, 2008, six months into the full-blown crisis, industry rumors cast doubt on whether Bear Stearns had sufficient liquidity to continue day-to-day operations.[15] Some hours later, the firm rebuffed these reports and assured the public it was flush with capital.[16] Nevertheless, the investment bank experienced a modern day "bank run" as lend-

8. By that time, even the non-business news outlets were beginning to report Bear Stearns' troubles. *See* Madlen Read, *Stocks Extend Rally After Inflation Data*, USA TODAY, June 14, 2007, http://www.usatoday.com/money/markets/2007-06-13-2549780130_x.htm?csp=34.

9. *Id.* ("[The] Bear Stearns Cos. reported weaker-than-expected second-quarter earnings . . . citing mortgage lending troubles.").

10. Merrill Lynch, as a lender to Bear Stearns' asset management business, acquired the assets that collateralized its loans and sold them on the open market to recoup its growing losses. *See* Jeremy Herron, *Bear Stearns Buys Time for Struggling Fund*, WASH. POST, June 23, 2007, at D02.

11. *See* Bloomberg News, *Bear Stearns to Pay $3.2B for Fund Bailout*, BOSTON GLOBE, June 23, 2007, http://www.boston.com/business/globe/articles/2007/06/23/bear_stearns_to_pay_32b_for_fund_bailout (noting Bear Stearns's difficulty selling assets to meet the mounting margin calls).

12. Stephanie Baum, *Bear Hedge Funds File for Bankruptcy*, FIN. NEWS ONLINE, Aug. 2, 2007, http://www.efinancialnews.com/assetmanagement/pensionfunds/content/2348455486.

13. *Cf.* Kate Kelly, *Prosecutors in Bear Case Focus in on Email*, WALL ST. J., June 19, 2008, at A1 ("[The] funds' woes . . . helped mark the beginning of the global credit crunch."). It also resulted in the prosecution of two Bear Stearns fund managers. *See id.* (explaining the events that led to the arrest and prosecution of the two hedge fund managers).

14. *See Timeline: The Credit Crunch of 2007/2008*, REUTERS, Aug. 5, 2008, http://www.reuters.com/article/gc06/idUSL155564520080805.

15. *See* Jeff Kearns & Yalman Onaran, *Bear Stearns Shares Fall on Liquidity Speculation (Update 6)*, BLOOMBERG.COM, Mar. 10, 2008, http://www.bloomberg.com/apps/news?pid=20601010&sid=aa874wpC8wcg&refer=news.

16. Maurna Desmond, *Bear Growls: 'Rumors are False,'* FORBES.COM, Mar. 10, 2008, http://www.forbes.com/2008/03/10/bear-stearns-closer-markets-equity-cx_md_0310markets21.html.

ers extracted assets from the firm.[17] On March 16, without capital or alternatives, the company buckled and was forcibly consumed by J.P. Morgan—all for $2 per share (initially).[18]

To be sure, the Bear Stearns rescue will not be soon forgotten.[19] Even so, the most significant impact of the story lies in what did *not* occur. Had Bear Stearns not been sold to J.P. Morgan and instead experienced a natural unwinding, the fallout could have caused a "systemic risk event"—an event that could have ruined the financial system and perhaps the economy at large.[20] According to Professor Steven Schwarcz, the possibility that a systemic risk event may occur can be defined as:

> [T]he risk that (i) an economic shock such as market or institutional failure triggers (through a panic or otherwise) either (X) the failure of a chain of markets or institutions or (Y) a chain of significant losses to financial institutions, (ii) resulting in increases in the cost of capital or decreases in its availability, often evidenced by substantial financial-market price volatility.[21]

Considering Bear Stearns's role in the financial markets, it is easy to understand why the Federal Reserve was so keen to

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17. *See* Brian Wingfield, *What Killed Bear?*, FORBES.COM, Apr. 3, 2008, http://www.forbes.com/2008/04/03/banking-bear-bernanke-biz-wall-cx_bw_0403 bear2.htm (claiming Bear Stearns was the victim of a "bank run that would have made Franklin Roosevelt cringe"). One particularly problematic event during this time was not an extraction of liquid assets, but rather Bear Stearns's inability to raise short-term liquid capital. *See* BAMBER & SPENCER, *supra* note 7, at 94–95 (explaining that Goldman Sachs refused to engage in overnight repurchase transactions with Bear Stearns).

18. Alejandro Lazo, *Congress to Probe U.S. Role in Bear Stearns Sale*, WASH. POST, Mar. 27, 2008, at DO3. The figure subsequently increased to $10 per share. *Id.*

19. The legality of the rescue has already received some attention. *See* Thomas O. Porter, II, Note & Comment, *The Federal Reserve's Catch-22: A Legal Analysis of the Federal Reserve's Emergency Powers*, 13 N.C. BANKING INST. 483, 485 (2009) (arguing that emergency provision of §13(3) of the Federal Reserve Act made the rescue of Bear Stearns "legally defensible").

20. *See* RETO R. GALLATI, RISK MANAGEMENT AND CAPITAL ADEQUACY 26 (2003) (discussing the effects of systemic shocks); Jenny Anderson & Vikas Bajaj, *A Wall Street Domino Theory*, N.Y. TIMES, Mar. 15, 2008, http://www.nytimes.com/2008/03/15/business/15risk.html (discussing systemic risk and Bear Stearns specifically).

21. Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193, 204 (2008). Though Professor Schwarcz's definition is well taken, there is no uniformly accepted definition of systemic risk. GALLATI, *supra* note 20, at 23.

facilitate the Bank's orderly demise. Because Bear Stearns was a dealer of many sophisticated financial products, a natural institutional failure could have caused whole swathes of activities and instruments tied to the creditworthiness of the Bank to disintegrate—an event that could have instantly brought global losses and further institutional failures.[22] In turn, these events could have caused markets to collapse as firms attempted to digest previously mitigated risk.[23] Because this domino theory could have increased costs of capital to the detriment of the overall economy, Bear Stearns was "saved" not for its own benefit, but because it was "too interconnected to fail."[24]

Since the historic Bear Stearns rescue, the Federal Government has used public funds to rescue,[25] bail out,[26] recapitalize,[27] and cleanup[28] some of the largest financial entities in his-

22. The primary culprits here were insurance-like risk-shifting contracts known as credit derivatives. *See* Elizabeth Spiers, *Bear Run: Why the Fed Had to Bailout Bear Stearns*, SLATE, Mar. 18, 2008, http://www.slate.com/id/2186792. For a meaningful discussion of these instruments, see Robert F. Schwartz, *Risk Distribution in the Capital Markets: Credit Default Swaps, Insurance and a Theory of Demarcation*, 12 FORDHAM J. CORP. & FIN. L. 167, 167 (2007). Moreover, Bear Stearns' prime brokerage unit provided back-end services to many other asset management businesses. *See* Spiers, *supra*. Without this functionality, some client funds would have been frozen as Bear Stearns slid into bankruptcy. *Id.*

23. Because other firms in the marketplace purchased instruments from Bear Stearns to hedge the risk of negative credit events, a failure of Bear Stearns would have forced its counterparties to reassume the risk that those events may again occur. *See* Spiers, *supra* note 22.

24. *See* Greg Robb, *Fed Saw Bear Stearns as Too Interconnected to Fail: Minutes*, MARKETWATCH, June 27, 2008, http://www.marketwatch.com/story/fed-saw-bear-stearns-as-too-interconnected-to-fail-minutes. This also brought the overall economy's new liquidity issues into the limelight. *See* José Gabilondo, *Leveraged Liquidity: Bear Raids and Junk Loans in the New Credit Market*, 34 J. CORP. L. 447, 449 (2009) (noting that the transaction "mark[ed] the official recognition that new liquidity dynamics in our credit markets merit attention").

25. *See* Press Release, Federal Housing Finance Agency, Statement of FHFA Director James B. Lockhart 1, 5 (Sept. 7, 2008), *available at* http://www.ustreas.gov/press/releases/reports/fhfa_statement_090708hp1128.pdf (Fannie Mae and Freddie Mac).

26. *See* Matthew Karnithchnig et al., *U.S. to Take Over AIG in $85 Billion Bailout; Central Banks Inject Cash as Credit Dries Up*, WALL ST. J., Sept. 16, 2008, at A1 (American International Group ("AIG")).

27. *See* 12 U.S.C.A. § 5211 (2008) (The particularly problematic Troubled Asset Relief Plan ("TARP")). The TARP started as a plan to purchase assets, but ran into pricing trouble. *See* Theo Francis, *Treasury Plan to Buy Toxic Assets Likely Hinges on Pricing*, BUSINESSWEEK, Feb. 8, 2009, http://www.businessweek.com/blogs/money_politics/archives/2009/02/treasury_plan_t.html. This led then Secretary Paulson to directly recapitalize the banks. *See* Ruthie Ackerman, *TARP Changes Colors*, FORBES.COM, Nov. 12, 2008, http://www.forbes.com/2008/11/12/

tory—all in the name of mitigating or preventing systemic risk events like those described above. Not surprisingly, these rescues, bailouts, recapitalizations, and cleanups have led many to call for regulatory reform, and much is underway to curtail future demands for this type of public finance.[29] Not surprisingly, the current regulatory movement is most concerned with avoiding that which caused the need for public funds in the first instance: suboptimal levels of systemic risk in the financial sector.[30] Today, some feel the actions that brought us to the brink of cataclysm in 2007 and 2008 are traceable to egregious risk taking by financial-sector firms.[31]

It has been argued that institutional failure might have been avoided if our laws could have prevented outsized risk taking in the years preceding the recent financial crisis. In the Bear Stearns context, this theory holds that if regulators had possessed the tools to limit risk taking in the soon-to-fall Bear Stearns hedge funds, there would have been little need for the Bear Stearns parent company to make a private loan to the

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treasury-tarp-update-markets-equity-cx_ra_1112markets28.html. However, many questioned whether the new plan would work at all. *See, e.g.*, Takeo Hoshi & Anil K. Kashyap, *Will The U.S. Bank Recapitalization Succeed? Lessons from Japan* (Nat'l Bureau of Econ. Research, Working Paper No.14401, 2008). Consequently, the new administration created a public-private partnership to facilitate the purchase of the still-toxic assets. *See* Maya Jackson Randall & Michael R. Crittenden, *Treasury Unveils Toxic-Asset Plan, Citing 'Acute Pressure' on Banks*, WALL ST. J., Mar. 24, 2009, http://online.wsj.com/article/SB123780994825213465.html. But it is far from clear this strategy will be successful. *See* Heide B. Malhotra & Antonio Perez, *Extinguishing Toxic Assets Is No Guarantee*, EPOCH TIMES, Apr. 15, 2009, http://www.theepochtimes.com/n2/content/view/15344.

28. *See* Ben S. Bernanke, Chairman, U.S. Fed. Reserve, Speech Before the Greater Austin Chamber of Commerce (Dec. 1, 2008), *available at* http://www.federalreserve.gov/newsevents/speech/bernanke20081201a.htm (Lehman Brothers).

29. *Compare* DEP'T OF THE TREASURY, BLUEPRINT FOR A MODERNIZED FINANCIAL REGULATORY STRUCTURE (2008), *available at* http://www.treas.gov/press/releases/reports/Blueprint.pdf [hereinafter BLUEPRINT], *and* THE GROUP OF THIRTY, FINANCIAL REFORM: A FRAMEWORK FOR FINANCIAL STABILITY (2009), *available at* http://www.group30.org/pubs/recommendations.pdf [hereinafter FINANCIAL REFORM], *with* DEP'T OF THE TREASURY, FINANCIAL REGULATORY REFORM, A NEW FOUNDATION: REBUILDING FINANCIAL SUPERVISION AND REGULATION (2009), *available at* http://www.financialstability.gov/docs/regs/FinalReport_web.pdf [hereinafter REBUILDING FINANCIAL SUPERVISION].

30. *See* Press Release, U.S. Dep't of the Treasury, Treasury Outlines Framework for Regulatory Reform: Provides New Rules of the Road, Focuses First on Containing Systemic Risk (Mar. 26, 2009), *available at* http://www.treas.gov/press/releases/tg72.htm [hereinafter Treasury Release].

31. *See generally* Karl S. Okamoto, *After the Bailout: Regulating Systemic Moral Hazard*, 57 UCLA L. REV. 183 (2009). Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 GEO. L.J. (forthcoming 2010) (abstract at 1), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1410072.

hedge funds, and in turn, the Federal Reserve might not have needed to rescue Bear Stearns at all. This intuition rightly underlies the recent movement to regulate the hedge fund industry and the derivatives markets[32]—at least to the degree that the current administration seeks to prevent a substantially similar financial crisis from recurring.

This logic, however, does not necessarily extend to other systemic risk events. In short, it is difficult to know which decisions carry the potential for systemic harm on an ex ante basis.[33] Consequently, Congress cannot simply regulate one particular decision-making pattern that has previously led to sys-systemic harm and assume that the financial markets are now free from the possibility of financial catastrophe.[34] The root of the problem is located not in a specific class of decisions, but in the aggregate expectations of financial decision makers. Consequently, the cause of suboptimal systemic risk rests in the collective psyche of the markets and as such is much more difficult to pin down.[35]

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32. *See* Treasury Release, *supra* note 30; *see also* Press Release, U.S. Dep't of the Treasury, Regulatory Reform: Over-the-Counter (OTC) Derivatives (May 13, 2009), *available at* http://www.ustreas.gov/press/releases/tg129.htm (announcing proposals for regulatory reform in the derivatives markets); Press Release, U.S. Dep't of the Treasury, Fact Sheet: Administration's Regulatory Reform Agenda Moves Forward: Legislation for the Registration of Hedge Funds Delivered to Capitol Hill (July 15, 2009), *available at* http://www.treas.gov/press/releases/tg214.htm [hereinafter Proposed Hedge Fund Regulations] (announcing regulatory reform in the hedge fund industry).

33. For example, the Crash of 1907 that prompted the creation of the Federal Reserve was the result of one single market participant's attempt to corner prices in the American copper market. *See* FED. RESERVE BANK OF BOSTON, PANIC OF 1907 3–6, *available at* http://www.bos.frb.org/about/pubs/panicof1.pdf. By contrast, the most recent failure is traceable to the collective action of many thousands of investment managers acting in concert. *See infra* Part I.A.2.

34. For example, the infamous "SOX" regulations, aimed primarily at this decade's accounting woes, did little to prevent the recent financial crisis. *See* Roberta Romano, *Does the Sarbanes-Oxley Act Have a Future?*, 26 YALE J. ON REG. 229, 293 (2009) (noting there is little link between SOX and the recent financial crisis).

35. Even so, some instances of failure tend to have a common theme. The events that often produce extreme failures in the financial sector also often appear after the materialization of a low probability, high impact event—in the vernacular, a "Black Swan" event. *See* NASSIM N. TALEB, THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE (2007). Because the industry never expects the "Black Swan," decision makers tend to ignore the outcomes attached to very low-probability high-impact events. *Id.* at 141 (noting "the presence of an ingrained tendency in humans to underestimate outliers—or Black Swans"). While this tendency to ignore the improbable is important to the thematic point of this Comment, I should note that the class of low-probability avoidance I refer to throughout is not identical to the Black Swan event. In short, the low probability

Considering this more abstract problem, it is unlikely that new and more exacting financial rules will capture all instances of suboptimal systemic-risk-generating activities. The better way to avoid future rescues, bailouts, and public recapitalizations is to regulate something within the mind of the decision maker: systemic-risk-generating *incentives*. In this logic, the antecedent is further removed. Rather than restricting specific activities we think may cause systemic risk—such as the excessive use of structured financial products and derivatives—we should regulate the agents and offices that make systemically critical decisions about such strategies. Accordingly, we should restructure risk-management incentives through corporate reporting and compensation reform to incentivize those responsible for systemically critical decisions to be more cognizant of the low-probability, high-impact events that occasionally plague the financial system.

The remainder of this Comment considers economic principles to show that altering corporate reporting and compensation schemes may ameliorate two economic vices: moral hazard and collective action. As this Comment shows, finance professionals who do not share equally in the losses and gains to a transaction (as is often the case) have a moral-hazard incentive to overzealously take risk and ignore low-probability events. Similarly, these decision makers have a collective-action incentive to rationally take risks, low-probability ones included, that benefit the firm but harm the overall structure of the market. To combat these problems, I review recent work on this topic by Professor Karl Okamoto.[36] As an extension of his work, I argue for a new disclosure regime that places pressure on risk managers to produce either a risk-based concurring or dissenting report for a financial firm's most significant risk-based decisions. Second, I argue for a compensation "clawback" private right of action—a program aimed at curbing overzealous risk taking though private sector incentives.[37]

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risk that may cause significant moral-hazard problems for an asset manager or a risk manager may present itself far more often than would the Black Swan event. *See infra* Part II.B.2.

36. *See* Okamoto, *supra* note 31.

37. This "incentives analysis" was made popular in the law and economics setting. *See* Ralf Michaels, *Comparative Law by Numbers? Legal Origins Thesis,* Doing Business *Reports, and the Silence of Traditional Comparative Law*, 57 AM. J. COMP. L. 765, 768 (2009) ("[N]eoclassical law and economics . . . is based essentially on the idea that law should be measured by the incentives it sets for welfare-maximizing conduct."). However, before going forward, a note about the na-

The following argument proceeds in four parts. First, Part I considers the history of risk management in both its theoretical and administrative contexts with the express purpose of revealing risk management's impressive development over the last fifty years. Part II searches for an explanation to an important question: if risk management has taken such great leaps, why the wholesale failure in 2007–09? This Part reviews anecdotal accounts and then, turning to harder science, considers the incentive problems inherent in investment and risk management. After concluding that market failure plagues the basic role of the decision maker in the financial sector, Part III recommends that Congress enact disclosure and clawback schemes to help firms and the financial markets avoid future calamity. This Comment concludes by briefly arguing that the governance debate should be reframed with reference to the party that always matters most—the everyday investor.

I. RISK AND THE FINANCIAL INSTITUTION

Part I of this Comment discusses the development of risk management in the modern financial institution. Despite several thousand years of financial innovation,[38] the appreciation of financial risk is an academic development of only the last

ture of the assertions in this Comment is necessary. It has been suggested, and I think rightly, that the mere allegation that an actor may naturally act in a destructive way may also paradoxically tend to legitimize that action. *See* Sumantra Ghoshal, *Bad Management Theories Are Destroying Good Management Practices*, 4 ACAD. MGMT. LEARNING & EDUC. 75, 76 (2005) ("[B]y propagating ideologically inspired amoral theories, business schools have actively freed their students from any sense of moral responsibility."). If this assertion is true in the legal policy that attends risk management, this Comment may contribute to and exacerbate the problems it seeks to identify and rectify. Such problems have been noted in other legal contexts. *See* Robin Paul Malloy, *Equating Human Rights and Property Rights—The Need for Moral Judgment in an Economic Analysis of Law and Social Policy*, 47 OHIO ST. L.J. 163, 177 (1986) (concluding that cost-benefit theorists of the right to life "affront strongly held moral values and suggest policy directives so contrary to the normative values of the society that both the economic system and the legal system capable of reaching such conclusions are discredited"). While I do not (and cannot) equate the right to life and risk management, it is possible that risk management and the banking industries in total may simply be in need of higher moral expectations—expectations that may need to be first sought in the legal literature. Though I recognize the importance of this issue, such larger discussions must, unfortunately, be left for another day.

38. Charles R.P. Pouncy, *Contemporary Financial Innovation: Orthodoxy and Alternatives*, 51 SMU L. REV. 505, 519–32 (1998) (cataloging the historical development of financial products over five millennia).

century.[39] And even then, the widespread implementation of risk-conscious management techniques can only be traced to the mid 1950s.[40] Standing next to well over a thousand years of formal banking,[41] or nearly three centuries of neoclassical economics,[42] the concept of risk management—in theory and in practice—is a recent novelty.

Notwithstanding this slow rise to power, the "risk archipelago" that risk management currently attempts to manage is substantial.[43] Thus, "financial risk" does not fit squarely beneath the broader concept of "risk management." Accordingly, it is necessary to define the scope of "risk" and "risk management" that I will refer to *in passim*. This Comment considers financial risk as the uncertainty of future outcomes as viewed from the perspective of a banking institution.[44] In the financial sector, bank risk minimally refers to three classes of risk:

(1) market risk: the risk that changes in asset prices will reduce firm value.

(2) credit risk: the risk that a counterparty's creditworthiness will reduce firm value.

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39. *See* GALLATI, *supra* note 20, at 4 (reviewing the modern history of risk management in the United States and noting that Henry Fayol developed a concept of "security" that seemed to concern some of the modern concepts of risk management by 1916). For one of these first texts, which notes the "tangle" that confuses profit lies in an understanding of risk, see FRANK H. KNIGHT, RISK, UNCERTAINTY, AND PROFIT 19 (1921).

40. *See* Betty Simkins & Steven A. Ramirez, *Enterprise-Wide Risk Management and Corporate Governance*, 39 LOY. U. CHI. L.J. 571, 579 (2008) (tracing the modern development of risk management to the early 1950s).

41. *See* Pouncy, *supra* note 38, at 519 (noting royal treasuries in 3500 B.C.E. took deposits of grain and silver as currency and made loans in the same).

42. The seminal writing, of course, was published in 1776. *See* ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS (1776).

43. *See* ACCIDENT AND DESIGN: CONTEMPORARY DEBATES IN RISK MANAGEMENT 3–4 (Christopher Hood & David K.C. Jones eds., 1996). For more comprehensive studies of risk see Vincent T. Covello & Jeryl Mumpower, *Risk Analysis and Risk Management: An Historical Perspective*, 5 RISK ANALYSIS 103, 103 (1985) (explaining the role of the Asipu, a group dedicated to managing society's riskiest decisions and rendering decisions on clay tablet); Simkins & Ramirez, *supra* note 40, at 577 (citing PETER L. BERNSTEIN, AGAINST THE GODS: THE REMARKABLE STORY OF RISK 8 (1996) (discussing the origins of risk and similar stories)).

44. *See* GEOFFREY A. HIRT & STANLEY B. BLOCK, FUNDAMENTALS OF INVESTMENT MANAGEMENT 587 (7th ed. 2003) (defining risk as the uncertainty of future outcomes).

(3) operational risk: the risk that a firm's internal systems will fail and reduce firm value.[45]

Given the foregoing, this Comment's references throughout to "financial risk" and "risk management" submit to a financial institution's method of identifying, measuring, and acting with respect to these three categories of risk.[46]

Having narrowed the class of risk (and thereby narrowed the scope of risk management), it is also useful to further delineate the roles of those who make risk-based decisions in the financial institution. To be sure, the organizational complexity of a financial institution is impacted by the activities the institution undertakes, and as such, it is beyond the scope of this Comment to analyze the decision-making framework of each idiosyncratic operation. But because the arguments made in this Comment speak to the generalities of risk-based decision making, I will assume that each firm employs at least an asset manager and a risk manager below some higher level of executive management.[47] In the pages that follow, I presuppose that the asset manager and the risk manager operate like "the pilot and the copilot" when making risk-based decisions.[48] The former makes the final operational decisions while the latter attends to the instrumentation and information used in the operation.[49]

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45. *See* MICHEL CROUHY, DAN GALAI & ROBERT MARK, RISK MANAGEMENT 543 (2001) (condensing bank risk into these three categories for use in the Risk Adjusted Return on Capital ("RAROC") model). There are, however, much finer divisions of bank risk. *See id.* at 34–39.

46. Admittedly, this discussion will largely pertain to market risk. For a recent discussion of operational risk, see Kimberly D. Krawiec, *The Return of the Rogue*, 51 ARIZ. L. REV. 127 (2009).

47. I do so specifically to expose the problems that plague secondary managers rather than corporate executives. As pointed out recently by Steven Schwarcz, though the compensation debate has historically concerned executive management, new problems are becoming recognized amongst lower levels of management. *See* Steven L. Schwarcz, *Conflicts and Financial Collapse: The Problem of Secondary-Management Agency Costs*, 26 YALE J. ON REG. 457, 457–58 (2009) (noting that there are a few exceptions and citing as examples Roni Michaely & Kent L. Womack, *Conflict of Interest and the Credibility of Underwriter Analyst Recommendations*, 12 REV. FIN. STUD. 653, 654 (1999), and H.D. Vinod, *Conflict of Interest Economics and Investment Analyst Biases*, 70 BROOK. L. REV. 53, 69, 72 (2004)).

48. CROUHY, GALAI & MARK, *supra* note 45, at 579–80.

49. *See id.* Importantly then, this Comment also presumes that the asset manager and the risk manager are not the same actor. In some common cases, this assumption will not hold true (for example in the personal investing context). Though I make this division throughout, it is worth noting that the asset manager

Turning now to the contemporary development of modern financial risk management, two overlapping movements must be explored. First, because "a common deficiency in risk-management systems and policy proposals is the lack of a firm theoretical foundation,"[50] Section A spends a moment explaining the theoretical scholarship that underlies the quantification of financial risk. Following this theoretical movement, Section B delves into a second, more practical movement, and seeks to illustrate how firms have applied the theoretical developments highlighted in Section A. In doing so, Section B sketches the corporate approach to risk management from the basic guesswork of the early 1950s to the modern day concept of "Enterprise Risk Management" ("ERM").

A. Theoretical Grounding

The modern history of financial risk can best be explained in four stages: (1) the formal quantification of financial risk, (2) the "free lunch" debates, (3) the development of the Black-Scholes Options Pricing Model, and (4) the rise of comprehensive risk management and "Value at Risk." Because this Comment is directed to legal professionals, the following discussion proceeds in a non-technical fashion.

1. The Formal Quantification of Financial Risk

The formal quantification of financial risk occurred via two groundbreaking models that mathematically married risk and return.[51] These models, the Mean-Variance Portfolio Selection Model[52] and the Capital Asset Pricing Model ("CAPM"),[53] are

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is not divorced from the study of risk, and the risk manager is not divorced from the study of investing. Each actor must understand the other's role, and in some cases, the two actors may be educated in such a manner that it would be possible to mimic the other. As will be explained in later sections, the primary difference between the actors lies in the method by which each is compensated. *See infra* Part II.B.3.

50. CROUHY, GALAI & MARK, *supra* note 45, at 22.

51. For those familiar with the field, this discussion will largely consider the development of Modern Portfolio Theory. For an early (and detailed) treatment of this topic in the legal literature, see Harvey E. Bines, *Modern Portfolio Theory and Investment Management Law: Refinement of Legal Doctrine*, 76 COLUM. L. REV. 721 (1976).

52. *See* Harry Markowitz, *Portfolio Selection*, 7 J. FIN. 77 (1952).

53. *See* William F. Sharpe, *Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk*, 19 J. FIN. 425 (1964); *see also* John Lintner, *The*

both Nobel Prize winning works that replaced subjective evaluations of the risk and return tradeoff with objective science.[54]

The Journal of Finance published the first of these works in 1952, *Portfolio Selection* by Harry Markowitz, and introduced the world to a new brand of financial theory: mean-variance analysis.[55] In his seminal article, Markowitz mathematically defined the concept of financial risk for the first time.[56] Markowitz's methods allowed financial managers to think about risk and return as a function of statistical returns, variation, and correlation amongst a portfolio's assets.[57] In other words, the model allowed financial managers to understand risk as a concept grounded in mathematical expectations.[58]

Though the model's numerous calculations made its real-time application unwieldy,[59] it suggested that returns could be estimated by historical observations (the "mean" in "mean-variance") and that risks could be quantified by the historical volatility of the returns (the "variance" in "mean-variance").[60] Because this relationship in the model becomes non-linear with more than one risky asset, mean-variance analysis also allowed financial managers to optimize a portfolio.[61] In this way, Markowitz's model enabled financial managers to mathematically determine which combination of assets in a portfolio produced

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Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets, 47 REV. ECON. & STAT. 13 (1965).

54. *See* Merton H. Miller, *The History of Finance: An Eyewitness Account*, 25 J. PORTFOLIO MGMT. 95, 95 (1999) (noting the importance of these two developments).

55. *See* Markowitz, *supra* note 52. For the more complete extension of the theory, see HARRY M. MARKOWITZ, PORTFOLIO SELECTION: EFFICIENT DIVERSIFICATION OF INVESTMENT (1959).

56. Mark Rubinstein, *Markowitz's 'Portfolio Selection': A Fifty Year Retrospective*, 57 J. FIN. 1041 (2002) (dedicating the entire article to the impact of the theory).

57. *See id.*

58. *See id.*

59. *See* Donald A. King, Jr. & Michael S. Young, *Why Diversification Doesn't Work: Flaws in Modern Portfolio Theory Turn Real Estate Portfolio Managers Back to Old-Fashion Underwriting*, 24 REAL EST. REV. 6, 9 (1994) (highlighting the weakness of the model and noting that it was unworkable because it was unwieldy).

60. *See* Miller, *supra* note 54, at 96.

61. The model allows one to select a particular risk level and maximize the portfolio's returns at that level. Adjusting the given risk tolerance thus creates a set of "efficient" portfolios. *See* J. Gregory Sidak & Susan E. Woodward, *Takeover Premiums, Appraisal Rights and the Price Elasticity of A Firm's Publicly Traded Stock*, 25 GA. L. REV. 783, 788 (1991) (explaining the efficient portfolio is a maximization of the mean-variance function for each risk observation).

the largest return by computing the expected return and expected variation of the assets in the portfolio—both statistics that could be derived from historical data.[62] Today, optimization is the foundational principle that leads to "diversification."[63] As is often mentioned, mean-variance analysis formally illustrated *why* financial managers should not put all their eggs in one basket.[64]

After Markowitz's work, Professors Sharpe, Lintner, and Treynor each independently gave finance its next giant leap in the early 1960s with the CAPM.[65] This model, which assumes investors adhere to the mean-variance analytical framework created by Markowitz,[66] simplified the calculations in Markowitz's original work and predicted that asset prices could be derived by their individual co-variation with market prices.[67] Thus, the CAPM allowed financial managers to understand the risk of a portfolio by comparing the portfolio's variation with the variation of the broad market—a relevant metric now termed "Beta risk."[68]

As has been argued since its inception, the CAPM failed to accurately predict the risk and return characteristics of a portfolio in many contexts, and weakly described the "real world."[69] Notwithstanding these limitations, the ability to quantify risk, albeit on a limited basis, had become more readily available to the business manager. According to finance scholars, that

62. *See id.*

63. *See* Miller, *supra* note 54, at 96.

64. *See, e.g.*, Library of Economics and Liberty, The Concise Encyclopedia of Economics, Harry Markowitz, http://www.econlib.org/library/Enc/bios/Markowitz.html (last visited Sept. 14, 2009).

65. *See* André F. Perold, *The Capital Asset Pricing Model*, 18 J. ECON. PERSPECTIVES 3, 15–17 (2004) (condensing Professor Sharpe's work on the CAPM); *see also* Sidak & Woodward, *supra* note 61, at 789 (noting the same three professors all developed the CAPM within moments of each other).

66. More formally, the CAPM assumes (1) unlimited access to borrowing at the risk-free rate, (2) uniform investment horizons, (3) rational maximization of utility in terms of mean and variation, (4) homogenous investor expectations, (5) perfectly divisible assets, (6) no taxes or transaction costs, and (7) market efficiency. *See* HIRT & BLOCK, *supra* note 44, at 605.

67. *See* Perold, *supra* note 65, at 15–17.

68. *See id.*

69. This limitation is also the foundation for Ronald Gilson's work on the value of transactional lawyers—that lawyers bring the imperfect CAPM world closer to its assumptions. Ronald J. Gilson, *Value Creation by Business Lawyers: Legal Skills and Asset Pricing*, 94 YALE L.J. 239, 255 (1984) ("[T]he business lawyer acts to constrain the extent to which conditions in the real world deviate from the theoretical assumptions of [the CAPM].").

alone was the value of the model; it was better than nothing at all.[70]

Markowitz's mean variance selection tool and his progeny's CAPM changed the world of finance.[71] In just over a decade, financial managers had been given a powerful instrument that took some of the guesswork out of financial management and replaced it with an ability to mathematically quantify a firm's risk profile. As such, the two theories heavily suggested that financial managers should specifically consider the risk characteristics of certain actions when making basic investment decisions in the firm.

2. The "No Free Lunch" Theories[72]

While the work of the scholars above substantially supplemented the analytical tools available to financial managers, the development of two related theories questioned the viability of older analytical tools. These two theories, the Modigliani-Miller Theorem ("M&M Theorem")[73] and the Efficient Markets Hypothesis ("EMH"),[74] together stand for the idea that, under some simplifying assumptions, non-normal returns to capital cannot be generated by creative capital structure judgments or investment strategies.[75] Stated differently, the M&M Theorem and the EMH further identified that risk and return calculations were the touchstone of financial management and that

70. *See* Miller, *supra* note 54, at 97 (claiming that the industry, in Milton Friedman's positivist sense, adopted the model not for its accuracy, but for its predictive value); *see also* Eugene F. Fama & Kenneth R. French, *The Capital Asset Pricing Model: Theory and Evidence*, 18. J. ECON. PERSP. 25, 25 (2004) ("The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and about the relation between expected return and risk.").

71. Finance, according to Merton Miller in 1999, had "been living on [Markowitz's] formula, literally, for more than forty years." Miller, *supra* note 54, at 96. And a decade later that no doubt still holds true. *See* Andrew Hanlon, *The Dubious Efficiency of the Efficient Frontier*, FORBES.COM, Apr. 9, 2009, http://www.forbes.com/2009/04/09/modern-portfolio-theory-personal-finance-financial-advisor-network-harry-markowitz.html (paying thanks to Markowitz and his progeny, but noting that financial managers need new tools to find uncorrelated asset classes).

72. I attribute this phrase to Professor Miller. *See* Miller, *supra* note 54, at 100.

73. *See* Franco Modigliani & Merton H. Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment*, 48 AM. ECON. REV. 261 (1958).

74. *See* Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383 (1970).

75. *See* Miller, *supra* note 54, at 98–99.

convenient shortcuts were not as relevant as the industry might have historically presumed.

First, the M&M Theorem extended the Markowitz, Sharpe, Lintner, and Treynor scholarship by showing that, under perfect market assumptions, a firm's market value is independent of its capital mix.[76] Thus, it was argued that a public company could not increase its value by simply "reengineering the capital structure."[77] By implication, the M&M Theorem held that managers could only increase value in a firm by selecting projects with certain risk- and profit-generation characteristics.[78] Though not as groundbreaking as the previous works described above[79] (and not the ultimate death knell of capital structure decisions in risk management[80]), the M&M Theorem provided financial managers with a further justification for considering the risk and return profile of assets rather than an alternative surrogate.

The second "no free lunch" theory, which operates in similar fashion to the M&M Theorem, is the EMH.[81] The EMH indicates that information is instantly reflected in a stock price as soon as that information enters an "efficient market."[82] The development of this theory had two primary implications for managers. First, it suggested that above-average returns in

76. *See* Modigliani & Miller, *supra* note 73, at 268.

77. *See* CROUHY, GALAI & MARK, *supra* note 45, at 27–28.

78. *See* Miller, *supra* note 54, at 99.

79. The value of the M&M theorem is often questioned because it is it is difficult test and thus does not have the same predictive force that attends mean-variance analysis or the CAPM. *See* Miller, *supra* note 54, at 99. Similarly, the M&M Theorem is also often disparaged because it readily falls apart when one considers that firms hold proprietary information about their profit generating activities—an information asymmetry that violates the "perfect information" assumption of the M&M Theorem. *See* Peter M. DeMarzo & Darrell Duffie, *Corporate Financial Hedging with Proprietary Information*, 53 J. ECON. THEORY 261, 262 (1991).

80. Professors Harris and Raviv conceive of at least four other justifications for altering a firm's capital structure: (1) "ameliorate conflicts of interest" and agency problems, (2) convey information to "mitigate adverse selection effects," (3) "influence the nature of products or competition," and (4) "affect the outcome of corporate control contests." *See* Milton Harris & Artur Raviv, *The Theory of Capital Structure*, 46 J. FIN. 297, 299 (1991).

81. Fama, *supra* note 74 (deriving the EMH).

82. As simply explained by *The Economist*, "[t]he efficient market hypothesis says that the price of a financial asset reflects all the information available and responds only to unexpected news. Thus prices can be regarded as optimal estimates of true investment value at all times." Economist.com, Economics A–Z, Efficient Market Hypothesis, http://www.economist.com/research/Economics/alphabetic.cfm?letter=E#efficientmarkethypothesis (last visited Sept. 14, 2009). For the formal derivation of the theory, see Fama, *supra* note 74, at 384–88.

the markets could not be generated using public information.[83] Second, the EMH also conveniently tended to show that, if one did generate a method to achieve non-normal returns using public information, market participants would adopt that method and precipitously erode its predictive value.[84] Consequently, the EMH recommended that some investment philosophies could not outperform others, and in turn suggested that it was impossible to "beat the market."[85]

Though the M&M Theorem and the EMH are not widely assumed to be applicable to the real world, each held that the corporate manager in the financial institution could not, on a theoretical basis, increase value to a firm via capital structure decisions or novel investment strategies.[86] Consequently, if the Mean-Variance Portfolio Selection Model and the CAPM point *to* risk-based decision making, the M&M Theorem and the EMH point *away from* non-risk-based decision making. In this sense, the latter two models complement the former two.[87]

3. The Black-Scholes Options Pricing Model

The next development of interest in the quantification of financial risk was the 1973 Black-Scholes Options Pricing Model.[88] Like earlier models, the Black-Scholes Model followed similar assumptions and actively set off further advances in the analysis of risk.[89] In short, the Black-Scholes Model re-

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83. As explained by the original scholar:

> Most simply the theory . . . implies that a series of stock price changes has no memory—the past history of the series cannot be used to predict the future in any meaningful way. The future path of the price level of a security is no more predictable that the path of a series of cumulated random numbers.

Eugene Fama, *Random Walks in Stock Market Prices*, 51 FIN. ANALYSTS J. 75, 76 (1995).

84. *See id.*

85. *See id.*

86. As pointed out by Merton Miller, the two theories are related in that they consider "*equilibrium* in the capital markets." *See* Miller, *supra* note 54, at 100.

87. *See id.*

88. *See* Fischer Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637 (1973); Robert C. Merton, *Theory of Rational Option Pricing*, 4 BELL J. ECON. & MGMT. SCI. 141 (1973). For a basic overview of this model, see NOVA Online, The Formula That Shook the World, http://www.pbs.org/wgbh/nova/stockmarket/formula.html (last visited Oct. 7, 2009) (citing Zvi Bodie and noting that the derivation of the Black-Scholes Model in finance is equivalent to the discovery of DNA in genetic engineering because both were the impetus for entirely new fields of study).

89. *See* CROUHY, GALAI & MARK, *supra* note 45, at 25.

duced options pricing to five variables when valuing a contingent equity claim: stock price, strike price, time, volatility, and the riskless rate of interest—all items which are readily observable.[90] This formula was considered to be superior to earlier models because it ejected lower-grade reliance on risk preferences and expected stock values.[91] After rigorous testing by scholars, the Black-Scholes Model has long been assumed to produce mostly reliable option prices.[92]

After the inception of the Black-Scholes Model, financial engineers applied its tenets to an extraordinary volume of financial problems.[93] The even basic extensions of the Black-Scholes Model to products such as derivative assets are beyond the scope of this Comment.[94] Therefore, it is only worth noting that the Black-Scholes Model allowed managers to complement the risk analysis set out by previous scholars in that, after identifying some unwanted risk, an option or other contingent claim asset could be priced, accurately, to manage that risk.[95] In this sense, the Black-Scholes Model operated both as a quantification device and as a mitigation device for risk managers to use in conjunction with other risk measurement tools.[96]

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90. *See id.* at 184–85.

91. *See* Carl Luft, *The Black-Scholes Option Pricing Model*, *in* HIRT & BLOCK, *supra* note 44, at 435.

92. *Id.* Like other models, it too falls short of perfection. *See* CROUHY, GALAI & MARK, *supra* note 45, at 185–87 (noting the limitations of the "Greeks," the building blocks of the Black-Scholes Model expressed in Greek notation, in measuring financial risk).

93. For an early comprehensive overview of options pricing theory, see Clifford W. Smith, Jr., *Option Pricing: A Review*, 3 J. FIN. ECON. 3 (1976). For a simpler description, see GALLATI, *supra* note 20, at 47–54.

94. The primary difficulty lies in one's ability to understand mathematics usually reserved for the physical sciences. *See generally* N.H. BINGHAM & RÜDIGER KIESEL, RISK-NEUTRAL VALUATION: PRICING AND HEDGING OF FINANCIAL DERIVATIVES 33–63 (1998) (opening discussion of derivatives pricing with discussion of measure theory in mathematics).

95. This, of course, does not consider the panoply of arbitrage opportunities that came into existence after the Black-Scholes. Because I think these opportunities do not meaningfully contribute to the discussion of risk management in later sections and will only cause confusion, I will point the reader to BINGHAM & KIESEL, *supra* note 94, for more complex study of arbitrage pricing.

96. This use is primarily effectuated through basic hedging strategies. For more on this topic, see *infra* Part II.A.2. However, the academic value of the Black-Scholes Model is even further reaching. Smith, *supra* note 93, at 5 (noting that the ability to expand the Black-Scholes Model to other contingent claim problems in finance is one of the most important observations in the recent history of finance).

4. Firm Level Metrics and Value at Risk

The primary development that brought risk quantification to its current heights is a sophisticated extension of these theories known as "Value at Risk" ("VaR").[97] In its commonly used form, VaR is a firm-level metric that considers (1) the probabilistic distribution of a firm's portfolio at some time in the future, and (2) that portfolio's market value at the current time.[98] This deceptively simple two-part model contains thousands of calculations and is better considered a risk model aggregator that produces one important magic number: the value the firm can expect to lose at some specified level of confidence over a given period of time—the firm's value at risk.[99]

Even though the VaR model is imperfect,[100] finance professionals have widely adopted the metric.[101] VaR exists in three classic forms.[102] The first of these three methods, the Variance-Covariance Approach, is a direct extension of Markowitz's work and assumes changes in a portfolio's value are

97. For comprehensive treatment of this topic, see CROUHY, GALAI & MARK, *supra* note 45, at 177–258.

98. For a basic inquiry into the model, see Simon Benninga & Zvi Wiener, *Value-at-Risk (VaR)*, 7 MATHEMATICA IN EDUC. & RES. 1, 1–2 (1998).

99. *See id.* at 1 ("Value-at-Risk (VaR) measures the worst expected loss under normal market conditions over a specific time interval at a given confidence level."). The significance of the VaR figure to a financial manager is self-evident. If it is accurate, the firm may instantly derive its exposure to financial risk. *See* CROUHY, GALAI & MARK, *supra* note 45, at 180.

100. The VaR model (along with the Black-Scholes options model) suffered a serious setback in 1998 when the now infamous hedge fund Long-Term Capital Management lost half a billion dollars in a matter of days as the firms internal financial models failed. For a full account of the Long Term Capital Management failure, *see generally* ROGER LOWENSTEIN, WHEN GENIUS FAILED: THE RISE AND FALL OF LONG-TERM CAPITAL MANAGEMENT (2000). For more formal considerations of the Long-Term Capital Management failure, see Philippe Jorion, *Risk Management Lessons from Long-Term Capital Management*, 6 EUR. FIN. MGMT. 277 (2000).

101. *See* CROUHY, GALAI & MARK, *supra* note 45, at 179–80. Unlike previous efforts to quantify risk, VaR researchers were mostly housed in industry facilities, not universities. *See* GALLATI, *supra* note 20, at 357 (noting that VaR was created by financial institutions). J.P. Morgan's risk-management group is perhaps most famous for initiating the VaR revolution. In 1989 J.P. Morgan's Dennis Weatherstone began utilizing VaR reports, and after some internal success with its product, started to assist others in developing VaR models—a spin-off firm we know today as RiskMetrics. Henry T. C. Hu, *The New Portfolio Society, SEC Mutual Fund Disclosure, and the Public Corporation Model*, 60 BUS. LAW. 1303, 1346 (2005).

102. I will refrain from commenting on the recent extensions of the model here. For more on this topic, see CROUHY, GALAI & MARK, *supra* note 45, at 229–57 (discussing extensions of the VaR approach).

normally distributed over time.[103] Accordingly, one need only determine the risk factors associated with the portfolio and those factors' individual distributions to calculate the portfolio's VaR.[104] The second method, the Historical Simulation Approach, derives VaR not from the normal distribution, but from the value of the portfolio's risk factors over a specified number of days.[105] In this variation of the model, the risk manager constructs a time frame, revalues the portfolio based on the historically observed changes in the risk factors, and constructs a histogram of portfolio values for which VaR can then be identified.[106] The third approach, the Monte Carlo Simulation Approach, takes a different tack. In this method, the risk manager continuously simulates the random processes that affect market prices.[107] As each simulation produces a new portfolio value, the values will converge to the true distribution of the portfolio.[108]

None of these three methods is foolproof. Because the Variance-Covariance Approach assumes a portfolio's distribution is normal, it fails to capture the true distribution of a portfolio—that is, the leptokurtic or "fat tail" nature of the distribution.[109] As such, this most basic approach underestimates the frequency with which the most unlikely events might occur.[110] The Historical Simulation Approach does not fare much better. Though this approach does not require the normal distribution assumption, it relies on the particularities of the past that are included in the historical data set.[111] Therefore, because this variety of the VaR calculation does not fully appreciate market events outside of the data set, it may lead to a biased VaR calculation.[112] Finally, the Monte Carlo Simulation Approach is generally considered to be the most efficient VaR calculation.[113] It can accommodate any distribution and can be used to value a complex portfolio of assets.[114] Even with these advances, however, the Monte Carlo Simulation Approach also does not in-

103. *Id.* at 198–99.
104. *See id.* at 199.
105. *See id.* at 206–07.
106. *Id.* at 207.
107. *Id.* at 212.
108. *Id.*
109. *Id.* at 216–17 tbl.5.10a.
110. *See id.*
111. *Id.* at 217 tbl.5.10b.
112. *See id.*
113. *See id.* at 217 tbl.5.10c.
114. *Id.*

clude outlier events in the artificially constructed distribution.[115]

In light of the foregoing, there is a simple truth about the VaR model: it is powerful, but it fails to capture an outlier event that might topple a financial institution. As expected, in the last two decades, VaR models have become the subject of much attention. Substantial research has been conducted in the last decade to fill in the gaps. As efforts to tweak and refine the VaR model occur, and advances in technology move onward, we might expect more. But for now, VaR—for better or worse—is what financial managers have to live with.

B. The Practice of Risk Management

In the last fifty years, risk management has been transformed from an industry that lacked a quantitative practice to an industry armed with tools to measure portfolio risk nearly instantaneously across multiple asset classes. Even so, these advances are only half of the picture. While Markowitz and his progeny were developing their groundbreaking theories, models, and computer software, another wing of professionals was using these developments to manage the business of finance. As I will explain below, like the theoretical development of financial risk, the practice of risk management has also undergone significant change in the last fifty years. First, Subsection 1 explains the practice of risk management in the few decades following the works of the theoretical scholars. Subsection 2 then considers the regulatory shift that followed the Market Crash of 1987 and the Basel Capital Adequacy Standards. Finally, Subsection 3 reviews the most recent development in the field: "Enterprise Risk Management" ("ERM").[116]

1. Early Beginnings

As highlighted above, risk management as a philosophy can be traced backwards a few thousand years, but its contemporary history, particularly in the financial institution, only extends to the 1950s.[117] Around this time, risk management was

115. *Id.*

116. For more information on this topic, see generally Simkins & Ramirez, *supra* note 40.

117. *See supra* text accompanying note 40.

cabined to actuarial studies in the insurance industry and had not yet made the leap to the basic financial institution business model.[118] The first contemporary text that considered risk management as a formal practice was Russell B. Gallagher's 1956 article, *Risk Management: A New Phase of Cost Control*.[119] This influential article appeared in the *Harvard Business Review* and was the first writing to advocate the creation of a full-time "risk manager."[120] From this document, others started to offer similar recommendations, and risk management began to take a more managerial flavor that considered firm costs, human resources, and operations management.[121]

While these managerial developments were in process, firms also began to implement theoretical advances in risk quantification. From the 1970s to the 1990s, most modern risk-management concepts were tied to very specific silos, or categories, of risk. In short, it became the job of financial science to manage these risks with new financial products.[122] This *ad hoc* process essentially begins with locating, defining, and quantifying a particular risk, and ends with a product that isolates a particular risk's incidence in the overall risk profile of the firm.

For example, prior to 1960, the Bretton Woods Agreement, an international treaty that was signed after World War II, fixed international foreign exchange rates across nations.[123] Further, the agreement held that the fixed rates were only alterable with the permission of the International Monetary Fund ("IMF"), a multination organization.[124] In the 1960s, these rates were (slowly) abandoned, and the world moved to floating foreign exchange rates.[125] However, when this aban-

118. *See* KIT SADGROVE, THE COMPLETE GUIDE TO BUSINESS RISK MANAGEMENT 1 (2d ed., Gower Publishing Ltd. 2005) (noting that insurance was the primary source of risk study until the 1960s and 1970s).

119. Russell B. Gallagher, *Risk Management: A New Phase of Cost Control*, HARV. BUS. REV., Sept.–Oct. 1956, at 75.

120. GALLATI, *supra* note 20, at 12.

121. *Id.* at 11–12.

122. *See* Ronald J. Gilson & Charles K. Whitehead, Essay, *Deconstructing Equity: Public Ownership, Agency Costs, and Complete Capital Markets*, 108 COLUM. L. REV. 231, 244–45 (2008) (noting that financial markets responded with new products during this time period).

123. *See* Articles of Agreement of the International Bank for Reconstruction and Development art. IV § 7, Dec. 27, 1945, 60 Stat. 1440, 2 U.N.T.S. 134, *available at* http://www.teamlaw.org/BWAgreements.pdf.

124. *Id.*

125. For background on the system, see Peter M. Garber, *The Collapse of the Bretton Woods Fixed Exchange Rate System*, *in* A RETROSPECTIVE ON THE

donment occurred, the "hitherto obscured volatility surfaced in traded foreign currencies."[126] With the appearance of this new risk—currency risk—financial engineers set out to quantify and manage its impact on their firms.[127] From that time onward, we have had a host of differing currency contracts that financial entities use to manage volatility in the foreign exchange markets.[128]

The previous example is just one of any number of other events that followed a similar sequence of steps.[129] During the 1970s and 1980s, financial products, as implemented by financial managers, were the mainstay of risk management in the financial institution, and risk management was not yet an industry-wide, comprehensive process.[130] It took a historic event to alter this line of logic.

2. Black Monday and The Basel Accords

On Monday, October 19, 1987, the S&P Composite Portfolio fell by 20.4 percent.[131] Termed "Black Monday," the market's crash that day was the largest percentage change in 29,000 days of stock market operation.[132] The crisis began as "program trading," or computer-driven buying and selling,

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BRETTON WOODS SYSTEM 461 (Michael D. Bordo & Barry Eichengree eds., Univ. of Chicago Press 1993).

126. *See* CROUHY, GALAI & MARK, *supra* note 45, at 6.

127. *Id.*

128. *Id.* However, this is but one of the reasons new financial products came into existence at that time. *See* Pouncy, *supra* note 38, at 524–29 (reviewing the financial innovation over this same period of time that was induced by a general increase in international trade—including Euromarkets, swap contracts, and back-to-back loans).

129. This example is not unique. I could similarly recount the development of swaps and options, over-the-counter (OTC) derivatives, and other financial products. Others have done so. *See generally* 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).

130. However, the process was coalescing. *See* Gilson & Whitehead, *supra* note 122, at 243–47 (noting rising interest rates began to congeal risk-management tools and practices).

131. G. William Schwert, *Stock Volatility and the Crash of '87*, 3 REV. FIN. STUD. 77, 77 (1990). Statistically speaking, the Crash of 1987 was a "25 standard deviation event." *See* Hu, *supra* note 101, at 1328 n.136.

132. *See* Schwert, *supra* note 131, at 77. For the comprehensive report commissioned by the President on this matter, see THE PRESIDENTIAL TASK FORCE ON MARKET MECHANICS, REPORT OF THE PRESIDENTIAL TASK FORCE ON MARKET MECHANISMS (1988) (submitted to the President of the United States, the Secretary of the Treasury, and the Chairman of the Federal Reserve Board).

blindly sold investments into falling markets.[133] The result was a downward spiral of prices, forced selling to cover obligations, and, in turn liquidity shortfalls.[134] Many claimed that Black Monday could have been avoided by more comprehensive risk-management practices within the trading arms of financial institutions.[135]

In the wake of the global effects of the 1987 crash, the international community, particularly the United States and Great Britain, rightly became interested in the concept of risk management at large financial firms.[136] To tackle this now global challenge, the Basel Committee on Banking Supervision was created to harmonize international capital adequacy standards for banks.[137] The idea was that the world market needed a better, more homogeneous method for determining the cu-

133. Program trading is "[c]omputerized trading used primarily by institutional investors typically for large-volume trades. Orders from the trader's computer are entered directly into the market's computer system and executed automatically." Investopedia, Program Trading, http://www.investopedia.com/terms/p/programtrading.asp (last visited Sept. 14, 2009). Portfolio insurance strategies were also frequently blamed for the Black Monday event. As explained by Anise C. Wallace:

> Portfolio insurance is a computer trading strategy used by institutional investors to protect paper gains or offset losses on stock holdings. When the stock market falls a certain amount—usually 3 percent—managers using the strategy sell a mathematically determined amount of stock index futures to protect against a decline in the value of their clients' stock portfolios.
>
> That selling, in turn, sets the wheels in motion for stock index arbitrage, in which computers take advantage of tiny discrepancies between the stock index futures—which represent a basket of stocks—and the stocks themselves. The arbitragers buy the cheaper contracts and sell the stocks that make up the index, which, of course, drives down stock prices.

Anise C. Wallace, *The Brady Report: Looking for Flaws; Study Cites Portfolio Insurers' Role as a Key to the Market Meltdown*, N.Y. TIMES, Jan. 11, 1988, at D8.

134. *See* Mark Carlson, *A Brief History of the 1987 Stock Market Crash with a Discussion of the Federal Reserve Response* (Fed. Reserve Bd., Finance & Economics Discussion Series, Working Paper No. 2007-13, 2006), *available at* http://www.federalreserve.gov/Pubs/feds/2007/200713/200713pap.pdf.

135. It is, however, unclear that such trading per se increases volatility. *See* G. William Schwert, *Stock Market Volatility: Ten Years After the Crash*, FIN. ANALYSTS J., May–Jun. 1990, at 23, 23.

136. *See* CROUHY, GALAI & MARK, *supra* note 45, at 21.

137. "The Basel Committee on Banking Supervision was founded in 1975," GALLATI, *supra* note 20, at 56, but the United States has monitored capital adequacy standards in banks for decades. *See* Malcolm C. Alfriend, *International Risk Based Capital Standard: History and Explanation*, ECON. REV., Nov.–Dec. 1988, at 28–34 (tracing the highpoints in history and noting that until World War II the Federal Reserve used assets as a percent of deposits to measure bank capital).

shion a bank should have on hand to absorb extreme risk events. To do so, the Basel agreements advocated the utilization of "core capital reserves" that would assure liquidity during times of crisis—a rainy day fund of sorts.[138] Though not binding on the signatories, 120 countries signed the agreements.[139]

However, soon after the Basel I regime came into existence, it showed signs of weakness, particularly in the method by which it calculated capital reserves. [140] To simplify, the Basel I agreement created internationally standardized buckets for different asset classes.[141] If an institution owned a certain dollar volume of a particular asset class, the firm simply multiplied a Basel I risk metric by the amount of assets in that bucket to arrive at their regulatory capital requirements.[142] In light of this unbending solution to a complex problem, sophisticated institutions became increasingly frustrated with Basel I's fixed risk calculations. With this problem and others in mind, a fresh Basel II agreement was in the works by 1999.[143]

The Basel II agreement, finalized in 2004, was an improvement over Basel I because it marked a response to the overall deregulatory political climate that existed in the late 1990s.[144] In reply to this political push and the woes of Basel I's simplistic calculations, Basel II allowed certain banks to

138. *See* Pierre-Hugues Verdier, *Transnational Regulatory Networks and Their Limits*, 34 YALE J. INT'L L. 113, 133 (2009) ("Regulatory capital requirements force banks to maintain sufficient capital to absorb significant losses without becoming insolvent."). Also though, the Basel agreements exist to prevent a race to the bottom in banking regulations that might attract banking activity and cause fragility across the (now) global system. *See id.* at 132.

139. *Id.*

140. *See* Jon Danielsson et al., *An Academic Response to Basel II* 4 (LSE Fin. Markets Group, Econ. & Soc. Research Council Research Centre, Special Paper No. 130, 2001), *available at* http://www.bis.org/bcbs/ca/fmg.pdf (noting the dissatisfaction with risk insensitive measures).

141. *See* Alfriend, *supra* note 137, at 30–31.

142. *Id.*

143. *See* Danielsson et al., *supra* note 140 (highlighting the VaR problems that Basel II set out to fix and arguing against their adoption); *see also* BANK FOR INT'L SETTLEMENTS, BASEL COMMITTEE ON BANKING SUPERVISION, INTERNATIONAL CONVERGENCE OF CAPITAL MEASUREMENT AND CAPITAL STANDARDS: A REVISED FRAMEWORK, COMPREHENSIVE VERSION 1 (2006) (highlighting that the first round of comments began in 1999).

144. *See* James D. Cox, *Coping in a Global Marketplace: Survival Strategies for a 75-Year-Old SEC*, 95 VA. L. REV. 941, 941–43 (describing the change in market environment following the Gramm-Leach-Bliley Act, Pub. L. No. 106-102, 113 Stat. 1338 (1999)).

create their own risk controls.[145] The Basel II agreement represented an explicit regulatory approval of the VaR model.[146]

The Basel agreements have become primary influences in the last two decades of banking regulation and risk management.[147] Currently, some are calling for a Basel III agreement to usher in the next wave of banking regulation.[148] The importance of these agreements to the field of risk management lies in their internal risk controls.[149] Each agreement expects the financial institution to "quantify risks, evaluate risks, price risks, and monitor risks" while allowing regulators to supervise the overall risk-management system.[150]

3. The Rise of Enterprise Risk Management

After Basel I and II, "a more advanced and sophisticated approach to managing risk" evolved.[151] This new method, termed "[e]nterprisewide risk management" ("ERM"), represented "a new risk management paradigm" in that it rejected the "silo" approach to managing specific categories of risk in favor of methodical risk management.[152] Formally stated by the leading authority, the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"):

> [ERM] is a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk

145. *See* Guy Kaplanski & Haim Levy, *Basel's Value-at-Risk Capital Requirement Regulation: An Efficiency Analysis*, 31 J. BANKING & FIN. 1887, 1890–91 (2007) (applying the Basel VaR multiplier).

146. The Basel II agreement was not implemented in the United States until 2006. *See* Aaron Unterman, *Innovative Destruction—Structured Finance and Credit Market Reform in the Bubble Era*, 5 HASTINGS BUS. L.J. 53, 104 (2009).

147. *See id.* (noting their widespread adoption).

148. *See We Need a Basel III For a New Order: Soros*, ECON. TIMES, Apr. 11, 2008 (discussing George Soros's lamentations for such a regime).

149. *See* CROUHY, GALAI & MARK, *supra* note 45, at 21.

150. *Id.*

151. *See* Simkins & Ramirez, *supra* note 40, at 580–81.

152. *Id.*

> to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.[153]

While this definition is meaningful and rather comprehensive, the ERM movement did not immediately reach homogeneity. The implementation occurred privately over time in various firms. Consequently, most ERM efforts developed incongruently across the industry.[154] Even so, beginning in the late 1990s, ERM had become a household phrase as institutions began to take the question of risk at the firm level more seriously, regardless of whether they had all adopted the process.[155] As explained by Federal Reserve Governor Susan Schmidt Bies, ERM developed along the lines of the major risk categories that are present in financial institutions.[156] In turn, over the course of a few market cycles, most sophisticated financial institutions had programs that systematically addressed each type of risk at the same managerial level.[157]

Today, ERM represents a significant shift in financial risk management. In a recent article, Professors Simkins and Ramirez consider the shift across three categories.[158] First, risk management in ERM systems moves from a fragmented silo model of risk management to a coordinated culture of risk management integrated at the senior level.[159] Second, ERM systems also reject ad hoc approaches to managing risks in favor of continuous efforts to manage risk as an "ongoing process."[160] Lastly, ERM signals a movement away from "narrowly focused" inquiries into financial risk and towards "broad-

153. *See* COMM. OF SPONSORING ORGS. OF THE TREADWAY COMM'N, ENTERPRISE RISK MANAGEMENT: INTEGRATED FRAMEWORK 2 (2006), *available at* http://www.coso.org/documents/COSO_ERM_ExecutiveSummary.pdf.

154. This fragmentation is largely due to consultancies developing their own proprietary models. *See* GALLATI, *supra* note 20, at 15, 21 (explaining the related concepts of Total Risk Management and Total Quality Management).

155. *See* James Lam, *Enterprise-Wide Risk Management and the Role of the Chief Risk Officer*, ERISK, Mar. 25, 2000, at 1 (noting that ERM was receiving attention in the wake of continued failures brought on by poor risk-management practices).

156. *See* Susan Schmidt Bies, Governor, Bd. of Governors of the Fed. Reserve Sys., Speech at the Nat'l Credit Union Admin. 2007 Risk Mitigation Summit: Enterprise Risk Management and Mortgage Lending (Jan. 11, 2007), *available at* http://www.federalreserve.gov/newsevents/speech/bies20070111a.htm. For the categories of risk, see *supra* note 45 and accompanying text.

157. *See id.*

158. *See* Simkins & Ramirez, *supra* note 40, at 581 fig.1.

159. *Id.*

160. *Id.*

ly focused" considerations of all business risk categories.[161] Even in light of these developments, the industry is still searching for ways to improve the administration of risk management. For example, the Credit Risk Management Policy Group, an industry group, has recommended the creation of a "Chief Risk Officer ("CRO") with a direct line of responsibility to the Chief Executive Officer ("CEO")."[162]

Because ERM builds on past and current techniques in a continuous way, it implicitly utilizes the historical tenets of the field and its most groundbreaking research in a scientific, systematic manner.[163] In sum, this shift represents a movement from guesswork to the most sophisticated process of risk management in history.

II. RISK MANAGEMENT IN THE CURRENT CRISIS

Part I of this Comment discussed the development of risk management in two Sections: the first considered its theoretical evolution[164] and the second considered its managerial implementation.[165] These two historical forays revealed, at a minimum, that risk management has become an increasingly integrated and sophisticated exercise.[166] Because most would expect the industry's performance to track the upward nature of this movement, it seems reasonable to ask why risk management has stumbled in recent months.[167]

Part II takes up this question in two Sections. First, Section A considers the early anecdotal explanation of the failure so far and finds, primarily, that the recent financial crisis has its roots in human failure—not in scientific or theoretical failure. Section B steps away from the anecdotal evidence and utilizes a harder economic analysis to explain why risk managers acted in such poor fashion. In the end, this Comment finds that excessive risk taking at the expense of the larger market

161. *Id.*

162. *See* COUNTERPARTY RISK MGMT. POLICY GROUP III, CONTAINING SYSTEMIC RISK: THE ROAD TO REFORM 23 (2008), *available at* http://www.crmpolicygroup.org/docs/CRMPG-III.pdf.

163. GALLATI, *supra* note 20, at 13.

164. *See supra* Part I.A.

165. *See supra* Part I.B.

166. *See supra* text accompanying notes 98–115, 151–163.

167. Others have pursued similar questions. *See* RISK MANAGEMENT: THE CURRENT FINANCIAL CRISIS, LESSONS LEARNED AND FUTURE IMPLICATIONS 26 (Don Mango et al. eds., 2009) (providing a collection of actuarial essays on the topic).

should have been expected for two reasons: the industry suffers from a moral-hazard incentive to undervalue low-probability risks at the internal level and a collective-action incentive to protect one's individual firm at the expense of the larger financial system.

A. Anecdotal Evidence of Failure

1. Internal Failures with Firm-Level Consequences

As discussed earlier, the current quantitative tools used to engage in risk detection and quantification are flawed in a few very important ways; in particular, they fail to accurately predict low-probability, high-impact events.[168] In the recent financial crisis, it appears that these limitations played meaningful roles inside the firm, but they did so in an anomalous fashion.

As a starting point, it may be reasonable to think that because the quantification of risk is an imperfect science, the recent financial crisis is traceable to a faulty model—namely a flawed VaR model that overlooked the possibility and impact of a swift end to the sub-prime mortgage market.[169] In an article on the limitations of VaR, Joe Nocera debunks this suspicion.[170] As the article reveals, some risk managers and corpo-

168. *See supra* Part I.A.

169. Some have made similar claims. *See* Christine Harper, *Death of VaR Evoked as Risk-Taking Vim Meets Taleb's Black Swan*, BLOOMBERG.COM, Jan. 28, 2009, http://www.bloomberg.com/apps/news?pid=20601109&sid=axo1oswvqx4s ("The risk-taking model that emboldened Wall Street to trade with impunity is broken and everyone from Merrill Lynch & Co. Chief Executive Officer John Thain to Morgan Stanley Chief Financial Officer Colm Kelleher is coming to the realization that no algorithm or triple-A rating can substitute for old-fashioned due diligence."). Other commentators have made this argument with respect to different product-specific models as well. *See* Carrick Mollenkamp et al., *Behind AIG's Fall, Risk Models Failed to Pass Real-World Test*, WALL ST. J., Oct. 31, 2008, at A1 ("AIG relied on [swap] models to help figure out which . . . deals were safe. But AIG didn't anticipate how market forces and contract terms not weighed by the models would turn the [investments], over the short term, into huge financial liabilities."); *see also* Felix Salmon, *A Formula for Disaster*, WIRED, March 2009, at 74, *available at* http://www.wired.com/techbiz/it/magazine/17-03/wp_quant?currentPage=all (chronicling the failures of the copula model used across the industry to misprice structured products).

170. *See* Joe Nocera, *Risk Mismanagement*, N.Y. TIMES MAG., Jan. 4, 2009, at 24, 24–33, 46, 50–51. Others have made similar claims, though. *See* Barry Eichengreen, *The Last Temptation of Risk*, NAT'L INT., May–June 2009, at 8, 8 (noting that risk-management failure is human failure—not risk model failure).

rate executives were well aware of their quantitative limitations but ignored them. Quoting an industry manager:

> [A] computer does not do risk modeling. People do it. And people got overzealous and they stopped being careful. They took on too much leverage. And whether they had models that missed that, or they weren't paying enough attention, I don't know. But I do think that this was much more a failure of management than of risk management. I think blaming models for this would be very unfortunate because you are placing blame on a mathematical equation. You can't blame math.[171]

As further pointed out by Nocera, financial firms might have opportunistically *harnessed* the model's shortcomings.[172] Strangely, the models built to protect financial firms offered the perfect excuse to build risky positions during the run-up to the sub-prime crisis.[173] The limitation in this sense "was a blessing" because it helped justify increased risk taking in a growing market that profitably rewarded such activity.[174] Resultantly, those concerned with taking profits in the inflating bubble rather than in preparing for its eventual collapse could simply point to the VaR model in support of their due diligence.[175] In reality, then, ERM and other risk-based managerial practices might have been nothing more than an effort to "minimize[e] the reportable magnitude of externally specified risk measures."[176] And that, of course, would be inapposite to the goals of the average investor.

However, the internal failure examined to this point says nothing of the division between risk managers and other executives. In the modern-day financial institution, firms employ an entire class of professionals that identify and evaluate firm-

171. Nocera, *supra* note 170, at 31.
172. *Id.* at 46.
173. *Id.* at 50.
174. *Id.*
175. *Id.* This willful-ignorance problem is particularly odd in the sense that risk managers and investors share some of the same ultimate investment goals—in this instance, both camps should celebrate the avoidance of catastrophic loss. *See Hearing Before the H. Comm. of Gov't Oversight & Reform*, 110th Cong. 2 (2008) (testimony of Dr. Alan Greenspan) (claiming that "those of us who have looked to the self-interest of lending institutions to protect shareholder's equity (myself especially) are in a state of shocked disbelief").
176. Michael G. Wacek, *Derivatives, AIG and the Future of Enterprise Risk Management*, *in* RISK MANAGEMENT: THE CURRENT CRISIS, LESSONS LEARNED AND FUTURE IMPLICATIONS 26 (Don Mango et al. eds., 2008).

wide risks with the understanding that higher-level management will review and act on their findings.[177] Accordingly, while corporate decision makers often rely on the advice of the risk manager, there is no guarantee that subsequent layers of management will actually pay heed to even the most accurate risk manager's advice. Recent evidentiary hearings show that a further breakdown in the internal design of risk management occurred specifically at this informational junction.[178] According to testimony before Congress, at least some executives at Fannie Mae and Freddie Mac actively ignored warnings from internal risk-management professionals in the months leading to the sub-prime crisis.[179] Though these problems are not insignificant, they are but part of the story.

2. Internal Failures with Systemic Consequences

Unlike the instances of failure mentioned in Subsection 1, the rescue of Bear Stearns was set in motion because a natural failure of the firm could have set off a chain reaction of failures across the industry—in other words, due to the potential for systemic harm.[180] While the Bear Stearns story is an interesting case study, *why* a domino-like chain reaction could have occurred at any place in the market is the larger issue. The anecdotal evidence suggests that our recent failures are the result of risk taking that benefited the individual firm at the ex-

177. This is a departure from the "pilot-copilot" used in the introduction to this Comment. *See supra* text accompanying notes 48–49. As I mentioned there, the simplifying division between asset and risk managers is not entirely realistic. In later sections I will return to this division, but it is worth noting here that the recent crisis does have roots in more complex organizational structures. For the basic explanation of the ERM system, see *supra* Part I.B.3.

178. For a brief overview of this issue, see Caroline McDonald, *Financial Sector Ignored RM Warnings, RIMS Says*, P&C NAT'L UNDERWRITER, Jan. 23, 2009, http://www.property-casualty.com/News/2009/1/Pages/Financial-Sector-Ignored-RM-Warnings--RIMS-Says.aspx, reviewing a recent webinar by Carol Fox, a senior director in the risk-management practice of Convergys Corporation, and noting that senior executives at Fannie Mae, a large mortgage securitization firm now in conservatorship, actively ignored warnings from risk management.

179. *See The Role of Fannie Mae and Freddie Mac in the Financial Crisis: Hearing Before the H. Comm. on Oversight & Gov't Reform*, 110th Cong. 2 (2008) (opening statement of Rep. Henry A. Waxman, Chairman, H. Comm. on Oversight and Gov't Reform), *available at* http://oversight.house.gov/documents/20081209101424.pdf.

180. *See supra* text accompanying notes 21–24.

pense of the overall market—a market-wide species of what might be called "stuffing risk into the tails."[181]

Recalling earlier discussions, a firm's risk profile is evaluated in terms of probable future outcomes.[182] One way to mitigate an unwanted future outcome in the risk profile (and thus to alter it) is to "hedge" that outcome's impact. Hedging strategies are therefore attempts to neutralize a future observation in a firm's portfolio by purchasing an asset with a historically negative correlation to the observation one seeks to eliminate.[183] If the hedge acts as designed and offsets the unwanted event, neither harm nor benefit should accrue to the firm.[184]

However, because that cancellation of risk occurs via two offsetting events, hedging relies on a stream of offsetting funds *and* a predictable counterparty to provide those funds. Consequently, hedging requires the firm to take on two new risks: the risk that the hedged positions may not exhibit negative correlation,[185] and the risk that the counterparty that supplies the stream of funds may default.[186] Importantly, then, the overall risk profile does not immediately decrease by the offsetting risk of the hedge. Instead, the original risk is diminished, and two new risks are added to the portion of the distribution associated with unlikely events—the tail.[187]

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181. This phrase is adopted from Nocera, *supra* note 170, at 46 (quoting Marc Groz).

182. *See supra* Part II.A.1 (discussing mean-variance analysis, the CAPM, and the VaR model).

183. Economist.com, Economics A–Z, Hedge, http://www.economist.com/research/Economics/alphabetic.cfm?letter=H#hedge (last visited Sept. 14, 2009).

184. *See* Investopedia.com, Perfect Hedge, http://www.investopedia.com/terms/p/perfecthedge.asp (last visited Sept. 5, 2009) ("[A Perfect Hedge is a] position undertaken by an investor that would eliminate the risk of an existing position, or a position that eliminates all market risk from a portfolio. In order to be a perfect hedge, a position would need to have a 100% inverse correlation to the initial position. As such, the perfect hedge is rarely found.").

185. This risk is termed "basis risk." *See* Investopedia.com, Basis Risk, http://investopedia.com/terms/b/basisrisk.asp (last visited Sept. 5, 2009) ("[Basis Risk is t]he risk that offsetting investments in a hedging strategy will not experience price changes in entirely opposite directions from each other. This imperfect correlation between the two investments creates the potential for excess gains or losses in a hedging strategy, thus adding risk to the position.").

186. This risk is termed "counterparty risk." Given the actual and near failure of counterparties in the marketplace, the concept of counterparty risk has received much attention. The leading industry document on the topic was created by the third meeting of the Counterparty Risk Management Policy Group. *See* COUNTERPARTY RISK MGMT. POLICY GROUP III, *supra* note 162.

187. The tail of a distribution is the area where an observation is least likely to occur. In finance, most distributions suffer from "leptokurtosis"—or fat tails. This simply means that more data than one might "normally" expect falls in the

Because decisions like hedging minimize some risks but push others into the tail of a distribution, many similar actions, if taken overzealously, look like "stuffing risk into the tails."[188] In the modern economy, any practice that neutralizes one risk by relying on some separate system takes the new risk that the second system may collapse. Because some of these collapses may only occur during a financial crisis or some catastrophic event (such as the September 11th tragedy)[189], the implementation of such strategies resembles tail stuffing to some degree. As a result, our complex system of finance has aggregated risk and shifted at least some of its consequences to a different area of the distribution. The modern economy has generally been well served by this more efficient structuring.[190] But, because more parties have come to rely on its consistent success, the cost of that change appears to be more severe consequences when the system fails.

As explained in *The Economist*, previous iterations of the financial sector played a version of the card game Old Maid.[191] In those days, banks would lend funds to clients and take on credit risk like they do today, but when a financial crisis occurred, one firm was usually left holding the losses—or the Old Maid.[192] Because the firm was readily identifiable, investors disposed of the firm like they would with any failing institution—by selling the stock.[193]

Risk taking today is no longer like playing Old Maid. The modern economy has taken the deck of cards (credit risk), dropped it into a blender (risk decomposition), and dispersed

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tails of a financial time series distribution. For a description of this phenomenon, see Riskglossary.com, Stable Paretian Distributions, http://www.riskglossary.com/link/stable_paretian_distributions.htm (last visited Sept. 5, 2009).

188. *See* Nocera, *supra* note 170, at 46. Because the misevaluation of asset correlation and the wholesale failure of a counterparty do not frequently occur, we can assume that such events would appear in the tail of the distribution.

189. *See* Roger W. Ferguson, Vice Chairman, Bd. of Governors of the Fed. Reserve Sys., Address at Vanderbilt University: September 11, The Federal Reserve, and the Financial System (Feb. 5, 2003), *available at* http://www.federalreserve.gov/boarddocs/speeches/2003/20030205/default.htm (discussing the central banking activities undertaken to support the flow of capital during the September 11, 2001 banking crisis).

190. *See* NOMURA FIXED INCOME RESEARCH, THIRTY YEARS LATER SECURITIZATION IS STILL GOOD FOR AMERICA 2 (2002) [hereinafter NOMURA] ("Securitization produces its benefits by improving the efficiency of the financial system.").

191. *See The Game is Up: Banks in Trouble*, ECONOMIST, Apr. 16, 2007, at 63.

192. *Id.*

193. *Id.*

the shreds across the industry (risk sharing).[194] The Old Maid is still somewhere hiding in the wings; the industry has just more efficiently spread the risk of holding the Old Maid to more members of the system.[195] That is intuitively attractive, but it also means that the potential for *multiple* failures increases when the market experiences the worst downturns.

A useful example of this problem is the market's recent reliance on Over the Counter ("OTC") Derivatives.[196] Derivatives are simply contracts that are used to shift risk from one party to another—they can be tailored to neutralize anything from corporate defaults[197] to hurricane damage.[198] Notwithstanding practical difficulties in pricing derivatives, these appealing instruments amassed "notional exposures"[199] valued well into the multiple trillions of dollars.[200] The problem is that if a major counterparty were to fail, a host of offsetting contracts tied to that firm would likewise fail, and previously shed risk would shift back to the contracting financial institution.[201] This lump-sum risk shifting would cause volatility and uncertainty in the market. As discussed in the context of the Bear Stearns failure, such events can be the harbinger of systemic harm.[202]

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194. *Id.*

195. *Id.* And, this is exactly the type of efficiency that was mentioned above in the Nomura Fixed Income document. *See* NOMURA, *supra* note 190, at 2.

196. For a brief discussion of how the market is structured, see Randall Dodd, *The Structure of OTC Derivatives Markets*, 9 FINANCIER 1 (2002).

197. These are, of course, the Credit Default Swaps.

198. Less well known, perhaps, weather derivatives are very useful for some firms. *See* Mark Ginocchio, *Weather Derivatives Becoming Hot Commodities*, USA TODAY, June 9, 2008, http://www.usatoday.com/weather/forecast/2008-06-09-weather-derivative_N.htm (quoting an industry participant and noting the increasing need to quantify and trade weather-related risk).

199. It is not pointed out enough that the notional value of a contract is a "reference point" only—it is not the value of the contract. As such, "figures well into the trillions of dollars" is somewhat misleading. *See* ALLEN C. PUWALSKI, FED. DEPOSIT INS. CORP., AN UPDATE ON EMERGING ISSUES IN BANKING: DERIVATIVES RISK IN COMMERCIAL BANKING (2003), http://www.fdic.gov/bank/analytical/fyi/2003/032603fyi.html ("[T]he notional amount of a derivative contract is merely the reference point to the underlying instrument. It serves as the basis for calculating cashflows under the contract.").

200. *See* Alan Rappeport, *Systemic Risk Haunts Credit-Default Swaps*, CFO.COM, Sept. 18, 2008, http://www.cfo.com/article.cfm/12280060/c_2984351/?f=archives (noting that the market had reached as high as $62 Trillion).

201. *See id.*

202. *See id.*; *see also supra* text accompanying note 21 (discussing the steps in systemic risk). After the fall of Lehman Brothers, another dealer in the derivatives market, this fear was tested. Fortunately, the OTC market survived and only a few million dollars actually changed hands. *See* William D. Cohan, *Three Days That Shook the World*, FORTUNE, Dec. 16, 2008, http://money.cnn.com/galleries/2008/fortune/0812/gallery.threedays.fortune/index.html (explaining the role

Market-wide over-reliance on derivatives is the paradigmatic example of economy-wide tail stuffing. Risk managers, assuming they have identified a shred of the dismantled Old Maid, chose to offset their exposure to that harm in a way that created systemically critical pockets of risk in the process.[203] Firms acted in a self-interested fashion at the *expense* of the overall market. As such, regulators have developed a centralized clearinghouse for derivatives dealers to relieve the build-up of systemically critical counterparty risk.[204]

In the end, our new system of finance made an important and rational tradeoff: firms chose to tailor their individual risk profiles by collectively altering the overall risk profile of the market. The net consequence of that shift was to place previously unseen pressure on the structure of the financial system. That is not to say the system is fatally flawed. It simply suggests that the current regulatory environment has not yet flushed out some of the new system's shortcomings. Ideas such as derivatives clearinghouses will no doubt become more common as we identify how the new risk-measuring, mitigating, and aligning economy functions. Getting there, however, is of course the harder task.

B. An Incentives Analysis of Risk Management

Considering the two problems above, the science of risk management does not appear to be the wrongdoer in the recent crisis. In fact, the opposite seems true: the science appears to have been abused to increase personal gains at the expense of the overall financial system.[205] As this Section shows, this seemingly irrational activity can be explained through two different economic analyses: moral hazard and collective action.

To demonstrate, Section B analyzes the internal market failures via moral-hazard principles and the external market failures via collective-action theory. First, Subsection 1 traces both concepts and their applications to the practice of risk management. The goal of this first Subsection is to simply illu-

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of the Federal Reserve and the Treasury in softening the blow of Lehman Brothers failure); Rappeport, *supra* note 200.

203. There is much evidence that this pocket developed in the insurance industry. *See* Wacek, *supra* note 176, at 26.

204. *See* Jacob Bunge, *ICE Begins Clearing Live Credit Derivatives Trades*, CNNMONEY.COM, Apr. 24, 2009, http://www.advfn.com/news_ICE-Begins-Clearing-Live-Credit-Derivatives-Trades_37431872.html.

205. *See supra* text accompanying notes 171–74.

strate that moral-hazard and collective-action problems have a logical nexus in risk management. Next, Subsection 2 reviews an analytical framework in the realm of decision science with an eye toward modeling both problems.

1. Moral Hazard and Collective Action in Risk Management

a. Risk Management and Moral Hazard

Moral hazard, like the study of risk, has a rich history.[206] I will not reach for its origins, but the concept was introduced to the financial system by way of the insurance industry.[207] In short, it considers different variations of the same basic concept: information asymmetry.[208] In an insurance relationship, the insured often has better information about his condition than does the insurer. Consequently, the individual is faced with the "moral hazard" of utilizing this informational asymmetry to his advantage at the expense of the larger group.[209] Because the insurance firm is concerned that it will select a customer that will respond to moral hazard, the firm is inversely faced with an "adverse selection" problem.[210]

For example, full-coverage vehicle insurance dampens the consequences of reckless driving for those who choose to drive recklessly and cause damage. In turn, full-coverage policies also allow some otherwise cautious drivers to act recklessly. Insurance firms, aware of this incentive, would like to avoid in-

206. *See* Tom Baker, *On the Genealogy of Moral Hazard*, 75 TEX. L. REV. 237, 245 n.28 (1996) (chronicling the development of moral hazard from Chaucer's use of "hazard" to describe dice in Pardoner's Tale).

207. *Id.* at 240 (noting that moral hazard grew out of probability theory and marine insurance).

208. For the seminal writings, see Kenneth J. Arrow, *Uncertainty and the Welfare Economics of Medical Care*, 53 AM. ECON. REV. 941 (1963), and Bengt Holmström, *Moral Hazard and Observability*, 10 BELL J. ECON. 74 (1979).

209. Economist.com, Economics A–Z, Moral Hazard, http://www.economist.com/research/economics/alphabetic.cfm?letter=M#moralhazard (last visited Sept. 5, 2009) ("Moral hazard means that people with insurance may take greater risks than they would do without it because they know they are protected, so the insurer may get more claims than it bargained for.").

210. Economist.com, Economics A–Z, Adverse Selection, http://www.economist.com/research/economics/alphabetic.cfm?letter=A#adverseselection (last visited Sept. 5, 2009) ("Adverse selection can be a problem when there is asymmetric information between the seller of insurance and the buyer; in particular, insurance will often not be profitable when buyers have better information about their risk of claiming than does the seller.").

suring those drivers who will bend to this persuasion. The former issue is a moral-hazard problem, the latter an adverse-selection problem.[211]

In the context of the recent financial crisis, this moral-hazard problem has appeared in one frequently mentioned way: when the Federal Government chooses to bail out systemically critical financial institutions (such as Bear Stearns), it, like an insurance company, incentivizes bad behavior by other systemically critical financial institutions.[212] While this is an important concern that should be addressed by policymakers, it is a different sort of moral hazard than I would like to take up here. As mentioned elsewhere, locating the *cause* of excessive risk taking and systemic risk is the larger question in the financial crisis.[213] Because risk management, as a field, contributed to the systemic events of 2007–2009, it is more meaningful to research the moral-hazard problems that plague *individual* financial decision makers.[214]

Turning to that more individual context, the information problem is still pervasive.[215] As a general matter, any principal in the agency relationship has an adverse-selection problem.[216] Because the principal must select an agent, and the

211. To be more explicit, there is a conservation theory that applies to information problems. As explained by Professor Gilson, moral hazard is the "information-related flip side that responds to adverse selection problems" as individuals seek to capitalize on their superior informational positions. *See* Ronald J. Gilson, *Engineering a Venture Capital Market: Lessons from the American Experience*, 55 STAN. L. REV. 1067, 1080 (2003). That is to say that as an adverse-selection problem becomes more acute, the opportunity for moral hazard increases in tandem. *See id.*

212. This also often leads to the "public loss and private gains" distinction. *See* Nouriel Roubinin, *Public Losses for Private Gain*, GUARDIAN, Sept. 18, 2008, http://www.guardian.co.uk/commentisfree/2008/sep/18/marketturmoil.creditcrunch (noting that the United States is a place where there is "socialism for the rich, the well-connected and Wall Street").

213. *See supra* text accompanying notes 180–181.

214. Others have noticed this distinction as well. *See* Okamoto, *supra* note 31, at 188 n.23 (explaining the underlying moral hazard in asset management existed prior to bank bailouts); *see also infra* Part II.B.2 (explaining Professor Okamoto's moral-hazard model).

215. In fact, the moral-hazard problem may simply be endemic to the liberalization of finance. *See* Thomas F. Hellmann, Kevin C. Murdock & Joseph E. Stiglitz, *Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?*, 90 AM. ECON. REV. 147, 150 (2000) (finding that bank liberalization incentivizes "gambling" in the banking sector).

216. For the seminal article on agency costs, see Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305 (1976). *See also* William W. Bratton, *Hedge Funds and Governance Targets*, 95 GEO. L.J. 1375, 1397 (2007) (citing Jensen &

agent she selects may respond to agency costs, it is possible that the principal will choose wrongly.[217] Resultantly, the agent has a moral-hazard incentive to shirk and prevent the principal from identifying the undesirable agency cost.[218] As a result, an entire body of law, agency law, is essentially dedicated to avoiding the effects of agency costs.[219]

However, the agency relationship causes a different moral-hazard conundrum for secondary managers. In short, the principals of the firm set the compensation structures of their agents.[220] Because principals seek to incentivize performance, the secondary managers are often not managing their own funds but *are* deriving benefit from the success of their decisions—that is, they take a share of the profits in the business

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Meckling and noting that, "[a]ccording to classic agency theory, problems of opportunism and adverse selection among managers generate 'agency costs' that impair corporate performance").

217. This is a basic application of the basic adverse-selection principle. *See supra* text accompanying notes 206–211. However, because the United States Government is now in the business of asset management, adverse selection may take on different form. *See* DEP'T OF THE TREASURY, PROCESS FOR SELECTING ASSET MANAGERS PURSUANT TO THE EMERGENCY ECONOMIC STABILIZATION ACT OF 2008 1–2, *available at* www.financialstability.gov/docs/assetmanagers.pdf (announcing a public notice process for selection of asset managers).

218. *See* Ram T. S. Ramakrishnan & Anjan V. Thakor, *Moral Hazard, Agency Costs, and Asset Prices in a Competitive Equilibrium*, 17 J. FIN. & QUANTITATIVE ANALYSIS 503 (1982) (noting that rational actors in an agency relationship will seek to maximize self-interest and thus cause moral hazard); Bengt Holmström, *Moral Hazard and Observability*, 10 BELL J. ECON. 74, 75 (1979) (discussing the shirking incentive). This problem is usually solved via monitoring schemes and reporting, but over-monitoring can also be problematic. *See* Roger D. Congleton, *Monitoring Rent-Seeking Managers: Advantages of Diffuse Ownership*, 22 CANADIAN J. ECON. 662, 663 (1989). Additionally, because the Federal Government insures deposits, a financial institution's primary creditors have no incentive to monitor the actions of the firm. Bebchuk & Spamann, *supra* note 31, at 9–11.

219. J. William Callison, *Venture Capital and Corporate Governance: Evolving the Limited Liability Company to Finance the Entrepreneurial Business*, 26 J. CORP. L. 97, 106 (2000) ("Agency law norms provide formal answers to the agency cost problem by limiting the agents' power to act on the principal's behalf and by imposing liability on agents who deviate from these norms.").

220. The benefits of these compensation plans can be non-monetary as well. *Cf.* Matt Littman, *John Thain's $35,000 Toilet*, HUFFINGTON POST, Jan. 29, 2009, http://www.huffingtonpost.com/matt-littman/john-thains-35000-toilet_b_162350.html (discussing an expensive convenience that one might call compensation). For this reason and others related to moral hazard, the law demands disinterested persons to develop corporate compensation structures. *See* Catherine M. Daily et al., *Compensation Committee Composition as a Determinant of CEO Compensation*, 41 ACAD. MGMT. J. 209 (1998) (reviewing the performance of inside and outside compensation boards but finding no evidence that captured executives do worse than independent boards).

in terms of a bonus, stock options, salary increases, promotions, and the like. Accordingly, because funds other than their own capitalize the firm, secondary managers do not share equally in the losses to capital when they make poor decisions.[221]

In the context of this Comment, when an asset manager does not share equally in the losses *to* capital but receives compensation for gains *on* capital, the manager may act in a way that might ignore the losses in favor of seeking the returns.[222] One way to do this is by searching out higher-return, riskier investments.[223]

The moral-hazard problem for secondary managers is not, however, unique to the asset manager; the framework may extend to the risk manager. However, unlike the asset manager, the risk manager does not often receive incentive compensation. Like the asset manager, though, the risk manager's personal funds do not fully capitalize the financial institution, but the risk manager receives compensation from the appreciation of the institution's capital stock. Though the risk manager's incentive problem is much less severe than the asset manager's incentive problem, the two are difficult to divorce. As explained earlier, the two managers must act together to make risk-based decisions: the asset manager acts as the primary decision maker and the risk manager acts to assure that the asset manager is accurately apprised of an investment's risk. For the purposes of this example, if these two persons constitute the full scope of authority to make each investment decision, the net effect of each manager's moral-hazard incentive is still negative.

And so both the asset manager's and the risk manager's moral-hazard problem is exposed: because these actors make decisions under the guise of the agency structure, each responds to the principal's decision to create a compensation vehicle. Because this vehicle often allows each actor to participate in gain but not loss, asset managers and risk managers, like other agents, have a disincentive to protect the firm from

221. As explained in the context of corporate executives by Bebchuk and Spamann, *supra* note 31, at 9–10, a banker in the first instance has little incentive to protect against astronomical losses because the equity investment in the firm is necessarily less that the total assets of the firm. However, because the largest banks utilize Bank Holding Companies ("BHCs")—entities that are themselves financed with another layer of debt—to hold equity in smaller banks, the bankers in the BHC are further insulted from losses to equity. *Id.* at 13–14.

222. *See id.*

223. *See id.*

downside losses to capital when she or he sees upside potential. As a result, we can expect these actors to bend to moral hazard as the compensation structure beneath which each operates changes.

b. Risk Management and Collective Action

Having analyzed decision making with internal consequences, it is useful to apply similar analysis to the recent internal decisions that created suboptimal levels of systemic risk. Recalling earlier discussions, the anecdotal evidence suggested that firms made choices to benefit themselves at the expense of the larger group.[224] In economics, this situation is sometimes analyzed in the context of a "collective action problem."[225]

The collective-action problem generally occurs when decision makers in large groups fail to provide optimal levels of a collective good.[226] As classically explained by Mancur Olson, because a collective good is one that naturally precludes a purchaser from utilizing the full benefit of the good, the individual provider will halt provision of the collective good prior to providing his optimal share.[227] Accordingly, as the group becomes larger, so too does its tendency to slide towards suboptimal production of the collective good.[228] Therefore, so long as the group is sufficiently large, the individual participant acts rationally when she makes decisions that benefit her but harm the overall group.[229]

If we construe the provision of structurally sound financial markets as a collective good, Mancur Olson's work may arguably be applied to all the secondary managers in the financial sector. At bottom, market safety is both nonrivalrous (one firm's use of safe markets does not preclude another's) and nonexcludable (one firm cannot exclude another from safe markets). Because one firm cannot, by definition, provide market safety for all firms, the basic concept of the collective-action problem can be syllogistically sketched as follows: (A) asset managers and risk managers are primarily responsible for the success of their individual firm and each makes rational

224. *See supra* Part I.A.2.

225. For the seminal work in this field, see MANCUR OLSON, JR., THE LOGIC OF COLLECTIVE ACTION (Harvard University Press 1965).

226. *Id.* at 35.

227. *Id.*

228. *Id.*

229. *See id.*

decisions to effectuate that responsibility; (B) risk-based decisions that benefit an individual firm may also harm the structure of the financial system, but decision makers have no incentive to provide optimal protection at the expense of their individual firm; (C) therefore, asset managers and risk managers will rationally act to protect their firms at the collective expense of overall market safety.

Aggregating this analysis across market participants exposes how the structure of the market suffers: all actors rationally seek profits that collectively damage the system. And so the second incentive problem is revealed. The size of the financial sector disincentivizes individual firms from protecting market structure. Thus, while the moral-hazard problem shows that managers are likely to ignore the potential cost of a risky event, the collective-action problem suggests that most managers are also indifferent to actions that contribute to systemic pressure.

2. Professor Okamoto's Moral-Hazard Model

So far, it appears on a post hoc basis that the economics of risk-based decision making could have predicted the moral-hazard and collective-action problems exposed in Section A. Because these two theories point to two forms of market failure, and we might choose to remedy those failures via regulation, it is helpful to model each incentive problem.

In a recent paper, Karl S. Okamoto models the framework an asset manager utilizes when making decisions.[230] Key to his analysis is the concept of "predictive prevention."[231] According to Professor Okamoto's scholarship, the risk manager's underlying function is to predict harm to the firm and prevent the harm if possible.[232] His model seeks to explain the decision-making process that an asset manager utilizes after the risk manager has identified some preventable and predictable harm to the firm. Stated differently, the model does not consider the method by which a risk manager identifies risk or the method by which he might mitigate the risk should he choose to—the model assumes that stage of the analysis has already occurred (or that it can occur in the future). The value of this model is in its ability to rely on the principles of moral hazard

230. *See* Okamoto, *supra* note 31, at 218–24.
231. *Id.* at 191.
232. *Id.*

(and perhaps collective action) to explain why an asset manager and a risk manager undervalue low-probability risks at the expense of the larger market.

In the following two Subsections, I will explain the inner-workings of this model and its predictive value. Though Professor Okamoto's work specifically considers the decisional framework of an asset manager, I will also explain in Subsection 3 that this framework extends to the central calculus of the risk manager as well.

a. The Basic Four Outcome Model

Professor Okamoto claims that all risk-based investment decisions have four outcomes and that each outcome has a particular set of costs and benefits to the asset manager and the risk manager. To illustrate, when the risk manager identifies preventable harm she must make a prediction as to whether the harm will occur. This decision may occur by either halting the transaction ("flagging") or approving the transaction ("green-lighting"). After doing so, either the risk materializes or it does not. If we pair these outcomes in discrete time, there can be four potential results: two negative and two positive.

Decisional Framework		*Risk Manager Action*	
		Action: Flag *(Predicted Materialization)*	Action: Green-Light *(Predicted Non-materialization)*
Outcome	Materialization	Direct Benefit	Direct Cost
	Non-Materialization	Lost Opportunity	Gained Opportunity

The above chart suggests that a manager is rewarded for being right and penalized for being wrong in each scenario. The core of Professor Okamoto's model assumes that the asset manager and the risk manager consider these outcomes and choose to flag a detected preventable harm where the net outcome is positive. This intuitive framework is, however, substantially complicated by the fact that a risk-management decision always occurs before one has complete knowledge of

whether a risk will materialize. As such, the model must discount each cost and benefit according to the probable outcome of that event.

The benefit of correctly flagging a risk can be represented by the probability that harm will occur if no action is taken (p) times the personal value to the asset manager and the risk manager of accurately predicting that outcome (A), or ($p \times A$). Conversely, the cost of incorrectly flagging a risk can be represented by the probability that harm *will not* occur ($1 - p$), times the opportunity cost of not participating in a transaction (B'), or ($(1 - p) \times B'$). Taken together, the net expected benefit to the asset manager and the risk manager of flagging a risk can be represented by the expected benefit of an accurate prediction less the expected opportunity cost of an inaccurate prediction, or $(p \times A) - ((1 - p) \times B')$.

The analysis of choosing to green light a transaction takes on reflexive logic. As such, the benefit to green lighting a transaction when the risk *will not* materialize is equal to the probability that preventable harm *will not* occur ($1 - p$), times the gain on the green lighted transaction (B''), or ($(1 - p) \times B''$). Likewise, the cost to the asset manager and the risk manager of *wrongly* green lighting a transaction takes the probability of harm (p) times the direct cost of the harm (C), or ($p \times C$). Together, the *benefit* of green lighting a transaction can be seen as the expected benefit of a rightly green-lighted transaction less the expected cost of a wrongly green-lighted transaction, or $((1 - p) \times B'') - (p \times C)$.

Combining the two halves of the model, the risk manager will only elect to flag a risk if the net expected outcome of flagging a risk is higher than the net expected outcome of green-lighting a transaction. The table below illustrates these expected values and results in the risk manager's final evaluation.

Decisional Framework		*Risk Manager Action*	
		Action: Flag *(Predicted Materialization)*	Action: Green-Light *(Predicted Non-materialization)*
Outcome	Materialization	$(p \times A)$	$(p \times C)$
	Non-Materialization	$((1 - p) \times B')$	$((1 - p) \times B'')$
	Total Benefit or Cost	$(p \times A) - ((1 - p) \times B')$	$((1 - p) \times B'') - (p \times C)$
	To Flag Risk	$(p \times A) - ((1 - p) \times B') > ((1 - p) \times B'') - (p \times C)$	

In sum then, Professor Okamoto's model illustrates the methodological steps that an asset manager is expected to take when making an investment decision. This decision is assumed to consist of two factors that impact the value of the decision to the asset manager: the direct benefit (or cost) of an accurate (or inaccurate) prediction and the opportunity cost (or benefit) from not participating (or participating) in the transaction. As the final inequality above illustrates, the asset manager will flag a transaction when the net expected value of doing so becomes positive.

b. The Predictive Value of Professor Okamoto's Model

To explain how the model illustrates the moral-hazard and collective-action problems addressed above, we can consider a few examples. First, assume that a risk manager has identified a harmful risk that she thinks is equally likely to materialize or not materialize—a risk with a 50 percent probability of harm. The model suggests that an asset manager will ignore a preventable risk unless she expects to gain more from flagging

the transaction than she expects to gain if she green-lights the transaction. Accordingly, when all other variables are constant and proportional to one another, the net benefit to the asset manager at this 50 percent level is $0.[233]

The baseline example above also has further implications. If a risk is 100 percent certain to occur, the opportunity cost of flagging the doomed transaction is $0 and the expected benefit of green-lighting the doomed transaction is also $0. In this case, rearranging the equation dictates that $A + C$ must be greater than zero to flag a transaction.[234] Because harm is 100 percent likely to occur (and thus A and C are always positive), the asset manager always flags the transaction. In other words, the model assumes that a rational asset manager would not approve a transaction that is 100 percent certain to result in failure.

Similarly, when an asset manager believes harm has a zero percent chance of materializing, she expects the benefit of halting the safe transaction to be $0. As a result, the opportunity cost of flagging the transaction is the entire value of the transaction *to her*, B'. If the asset manager chooses to green light a transaction, her expected benefit is the full value of the transaction, B''. In this case, the value of the transaction must be less than $0 for the asset manager to flag the transaction.[235] Assuming the firm would not consider negative net-present-value transactions, B' and B'' are always positive in a zero per-

233. Plugging 0.50 into the model when A, B', B'', and C are all equal constants renders the following: $(0.5 \times A) - ((1 - 0.5) \times B') > ((1 - 0.5) \times B'') - (0.5 \times C)$, or $(0.5 \times A) - (0.5 \times B') > (0.5 \times B'') - (0.5 \times C)$, and therefore $A - B' = B'' - C$, *or zero net benefit*.

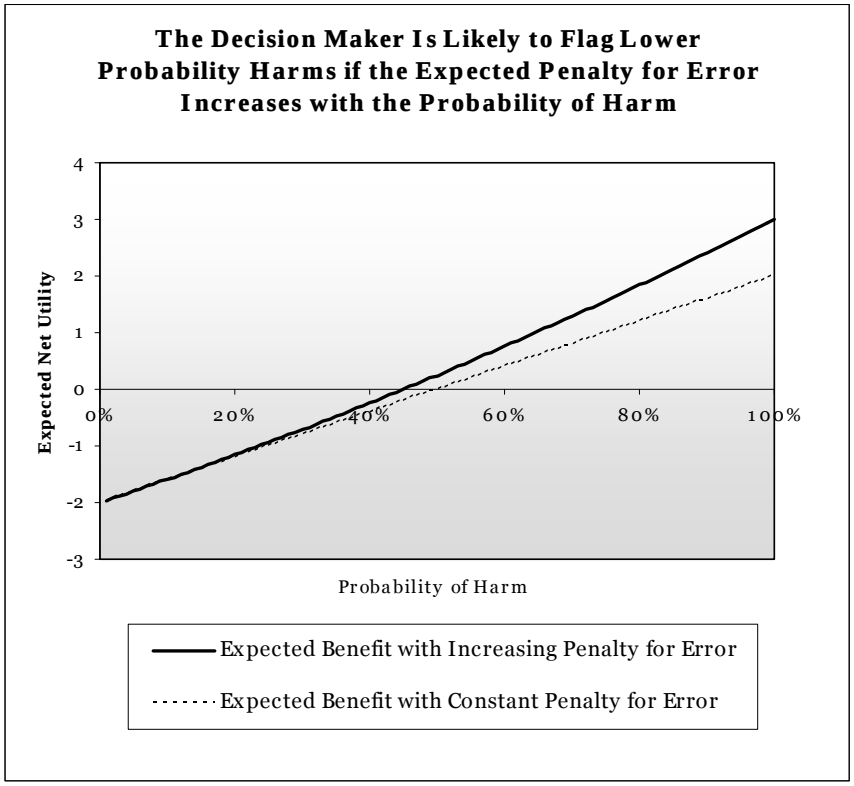
234. To illustrate, $((p \times A) - ((1 - p) \times B') > ((1 - p) \times B'') - (p \times C))$ becomes $((1 \times A) - (0 \times B') > (0 \times B'') - (1 \times C))$, or $A > -C$. As such, if the asset manager experiences equal benefit for raising a flag and equal cost from green-lighting a doomed transaction, flagging a risk at the 100 percent level always results in twice the value of the gained benefit and avoided punishment. This can be represented by manipulating the equation above to read $A + C > 0$. Because both terms share identical constant nonzero values in this example, the inequality always remains intact and the risk manager always flags the harm.

235. To illustrate, if we assumed constant and proportional values, the original equation $((p \times A) - ((1 - p) \times B') > ((1 - p) \times B'') - (p \times C))$ becomes $((0 \times 0) - (1 \times B') > (1 \times B'') - (0 \times C))$, or $-B' > B''$. We can read this to mean, that at a 0 percent chance of harm, the asset manager considers only the transaction's value. Assuming she shares equally in the upside and downside, B' carries the same value as B''. In short, her opportunity cost to flagging is exactly equal to her direct cost of not flagging. Consequently, we can rearrange the equation above to reflect this adjustment and $-B' > B''$ becomes $0 > 2B$. Because B is never negative at the 0 percent level, the inequality fails in every case and the risk manager will never flag the harm.

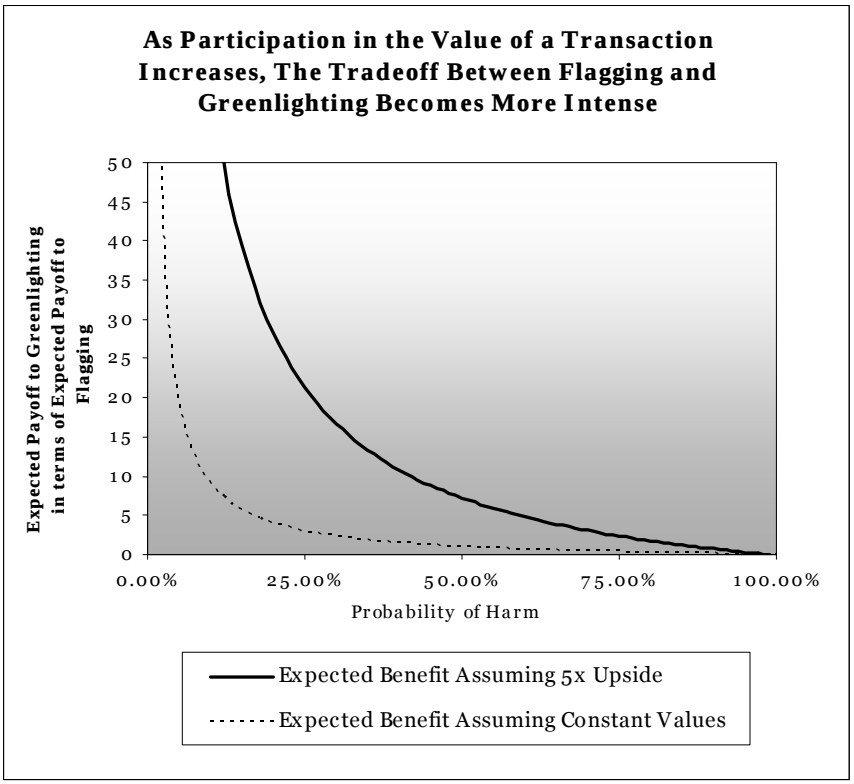
cent risk environment. As such, the manager always greenlights the zero-risk transaction. Stated simply, the model predicts that a rational asset manager would not halt a transaction that cannot possibly harm the asset manager and the firm.

In light of the foregoing, the model explains the easy decisions an asset manager faces when the variables in the model are at their logical extremes. However, if one assumes that the model's variables are not constant, a very different result occurs. One might assume that the asset manager's costs for failing to flag a transaction when she should (C) increase as the probability of a harmful event increases (p). It stands to reason that an asset manager is more likely to be chastised for misevaluating a high-probability risk than a low-probability risk because her performance is more easily evaluated at high-probability levels. Therefore, if a risk manager knows she will be punished more severely when a risk is more certain to occur, the risk manager will be more likely to flag lower-probability risks.[236] And, as the multiplier increases, we would expect the calculus to become more demanding.

236. As a result ($p \times C$), the cost of wrongfully failing to raise a flag, becomes ($p \times ((1 + p) \times C$) and therefore our final equation results in the following: $(p \times A) - ((1 - p) \times B') > ((1 - p) \times B'') - (p \times ((1 + p) \times C)$.



The foregoing has assumed the asset manager fully participates in the transaction. Unless the asset manager is the only stakeholder in a firm, this assumption is false. Accordingly—and here is the moral-hazard calculus—it might be said that the level of participation the manager has on the upside is a multiple of that which she has on the downside. To test this theory, the basic equation can be adjusted to show that the net benefit of accurately predicting harm must outweigh the net cost of inaccurately predicting harm. As such, the original equation, $(p \times A) - ((1 - p) \times B') > ((1 - p) \times B'') - (p \times C)$, becomes $p \times (A + C) > (1 - p) \times 2B$. This rearrangement can be read to mean that a trade-off exists between flagging a probable harm (p) and not flagging a probable harm ($1 - p$). Because the relative value of the p term and its opposite ($1 - p$) vary inversely under each probable outcome, there is a relationship between "being right" and "being wrong." As the chart below suggests, when the potential for upside gain increases, the asset manager's decision becomes more demanding.



3. Explicitly and Implicitly Confirming Suspicions

Professor Okamoto's model explicitly confirms the moral-hazard problem and may implicitly confirm the collective-action problem. First, the model confirms that when a firm selects a compensation structure, the asset manager has the moral-hazard opportunity to take advantage of that structure. Because the asset manager does not manage all of her own wealth, we assume that she is also shielded from most, if not all, downside risk. The model shows that if we assume managers have more upside in a transaction than downside, the manager's ability to flag lower-level risks becomes increasingly impaired. Therefore, it appears that the moral-hazard calculus becomes increasingly difficult for the asset manager to ignore with higher levels of performance based compensation and lower-level risks.

Though Professor Okamoto's work is confined to the decisions of an asset manager, the model can be extended to approximate the risk manager's internal calculus as well. I will

not rehash the earlier discussion of the model as it applies to the risk manager, but we can safely assume that a risk manager considers the costs and benefits of making right and wrong decisions when valuing risks. In the risk-management context however, because the risk manager does not often receive incentive compensation, the B' and B'' terms in the model have substantially less value to the risk manager. Accordingly, we would also expect the risk manager's moral-hazard incentive to be substantially less severe. Notwithstanding this calculation, because the risk manager must also receive compensation from the firm and remain employed, we can assume that the moral-hazard calculus is not wholly absent from the risk manager's decision-making framework. In any event, because the asset manager and the risk manager must make risk-based decisions together, the net effect of the moral-hazard incentive is the same: to undervalue low probability events.

Turning to the collective-action problem, the model implicitly confirms another suspicion—that neither the asset manager nor the risk manager considers the full impact of their actions on market safety. First, because Professor Okamoto's four outcome model does not consider the decision maker's cost and benefit to making poor externally critical decisions, and the model explains the expected outcome of certain decisions without resorting to this consideration, it might be reasonable to conclude that the collective-action concern is wholly absent from the decision maker's calculus. Though possible, the more likely case is that this consideration is naturally weak, but still contained in the aggregate terms of the model. If that is the case, when a transaction is allowed to go forward, the model suggests that the decision maker has (1) evaluated the possibility and impact of systemic harm generated by the transaction and (2) concluded that the systemic harm does not outweigh the net benefit of the transaction *to the decision maker*. Because Part II.A.2.b implies every decision maker in the market has a natural incentive to under-provide market safety, this consideration would seem to provide less of a counterbalance in the decision maker's internal calculus.

In total then, Professor Okamoto's model shows that moral-hazard incentives and collective-action incentives impede a decision maker's ability to gauge the net expected benefit of a given transaction. Because excessive risk taking is often detrimental to our financial system, policymakers should consider rectifying these two market failures via regulation.

III. RISK MANAGEMENT RECONSIDERED

Parts I and II have revealed a disturbing possibility: risk management—the field of professionals designed to balance overzealous risk taking—might have failed the economy and investors because internally flawed incentive structures resulted in inattentiveness to low probability events. Part III of this Comment considers potential regulatory solutions to remedy these failures.

First, Section A briefly analyzes Professor Okamoto's regulatory suggestions. At this point, it is worth noting that Professor Okamoto's work was primarily aimed at modeling the decisional framework of the risk manager and thus Professor Okamoto was less concerned with future regulation. Even so, he did provide a few useful guideposts that should be considered. Following this analysis, Section B turns to the two halves of Professor Okamoto's model and argues for the creation of two regulatory programs: (1) a new disclosure regime to expose the specific successes and failures of the asset manager to the public, and (2) a "clawback" private cause of action to incentivize greater respect for lower probability risks. Finally, Section C turns to the collective-action problem and recommends further research in the provision of market safety as a collective good.

A. Professor Okamoto's Recommendations

Professor Okamoto's decision model shows that the asset manager naturally responds to the costs and benefits of a right or wrong prediction.[237] Accordingly, he argues that regulators may either increase the relative benefit for being right by providing an additional reward, or increase the relative cost of being wrong by imposing an additional cost.[238]

Regarding the former option, Professor Okamoto notes that it would be difficult to determine when an asset manager has aptly avoided harm to her firm and thus deserves some extrinsic reward for performance. The asset manager may know when such avoidance occurs, but any outsider would have difficulty identifying the appropriate action.[239] Conversely, it is rather simple to identify a wrongful action. If a risk materializes,

237. *See* Okamoto, *supra* note 31, at 218–24.
238. *Id.* at 228.
239. *Id.*

then it will likely cause a loss or failure that will be visible to the market through everyday channels.[240] Thus additional penalties, the latter option above, could be helpful and more easily administered than additional rewards.[241]

However, Professor Okamoto points out that attaching personal liability to poor managerial decisions on an ex post basis comes with negative consequences—primarily that increased liability provides the incentive to internally underinvestigate wrongdoing.[242] Therefore, Professor Okamoto argues that any new regulation should create clear standards of wrongdoing with "best practices" guidelines for exculpation.[243] Doing so would force executives to treat the asset manager as an "insurance policy" rather than a "deal killer."[244]

Professor Okamoto then argues that asset managers have a "skin-in-the-game-problem." He suggests that one way to increase the cognizance of harm is to force the asset manager to "eat his own cooking."[245] Because increasing the asset manager's personal down-side financial exposure to a transaction increases his or her exposure to loss, the risk manager's moral-hazard incentive decreases as exposure to harm increases. Though this makes sense, Professor Okamoto points out that the primary reason that the asset manager in the limited liability firm exists is to achieve efficiencies in risk bearing.[246] Thus increasing the downside risk an asset manager may have in a transaction is a "balancing act" of sorts between taking on acceptable and unacceptable levels of risk.[247] Given the difficulty in striking this balance, Professor Okamoto was "not ready to make a proposal one way or the other."[248] He did, however, mention that providing increased disclosure of compensation structures might provide a market solution to the "skin-in-the-game problem" by allowing investors to evaluate a firm's atti-

240. *Id.*

241. *Id.*

242. *Id.* at 228–29 (discussing Jennifer Arlen, *The Potentially Perverse Effects of Corporate Criminal Liability*, 23 J. LEGAL STUD. 833, 836–37 (1994)).

243. *Id.* at 231.

244. *Id.* at 234. If adopted, we would therefore expect the incentives of top-management to become more closely aligned with the monitoring function mentioned earlier. *See supra* note 218.

245. Okamoto, *supra* note 31, at 229.

246. *Id.* at 228; *see also* Stephen F. O'Byrne & S. David Young, *Top-Management Incentives and Corporate Performance*, 17 J. APPLIED CORP. FIN. 105, 105 (2005).

247. Okamoto, *supra* note 31, at 230.

248. *Id.*

tude towards risk via the compensation structure of the asset manager.[249]

B. Furthering Professor Okamoto's Scholarship

Professor Okamoto's proposals are sound suggestions for future regulatory design. Because I agree that the logic surrounding the current model is, as Professor Okamoto suggests, flawed, I also believe that we might "tip the balance" in favor of predicting more harm via regulation. However, I think that we may do so by focusing on the risk manager rather than the asset manager.

Below, I argue for two programs that should operate in tandem with one another. The first concerns additional disclosure of risk-based decision making, and the second relates to additional penalties for substandard risk-management practices. Because both programs will rely on a firm's use of a risk manager, it is worth introducing the concept of a "qualified risk manager" here.

To be brief, because both proposals below will operate to frustrate some natural activity, it is necessary to assure that each firm subject to these regulations will employ a risk manager to inform risk-based decisions. To do otherwise would create a loophole and incentivize flight from firms subject to this regulation to exempt firms.[250] Accordingly, each publicly registered firm that engages in market transactions, regardless of size or other classification, should be required to employ, at minimum, one qualified risk manager per line of business. A risk manager would qualify by agreeing to personally assure the accuracy of any risk-based disclosure required of the firm (the subject of Subsection 1), and by agreeing to be subject to a clawback regime for ill-informed, risk-based decision making (the subject of Subsection 2).[251]

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249. *Id.*

250. Though not the specific collective-action problem I spoke of earlier, Professor Schwarcz argues that firms cannot provide such compensation structures for secondary managers alone. *See* Schwarcz, *supra* note 47, at 468–69. Accordingly, there is also a persistent need to prevent "gaming" the regulations.

251. This definition is intentionally broad and thus will be limited to those firms that are currently required to register with the Securities and Exchange Commission. Depending on the outcome of future legislation, the regulations suggested here may or may not include hedge funds. *See* Proposed Hedge Fund Regulations, *supra* note 32. Should this legislation prove unsuccessful, it is likely that the regulations here would be required to reach past the sphere of registered

1. Aligning Incentives via Dual-Disclosure

Turning now to the specific proposals, regulations grounded in some variation of Professor Okamoto's work might be successful if we increased disclosure of the risk manager's internal decision making. Because the model suggests that the cost and benefit of making an accurate prediction can be derived from non-monetary compensation,[252] the non-monetary benefit of making an accurate prediction or the non-monetary cost of making an inaccurate prediction might be increased by explicitly expanding the visibility of that success or failure to the market.

To explain, specific lines of business could be required to disclose specific risk considerations at extreme levels and to document the decision-making process at less significant levels. For potentially detrimental transactions, we might ask that a risk-management committee, comprised of at least one qualified risk manager, release a report of risk-specific considerations at the same time that the firm must release a substantially similar report—a forced special concurrence or dissenting opinion of sorts.[253] Though it is hard to tell what a "critical decision" might be, we could ask that firms disclose the risk manager's input on transactions that occur at some heightened level of materiality—perhaps a higher standard than the "reasonable investor" standard that attaches to securities disclosures under current law.[254] If these two reports exited a firm untainted by either drafting party,[255] we could then allow

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firms to assure that competent risk managers do not flee to the hedge fund industry.

252. Okamoto, *supra* note 31, at 230.

253. We, of course, do this in various other contexts. *See* Merrit B. Fox, *Civil Liability and Mandatory Disclosure*, 109 COLUM. L. REV. 237, 239 (2009) ("Corporate transparency has been increasingly recognized as a key element in financial market development and in economic growth more generally.").

254. It may be possible simply to mirror the materiality requirement in securities laws. As expressed by the Supreme Court, materiality in the context of events that are "contingent or speculative in nature" turns on whether a reasonable investor would have viewed the information as significant at the time the decision was made. *See* Basic, Inc. v. Levinson, 485 U.S. 224, 232 (1988) (adopting TSC Industries, Inc. v. Northway, Inc., 426 U.S. 438 (1976)).

255. Of course, there will be the potential for collusion here. It is easy to imagine how that phone call from the CEO might work—"Jeff, how's that silly risk management disclosure thing looking, you know we made a killing writing all those contracts last quarter . . . ." One way regulators have coaxed this type of collusion out of the marketplace is through whistle-blowing provisions. *See* Anthony Heyes & Sandeep Kapur, *An Economic Model of Whistle-Blower Policy*, 25 J.L. ECON. & ORG. 157, 165 (2009). The collusion problem could be avoided by fi-

the market to evaluate the decisions a risk manager makes *and* the corporation's use of the risk manager's decisions.

The sheer cost and intrusion of this program dictates that it must be limited in some cases. At the outset, many small firms could not continue operations underneath the financial burden of this program. As such, firms below some reasonable size should be exempted. Next, many decisions could not reasonably be disclosed to the marketplace—namely trade secrets and other sensitive information. Accordingly, considerations that would require a firm to reveal its competitive advantage in the market place could be segregated into a separate category of information. One way to maintain the advantage of this program would be to require documentation of the decision-making process. These records could then be used in a separate clawback program (discussed below) that would allow regulators to determine whether the firm adhered to established risk-management practices. The value of this disclosure regime would be to expose (or at least document) the substance of a decision and the relationship the risk manager has with her asset management counterparts, while also allowing the market (or regulators) to determine which firms have adequate processes.

In the context of Professor Okamoto's model, this dual disclosure regime takes the internal cost-benefit analysis that attaches to significant firm decisions and exposes it to the open market. In this way, the benefit (or harm) for making a right (or wrong) decision is multiplied as the responsibility for an action the risk manager suggests (and the asset manager takes) is directly traceable to the risk manager. As we might expect, this type of disclosure would shift some responsibility for decision making from the asset manager to the risk manager—and that shift in the balance of power may be a substantial drawback. However, it may also allow for scorekeeping and thus could increase the market's ability to price good risk managers while quickly ejecting those risk managers (and perhaps asset managers) who routinely fail to make appropriate decisions.

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nancially rewarding any person in the firm that reveals up-the-chain complicity. Additionally, if regulations required stiff penalties for "getting caught," something like immediate removal from office and mandatory fines, we might further incentivize risk managers and executives to avoid collusive reporting. If this framework were adopted, and managers in fact avoided collusion, we could make very specific judgments about a risk manager's abilities and a firm's attitude to risk taking at the most serious levels.

Though this proposal could curtail some substantial risk taking by risk managers and asset managers, it is far from perfect. At a minimum, the additional costs that such a regime would impose on the compliance operations of a public firm could prove politically fatal to this proposal. On top of these limitations, the exemptions above would likely prevent much relevant information from ever reaching the marketplace. In the end, however, the regime would require new disclosures for such substantial activities as adding a new line of business or introducing a new investment product. More importantly, though, the privately-documented reports would provide information that could be used in the next wing of the proposal.

2. Aligning Incentives via Clawback Provisions

Another way to increase a risk manager's stake in a group of transactions is to mandate a compensation "clawback" program. In short, such a program could require firms to employ a qualified risk manager in each line of business, to segregate those managers' compensation for a select period of time, and to clawback the segregated funds in certain circumstances. Though this Comment cannot possibly consider the full breadth of such a mandate, any clawback program would at least include design and enforcement components.

At the outset, policymakers would need to design the limitations of the clawback program—something we might call a "minimally qualified clawback program." This consideration would most likely entail determining how much downside exposure a risk manager would be required to have or, in the context of the clawback, how much compensation would need to be placed at bay. Such a decision would also likely require policymakers to determine minimum compensation levels and minimum segregation percentages.[256] Additionally, those designing the clawback scheme would need to determine over what period these funds should be subject to the reach of the clawback.[257] And, finally, it may also make sense to determine how

256. The core recommendation here is not to quash our propensity to invent pay structures, but rather to prevent firms from isolating management from the clawback scheme. So long as an appreciable amount of compensation is eligible for the clawback scheme, the compensation program should survive scrutiny.

257. Because extreme risk events often do not materialize for some time, it may make sense to wait as long as an entire market cycle, near sixty months or so according to history, before funds would transfer to the risk manager. *See* Nat'l Bureau of Econ. Research, Business Cycle Expansions and Contractions,

much control a risk manager may have over the investment of the funds during the restricted period.[258]

Because I feel that I must draw a line to move forward, one middle-of-the-road design would be to require that reporting firms: (1) employ at least one qualified risk manager for each line of business, (2) segregate each risk manager's compensation at a modest percentage, say 20 percent, and (3) retain the segregated funds in a separately managed account limited to liquid asset class investments for at least thirty-six months. I do not suggest that these minimum requirements are sufficient, only that they are one potential solution to this line-drawing problem.

Assuming policymakers would select a similar set of constraints, it is next necessary to determine how and when a risk manager would be subject to a clawback of segregated funds. Because risk taking should not be overly stifled, the standard to trigger a clawback should be rather high—perhaps something to the effect of "willful and persistent disregard for industry best practices."[259]

Having determined a standard to trigger the clawback, policymakers would then need to determine whether the enforcement of the clawback is achieved via a public entity, the firm itself, or some independent third party. As another middle-of-the-road option, policymakers could combine the attributes of both and allow regulators and interested private parties to prove in a civil action that a firm does not have a minimally qualified clawback program, or that a risk manager has violated the clawback standard. The former suit would be filed against the firm for some specified upper limit of recovery; the latter suit would be filed against the risk manager for the sum present in the clawback account.

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http://www.nber.org/cycles/cyclesmain.html (last visited Sept. 5, 2009). Again, this temporal restraint just described is not designed to decimate the supply of risk managers, but simply to assure that the clawback would be effective for those risk-based decisions that may not reveal impropriety for some time.

258. One could not expect risk managers to tolerate non-investment of some appreciable portion of their compensation for even a moderate period of time during the restricted period. Perhaps a risk manager could select from certain predefined investment activities (or asset classes) that achieve the benefits of normal diversification principles but prevent personal consumption. In this case, it may make sense to require a risk manager to personally reinflate the fund if her investment choices result in a net-negative return.

259. Professor Okamoto did recommend a similar concept, but for applying penalties directly to the risk manager for wrong decisions. *See* Okamoto, *supra* note 31, at 231–35.

This proposal creates a few interesting wrinkles in risk management. At the outset, if a risk manager knows that her compensation would be tied to long-term performance, only individuals who are confident in their abilities to manage a firm's risk for that period of time will take such a position. In this way, a clawback regime may increase the quality of risk managers in the industry. Because firms in this proposal are required to staff a risk manager and either report or document that person's individual (or committee) decisions, there is also an incentive to increase potential compensation and attract more productive risk managers.

Finally, as this recommendation should be used in tandem with the dual disclosure regime above, the risk manager would have a greater incentive to report *all* material decisions to the public because those disclosures will no doubt be evidence of appropriate or egregious action if a lawsuit is later filed—particularly with respect to low-probability risks.

In sum, because the natural incentives in Professor Okamoto's framework led to undervaluation of low probability risk, we could alleviate some of the moral hazard by exposing manager decisions to the larger market, and clawing back compensation when egregious risk taking is found. Doing so (1) incentivizes risk managers to locate and report risks to the firm; (2) forces decision makers to consider those findings; and (3) allows investors, via market-based solutions, to evaluate the ability of the risk manager and the firm's attitude towards risk.

C. Considering the Collective-Action Problem

To complete the analysis of the problems identified in Part II.A, it is necessary to return to the collective-action problem. There, I argued that firms do not possess the necessary incentives to independently provide optimal levels of market safety. To continue this analysis, it is worth noting that the moral-hazard framework above will likely incentivize greater production of market safety. Thus, to the extent that the eradication of suboptimal systemic risk can be accomplished by disincentivizing moral hazard in risk-based decisions, the proposals above will help to minimize the collective-action problem.[260] To

260. The Obama Administration has recently recommended an overhaul of the financial system. *See generally* REBUILDING FINANCIAL SUPERVISION, *supra* note 29 (providing details of the plan). Should this plan go forward, the Federal Reserve will likely become the "market safety regulator" in the United States, with

be sure, however, these proposals will not sufficiently incentivize firms to provide optimal levels of market safety.

Outside of these benefits, it may be useful to return to Professor Okamoto's model. In Part II.B.3, I argued that asset managers and risk managers likely consider the provision of market safety when making risk-based decisions, but that Professor Okamoto's model would suggest that these considerations are weighed against the personal costs and benefits to the decision maker. Accordingly, I also argued that these considerations are at least minimally present in the decision maker's calculus. Like the moral-hazard problem analyzed above, it may therefore be possible to isolate the collective-action variable as well.

Unfortunately, in attempting to do so, one must come up empty handed. In short, to create regulatory solutions for the collective-action problem grounded in Professor Okamoto's model, we would need to be able to identify, ex ante, those actions that place collective pressure on market structure—or, stated differently, those specific decisions that are "unsafe." Because the nature of market safety necessarily requires policymakers to know how specific risk-based decisions of many thousands of decision makers affect the larger market before the decisions occur, it would be largely impossible to create some ex ante, rule-based regime predicated on "market safety" without excellent foresight. Similarly, to provide ex post liability for the creation of unsafe markets, one would also need to trace which actions led to the creation of unsafe markets and then, with more difficulty, isolate those firms responsible for that action. In this case, regulators would be asked to string together impossible causation chains. Because both the difficulty inherent in either ex ante incentive decisions or ex post liability decisions is probably fatal to any proposal grounded in Professor Okamoto's model, I think it is unlikely that one could

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instructions to monitor systemically critical institutions. *Id.* at 52. As such, we might ask the Federal Reserve to monitor the collective actions of risk managers by reviewing the various reports they would produce in compliance with the above proposals. This could allow the regulators to detect unnecessary "tail stuffing" at the aggregate level before it becomes systemically critical. If stress testing and better reporting had been in place over the last decade, they might have raised red flags in the mortgage securitization market and the OTC derivatives market because one entity could have viewed the aggregate positions in each market. In turn, we could have disclosed these findings to the markets and perhaps created new regulations that stalled the pooling of tail risk. Though this is not a magic bullet for determining systemically critical events on an ex ante basis, it would be helpful.

use incentives analysis to isolate the collective-action variable in pursuit of market safety. Indeed, I suspect this logic underlies the post hoc addition of new rules to the statute books after a financial crisis occurs. However, because this Comment is dedicated to creating regulation that does not rely on specific rule-based eradication of systemic risk, it may be necessary to rely on sources outside of Professor Okamoto's model for the provision of market safety.

In turn, because the underprovision of market safety can be analyzed as a public good, further research may point to other methods of providing market safety as a collective good. As a jumping off point, we might consider a tax on financial sector transactions. Though there are many arguments against this type of activity, a transactions tax may incentivize firms that previously provided no market safety to do so in the future.

CONCLUSION

This Comment considered the recent risk-management problems that have come to light in the Financial Crisis of 2007–2009. Risk management looks to have the theoretical and administrative wherewithal to protect investors in the financial markets, but, in practice, economic incentives preclude optimal risk-management precautions. Consequently, this risk-management problem, like other market failures, may require a regulatory solution. This Comment suggested that we curb the dual problems of moral hazard and collective action by creating new disclosure and compensation regimes. While they are not intended to be comprehensive, I do hope that these proposals are read to indicate that we need to make serious changes to the concept of risk management.

More importantly, though, the recent risk-management failure has damaged one party more than any other: the average investor. Though this year saw fortunes lost on Wall Street, we have also seen blue-collar retirement accounts pushed to the limits. With that loss, and the public debt we have used to remedy these failures, everyday Americans are coming under increasing pressure to provide for their financial well being. Because this implies that the true losers in the financial crisis had little control over the incentives of risk managers on Wall Street and elsewhere, policymakers need to address the basic human problems inherent in the trading firm

on more than just economic grounds. While the proposals in this Comment are susceptible to the standard arguments against further regulation in the financial markets, the distributional impact of the current system should overcome whatever fear we have in overregulation. In my opinion, our public policy should not incentivize the better-informed financial elite to make decisions at the expense of the everyday investor. Some equity should exist between the two camps, and our current system exacerbates the divide.