

Regulating *Ex Post*: How Law Can Address the Inevitability of Financial Failure

Iman Anabtawi* & Steven L. Schwarcz**

Unlike many other areas of regulation, financial regulation operates in the context of a complex interdependent system. The interconnections among firms, markets, and legal rules have implications for financial regulatory policy, especially the choice between ex ante regulation aimed at preventing financial failure and ex post regulation aimed at responding to that failure. Regulatory theory has paid relatively little attention to this distinction. Were regulation to consist solely of duty-imposing norms, such neglect might be defensible. In the context of a system, however, regulation can also take the form of interventions aimed at mitigating the potentially systemic consequences of a financial failure. We show that this dual role of financial regulation implies that ex ante regulation and ex post regulation should be balanced in setting financial regulatory policy, and we offer guidelines for achieving that balance.

I. INTRODUCTION	76
II. LAW AND SYSTEMS	78
A. The Nature of Systems	78
1. <i>Systems Structure</i>	78
2. <i>Systems Behavior</i>	80
3. <i>Systems Functions</i>	80
B. Law-Related Systems	81
1. <i>Identifying Law-Related Systems</i>	81
2. <i>Using Systems Analysis as a Methodology to Analyze Law</i>	82
3. <i>The Role of Law in Law-Related Systems</i>	84
C. The Financial System as a Law-Related System	84
III. <i>EX ANTE</i> VERSUS <i>EX POST</i> FINANCIAL REGULATION IN A SYSTEMS PARADIGM	91
A. <i>Ex Ante</i> Versus <i>Ex Post</i> Financial Regulation	91
B. The Limits of <i>Ex Ante</i> Financial Regulation	93
1. <i>Normal Accidents</i>	93
2. <i>The Political Economy of Financial Regulation</i>	96
3. <i>Unintended Consequences</i>	99

* Professor of Law, UCLA School of Law. E-mail: anabtawi@law.ucla.edu.

** Stanley A. Star Professor of Law & Business, Duke University School of Law; Founding/Co-Academic Director, Duke Global Capital Markets Center. E-mail: schwarcz@law.duke.edu. We thank Lawrence Baxter, Samuel Buell, Daniel Bussel, Anna Gelpern, Kathryn Judge, Wulf Kaal, Timothy Malloy, Sara Roos, and Daniel Schwarcz for helpful comments. We also thank Robert Double, Arie Eernisse, Douglas Merkel, and Dylan Raife for valuable research assistance.

IV. REGULATING THE FINANCIAL SYSTEM <i>EX POST</i>	102
A. <i>Ex Post</i> Regulatory Strategies.....	102
1. <i>Financial Safety Nets</i>	103
a. <i>Firms</i>	104
b. <i>Markets</i>	106
2. <i>Disrupting Transmission Chains</i>	112
a. <i>Reducing Interactive Complexity</i>	113
b. <i>Reducing Tight Coupling</i>	117
B. The Costs of <i>Ex Post</i> Financial Regulation	122
1. <i>Moral Hazard</i>	122
2. <i>Taxpayer Burden</i>	125
3. <i>The Danger of False Positives</i>	126
4. <i>Inefficiencies</i>	126
V. BALANCING <i>EX ANTE</i> AND <i>EX POST</i> FINANCIAL REGULATION	128
VI. CONCLUSION.....	131

I. Introduction

The financial system can be viewed as a complex network in which financial firms interact directly and indirectly (through markets) against the background of legal rules. Like any system, the financial system's behavior depends on its structure—the relationships among its elements. A key feature of the financial system's structure is that it possesses the characteristics of a high-risk system. High-risk systems are accident-prone. They tend to experience long periods of stability and occasional, catastrophic failures.

This Article analyzes the implications of systems analysis for reducing financial systemic risk,¹ a serious challenge for financial regulators. We begin in Part II by considering the nature of systems and the usefulness of systems analysis as a methodology for studying law. Law-related systems are systems in which the law is an integral element. In the financial system, as in any other law-related system, law can intervene at various junctures. In particular, it can operate *ex ante*, to prevent a financial failure from occurring, or *ex post*, to mitigate a financial crisis that has already been set in motion.

1. Financial systemic risk is:

[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.

Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193, 204 (2008) [hereinafter Schwarcz, *Systemic Risk*].

We develop our distinction between *ex ante* and *ex post* regulation in Part III. While this distinction is frequently made in legal scholarship, it has distinct implications in the context of a law-related system in general and the financial system specifically. *Ex ante* versus *ex post* debates have traditionally been associated with the question whether the law should be given content before or after harmful conduct has occurred. This question—whether deterrence is best served by “bright-line rules” or “flexible standards”—is meaningful when deterrence is the law’s primary aim. In a law-related system, however, regulation can operate not only to prevent harmful conduct, but also to mitigate the harmful consequences that flow from that conduct. As a result, law has a role to play even after harmful conduct has taken place.

After developing our distinction between *ex ante* and *ex post* regulation in the financial system, we consider the limits of *ex ante* financial regulation. We argue that, while relying exclusively on *ex ante* regulation might at first appear to be a desirable policy objective, it will always have to be supplemented by *ex post* regulation. *Ex ante* regulation cannot prevent all financial crises. Furthermore, it is unrealistic to believe that complete *ex ante* regulation could survive the political opposition of the financial services industry. Finally, tight financial regulation will always confront the problems of chilling efficient risk taking and inducing regulatory arbitrage.

In subpart IV(A), based on our study of the financial system’s features, we offer two types of *ex post* regulatory strategies for mitigating systemic risk. The first, creating financial safety nets, operates on the elements of the financial system. Financial safety nets are designed to absorb losses of a financial firm or market that has begun failing. The second, disrupting the transmission of systemic risk, operates on the financial system’s interconnections. Both types of intervention can mitigate the spread and severity of a financial failure.

Ex post financial regulatory strategies confront legitimate criticisms. These include concerns about moral hazard, taxpayer burden, the danger of unnecessary rescues, and inefficiencies that are often associated with bailouts. In subpart IV(B), we discuss these objections and respond to them. In our view, the potential costs of *ex post* financial regulation can be managed and are outweighed by the potential benefits of containing systemic risk.

In the wake of the financial crisis of 2007–2009 (the Financial Crisis), the Dodd-Frank Act overhauled financial regulation in the United States. In Part V we raise our concern that Dodd-Frank’s underpinnings reflect a strong *ex ante* financial regulatory bias. Our analysis suggests that financial regulation should instead address systemic risk in a more balanced fashion. Drawing on our evaluation of the respective limits of *ex ante* and *ex post* regulation, we propose guidelines for accomplishing this task. Our

approach is designed to encourage prudent, while discouraging reckless, risk taking.

II. Law and Systems

A. *The Nature of Systems*

1. *Systems Structure.*—A system is, broadly speaking, a group of interrelated elements that form a distinct whole.² Systems can be categorized according to many different attributes. For example, a system can be living or nonliving.³ It can be simple or complex.⁴ Or it can be stable or unstable.⁵ Although systems vary widely, they all possess certain attributes. For something to qualify as a system, (1) it must be composed of elements, (2) its elements must be interconnected, and (3) it must have a function that is distinct from its elements.⁶ In the absence of any of the foregoing attributes, all that exists is a group of things.⁷

Elements are the most basic unit of a system.⁸ The elements of a system are its component parts. These parts may have physical properties, as do objects, or they may have abstract properties, as do legal rules. Without more, however, a collection of elements does not form a system.⁹ The elements of a system have to be interconnected. Relationships tie the elements of a system together.¹⁰ Finally, a system has a unique function. To be sure, a system's elements have individual functions, but the functioning of the system as a whole is distinct from the functioning of its parts.¹¹

The human respiratory system possesses the foregoing attributes in the context of a familiar biological system. First, it is composed of elements—the nose, the trachea, the bronchial tubes, the diaphragm, and the lungs.¹²

2. See A.D. Hall & R.E. Fagan, *Definition of System*, 1 GEN. SYS. 18, 18 (1956) (defining a system generally as “a set of objects together with relationships between the objects and between their attributes”).

3. James G. Miller, *The Nature of Living Systems*, 20 BEHAV. SCI. 343, 348 (1975).

4. See DONELLA H. MEADOWS, THINKING IN SYSTEMS: A PRIMER 22 (Diana Wright ed., 2008) (using a bathtub as an example of a simple system and deducing from it principles that can be applied when analyzing more complex systems).

5. Hall & Fagan, *supra* note 2, at 23.

6. MEADOWS, *supra* note 4, at 11.

7. *Id.* at 12.

8. See *id.* (noting that “the elements of a system are often the easiest parts to notice”).

9. *Id.*

10. See Miller, *supra* note 3, at 347 (“A system is a set of interacting units with relationships among them.”).

11. See MEADOWS, *supra* note 4, at 12–17 (asserting that system purposes “are not necessarily those intended by any single actor within the system”).

12. JEREMY P.T. WARD ET AL., THE RESPIRATORY SYSTEM AT A GLANCE 10–13 (3d ed. 2010).

Each of these elements has a unique function that can be studied in isolation.¹³ In addition, each part is connected to the others, directly or indirectly.¹⁴ Finally, as a whole, the human respiratory system serves a function that is distinct from the function of its component parts: It carries out the metabolic process of breathing.¹⁵

When a group of things is either unconnected or connected in a way that does not give rise to a whole that serves an independent function from that of its parts, it is a nonsystem.¹⁶ A nonsystem possesses “separability.”¹⁷ Separability exists when elements act independently of other elements.¹⁸ A baseball card collection is an example of a nonsystem. Although the cards in the collection may share common properties, they are separable because no element of the collection depends intrinsically on another. Moreover, adding or removing cards from the collection may change the collection’s value, but the group of cards remains a collection. In contrast, removing any element of the human respiratory system fundamentally alters the system’s behavior.

Recognizing the distinctions between systems and nonsystems is important when choosing one’s level of analysis. Nonsystems can be usefully analyzed by looking at their individual elements.¹⁹ Although the various elements of a nonsystem may be grouped together, it is not necessary to consider the elements *as* a group because doing so will not yield insights beyond those that can be found by analyzing the elements individually. In other words, if something is not a system, then little is lost from studying it at the elemental level.

If we were to study only the individual elements of a system, however, we would be ignoring the relationships among the elements as well as the functioning of the system as a whole. In a system, the state of each element is conditional on the states of the others.²⁰ Restricting our level of analysis to the elements would ignore each element’s effects on the other elements. More broadly, we would miss the connections between each element and the system of which they were a part. Understanding and predicting a

13. *See id.* (describing the functions of the parts of the respiratory system).

14. *Id.*

15. *See id.*

16. *See* Miller, *supra* note 3, at 362 n.7 (“Were there no communication between [parts] there would be no organization, for we would merely have a collection of individual elements isolated from each other.”).

17. *See id.* (explaining that organized systems demonstrate “conditionality” while nonsystems demonstrate “separability”).

18. *See id.* (noting that separability occurs in mechanical forms when “what looks like one machine proves to be composed of two (or more) sub-machines, each of which is acting independently of the others”).

19. *See id.*

20. *Id.*

system's behavior thus requires a knowledge of both the elements of a system and how those elements interact.

2. *Systems Behavior*.—Not surprisingly, the structural differences between systems and nonsystems give rise to differences in their respective behaviors. Recall that a nonsystem is composed of elements whose states are independent of each other.²¹ Being nothing more than a group of unconnected things, nonsystems do not exhibit any behavior apart from the behavior of their constituent parts.²² Thus, the behavior of a nonsystem can be analyzed satisfactorily in terms of its discrete elements.

A fundamentally different approach is needed when analyzing the behavior of systems. As a result of the connections among a system's elements, activity in one element may affect the behavior of the other elements.²³ In addition, a system has its own behavior.²⁴ An important insight of systems theory is that a system's behavior is the product of its underlying structure.²⁵ Much of the power of systems analysis comes from this insight. It helps explain, for example, why similar patterns of behavior arise in a variety of different contexts.²⁶ These patterns often result from certain structurally similar features of the systems.²⁷ It follows that behaviors, either desirable or undesirable, that are latent within a system, that is, that have not yet revealed themselves, can potentially be addressed by analyzing and altering the system's structure.

3. *Systems Functions*.—Systems also have functions.²⁸ The primary function of the respiratory system is the exchange of gases.²⁹ An inventory control system's function is to manage the availability of stocks for production, sales, or delivery.³⁰ The Uniform Commercial Code Article 9 filing system's function is to communicate the possible existence and

21. See *supra* note 18 and accompanying text.

22. See MEADOWS, *supra* note 4, at 12 (observing that when an element is taken away from a nonsystem its function does not change).

23. See *id.* at 12–13 (using a tree system to illustrate how interconnections between elements can cause changes in one element to affect the behavior of other elements in a system).

24. See *id.* at 15 (explaining that a system's purpose is not necessarily the same as those of its elements).

25. *Id.* at 89.

26. See *id.* (noting that different feedback-loop structures cause different behaviors).

27. See *id.* at 27–29 (describing two systems of the same structure, balancing feedback loops, that exhibit similar behavior).

28. *Id.* at 11.

29. WARD, *supra* note 12, at 11.

30. See SVEN AXSÄTER, INVENTORY CONTROL 1–2 (2006) (characterizing an inventory system as balancing the conflicting goals of an organization's purchasing, production, and marketing departments).

priority of a security interest.³¹ In each of these examples, the relevant system's elements operate together to produce one or more distinct overall system functions. The most accurate way to determine the functions of a system is to observe the system in operation.³² Systems generate outputs.³³ By identifying the results that a system produces, one can deduce the system's functions.

As a positive matter, a system can be regarded as “goal-seeking” in the sense that it is a means to an end.³⁴ In this sense, a system has no function apart from producing the results that the system in fact generates. In normative terms, however, one can assign goals to a system that need not be aligned with how the system functions.³⁵ In other words, the designers of a system may desire certain goals for the system even if the system is not producing them. Systems often “add up to an overall behavior that no one wants.”³⁶ Importantly, when a system's functions deviate unacceptably from the goals that have been established for it, it may be possible to alter the system to achieve more desirable outcomes.³⁷

B. *Law-Related Systems*

1. *Identifying Law-Related Systems.*—We consider a system to be “law-related” if law is an integral element of the system.³⁸ By definition, the elements of a system are interconnected. Not all of a system's elements are equally important to the system, however.³⁹ We refer to an element as being “integral” to a system if removal of that element would alter the system's behavior in some salient way. Thus, in a law-related system, the state of the law plays a critical role in how the system operates.⁴⁰

31. See *McCarthy v. BMW Bank of N. Am.*, 509 F.3d 528, 530 (D.C. Cir. 2007) (“[A] principal purpose[] of [the Article is] to enforce the policy against secret liens by demanding strict compliance with filing or recording requirements.” (internal quotation marks omitted)).

32. See Lynn M. LoPucki, *The Systems Approach to Law*, 82 CORNELL L. REV. 479, 503–04 (1997) (detailing the use of observation to discern the functions of a system's subsystems and, in turn, the function of the larger system).

33. *Id.* at 503.

34. *Id.* at 485.

35. *Id.* at 503.

36. MEADOWS, *supra* note 4, at 15.

37. See *id.* at 16–17 (describing how a system can be altered by changes in its elements, interconnections, and functions).

38. See LoPucki, *supra* note 32, at 488–89 (describing a law-related system and distinguishing it from a legal system).

39. See MEADOWS, *supra* note 4, at 16 (noting that changing an element “usually has the least effect on the system” but that “particular elements of a system can indeed be important”).

40. Not all systems are law-related, of course. Our solar system consists of the sun and the astronomical objects gravitationally bound in orbit around it. Positive law is not an element of the solar system and so cannot influence its behavior. A United States Supreme Court decision that

2. *Using Systems Analysis as a Methodology to Analyze Law.*—Once we identify a system as being law-related, we can use systems analysis as a methodology for studying law's role in it. Systems analysis involves seeking to understand a system's structure, connections, and functions.⁴¹ Professor Lynn LoPucki, who has applied a systems-analysis approach to several law-related systems, sees systems analysis as “build[ing] upon traditional methods of analyzing the law.”⁴²

Systems analysts consider the parts of a system from the standpoint of their roles within the system as a whole.⁴³ Instead of screening out the dynamic nature of systems, they screen it in. To be sure, the elements of a system are important to the systems analyst. They are, after all, the system's building blocks. Systems analysts believe, however, that the functioning of a system's elements cannot be properly understood without reference to those elements' interactions.⁴⁴ Put differently, the relationships between the parts of a system are as important to systems analysts as the way the parts function individually. Relatedly, systems analysts see the behavior of the whole of a system as depending, in part, on the system's individual elements.⁴⁵ They view studying the whole directly, without reference to its parts, as ignoring valuable information. According to systems analysts, the functioning of the whole has much, though not everything, to do with the functioning of its individual elements.⁴⁶

To make the systems-analysis approach more concrete, consider the example of an ant colony. Most people would agree that an ant colony is something more than a collection of ants. Members of an ant colony perform distinct tasks, such as “foraging, nest maintenance, patrolling, and midden work” (cleanup of debris).⁴⁷ This allocation of tasks is an important

declares it unconstitutional for the earth to revolve around the sun will have no effect on the earth's path. Thus, the solar system, like most physical systems, is not a law-related system.

Unlike physical systems, social systems are often law-related. The judicial system, the health care system, and the bankruptcy system, to name only a few examples, are all law-related systems. Law plays an important role in each of them. Remove the element of the law from any of these systems, and it would behave very differently.

41. *See, e.g.*, LoPucki, *supra* note 32, at 482–83 (“To ‘analyze’ a system is to break it down into its constituent parts, to determine the nature and identity of its subsystems, and to explain the relationships among them.”).

42. *Id.* at 509.

43. *See id.* at 503–05 (explaining that any systems analysis must include the analysis of its component parts and how they contribute to the overall function of the system).

44. *See* MEADOWS, *supra* note 4, at 13–14 (demonstrating the importance of interconnections through a description of the interconnection of the elements of a tree system).

45. *See id.* at 17 (“To ask whether elements, interconnections, or purposes are most important in a system is to ask an unsystemic question. All are essential.”).

46. *See id.* at 15 (explaining that while the functions of individual elements of a system are important, the function or purpose of the whole system is not necessarily the same as the function intended by the individual elements).

47. NINO BOCCARA, MODELING COMPLEX SYSTEMS 1–2 (R. Stephen Berry et al. eds., 2004).

feature of an ant colony. Limiting oneself to studying the discrete tasks of individual ants, however, would eclipse the cooperative ant behavior evident at the level of the colony. At the level of the colony, task allocation among ants is continually adjusting.⁴⁸ As conditions change, ants redeploy themselves accordingly.⁴⁹ Considering the colony's dynamics is necessary to understand the processes by which individual ants assume various tasks.

Systems analysis recognizes that a system, such as an ant colony, consists of both its elements and their relationships to each other. As a methodology for analyzing law-related systems, it gives us the means to look beyond a system's elements to their relationships within the system as a whole. More specifically, it provides us with a framework for analyzing how and why certain elements of a system affect others, whether the operation of the system is achieving its goals, and how the law can intervene when the system produces undesirable results.⁵⁰

Systems analysis of law-related systems formalizes and makes explicit the relationships between law and its broader contexts.⁵¹ The systems-analysis methodology provides insights into law's role in systems that traditional methods of legal analysis are likely to miss. Analytical legal scholarship typically identifies a particular problem and uses a certain approach to solve it.⁵² Limiting the scope of a project in this way has the advantage of making it more tractable.⁵³ The disadvantage of focusing narrowly on a specific problem, however, is that it sets aside the broader context in which that problem exists.⁵⁴ By screening out related elements of the system, as well as the system's interconnections, traditional legal scholarship is often forced to treat law's dynamic effects, to the extent it does so at all, discretely.⁵⁵

48. *Id.* at 2.

49. *Id.*

50. *See, e.g.,* LoPucki, *supra* note 32, at 506–07 (laying out a process by which normative analyses could uncover “system-unintended” results and correct those results).

51. *See id.* at 480–82 (describing how systems analysis operationalizes concepts by “accommodat[ing] as much complexity as possible,” allowing every proposition to be tested empirically and asserting that systems analysis “has the potential to put legal scholarship in touch with reality”).

52. *Id.* at 480.

53. *Id.*

54. *See id.* (criticizing this approach because it can “screen[] out important aspects” and may “lead[] the analyst to the wrong conclusion”); J.B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-Society System: A Wake-Up Call for Legal Reductionism and the Modern Administrative State*, 45 DUKE L.J. 849, 906 (1996) (“Our legal system has been fundamentally reductionist in approach as well as in theory.”).

55. *See* J.B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and Its Practical Meaning for Democracy*, 49 VAND. L. REV. 1407, 1411 (1996) (“It is impossible to understand and manage the dynamical qualities of law and society by dividing them into separate spheres, subdividing those spheres into separate compartments, and so on.”).

3. *The Role of Law in Law-Related Systems.*—The systems-analysis paradigm has concrete implications for how law can influence the behavior of a law-related system. It is especially helpful in elucidating the role that law can play intertemporally,⁵⁶ at various junctures in the operation of the system, because a system's behavior often unfolds over time.⁵⁷ Intertemporally, law can operate over three different time periods: (1) before the occurrence of an event, (2) after the event has occurred but before its repercussions have ended, and (3) after the full effects of the event have been sustained.⁵⁸ At each of these junctures, law's intervention can have important effects.

When law operates to avert a harm, it is operating preventively.⁵⁹ Preventive law is designed to reduce or eliminate problems before they arise in the first place.⁶⁰ Law can also help to mitigate the negative consequences of a harmful event after it has occurred.⁶¹ Law would operate here to halt or slow the progress of those consequences to minimize further losses. Mitigative intervention can take over where preventive intervention leaves off.⁶²

C. *The Financial System as a Law-Related System*

Our purpose in this subpart is not to attempt to describe in detail what is commonly known as the “financial system” but rather to establish the financial system as a law-related system. As we have defined it, a system incorporates elements, interconnections, and functions.⁶³ Further, a law-related system is a particular type of system in which law is an integral element.⁶⁴

56. Within the field of statistics, intertemporality is referred to as “time series.” See generally GENSHIRO KITAGAWA, INTRODUCTION TO TIME SERIES MODELING (2010) (describing time series in the same manner as intertemporality).

57. See MEADOWS, *supra* note 4, at 2 (defining a system as “a set of things . . . interconnected in such a way that they produce their own pattern of behavior *over time*” (emphasis added)).

58. See Timothy F. Malloy, *Principled Prevention*, 45 ARIZ. ST. L.J. (forthcoming 2013) (manuscript at 6–7), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2304420 (describing two approaches to chemical regulation, one that seeks to avoid the use of such chemicals and the other that seeks to mitigate the harmful effects of their use).

59. *Id.* (manuscript at 4).

60. *Id.*

61. *Id.* (manuscript at 3–4).

62. Even after the full effects of a harmful event have been sustained, law may have a role to play. At this juncture, law can attempt to help participants in the system cope with the effects of the system's behavior through measures designed to alleviate suffering. For purposes of this Article, we focus on the preventive and mitigative roles of law and set aside law's role of intervening to alleviate suffering after the full consequences of a harmful event have occurred. Our rationale for excluding such palliative measures from the scope of our analysis is that we believe the ultimate distribution of losses associated with economic shocks involves choices best made through political decisions that do not bear on the operation of the financial system.

63. See *supra* text accompanying note 6.

64. See *supra* note 40 and accompanying text.

A functional approach to identifying the elements of the financial system looks to the objective purposes that the financial system serves.⁶⁵ It then attempts to discern the elements that further those purposes within the system.⁶⁶ An alternative to a functional approach is to adopt an institutional one.⁶⁷ An institutional perspective identifies a system's elements based on whether they possess specified legal attributes.⁶⁸ The difficulty with using an institutional approach to identify the elements of the financial system is that it is unlikely to be adaptive when the system is experiencing change.⁶⁹ For example, as a result of regulatory arbitrage, substantial financial intermediation—the process of transforming loans into credit—moved from commercial banks to shadow banks between 1990 and 2007.⁷⁰ Like traditional banks, shadow banks intermediate between borrowers and lenders.⁷¹ Unlike traditional banks, however, they operate without formal government guarantees and without formal access to central bank liquidity.⁷² Failure to subject shadow banks to a regulatory regime similar to that which applies to traditional banks is widely believed to have contributed to the buildup of risks in the financial system in the period leading up to the Financial Crisis.⁷³

The elements of the financial system can be identified functionally as those institutions or processes involved in the provision, allocation, or

65. See GROUP OF THIRTY, *THE STRUCTURE OF FINANCIAL SUPERVISION: APPROACHES AND CHALLENGES IN A GLOBAL MARKETPLACE* 13 (2008), available at <http://www.group30.org/images/PDF/The%20Structure%20of%20Financial%20Supervision.pdf> (explaining that under a functional approach, supervisory oversight is determined by the business being transacted by the entity).

66. See *id.* at 26–27 (using Italy as an example of the use of the functional approach and describing the details of its regulatory system).

67. *Id.* at 13.

68. *Id.*

69. Cf. Wulf A. Kaal, *Evolution of Law: Dynamic Regulation in a New Institutional Economics Framework*, in *FESTSCHRIFT IN HONOR OF CHRISTIAN KIRCHNER* (Kaal et al. eds., forthcoming 2014) (manuscript at 4), available at <http://papers.ssrn.com/abstract=2267560> (describing the dynamic nature of regulation).

70. Margaret M. Blair, *Financial Innovation, Leverage, Bubbles and the Distribution of Income*, 30 REV. BANKING & FIN. LAW 225, 227–28 (2010); see also FED. RESERVE BANK OF N.Y., STAFF REPORT NO. 458, *SHADOW BANKING* 8 fig.1 (rev. 2012). The shift to less regulated intermediaries has also come about as new, more efficient firms entered financial markets. See Charles K. Whitehead, *Reframing Financial Regulation*, 90 B.U. L. REV. 1, 37 (2010) (“Many of the less-regulated firms are new market participants that, independent of regulatory differences, are more efficient in managing risk than traditional intermediaries.”).

71. FED. RESERVE BANK OF N.Y., *supra* note 70, at 10.

72. Steven L. Schwarcz, *Regulating Shadows: Financial Regulation and Responsibility Failure*, 70 WASH. & LEE L. REV. (forthcoming 2013) (manuscript at 14–15), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2159455.

73. See, e.g., FED. RESERVE BANK OF N.Y., *supra* note 70, at 1 (contending that shadow banking contributed to price appreciation in real estate prior to the financial crisis).

deployment of financial capital.⁷⁴ From this perspective, the financial system consists of three principal elements—firms, markets, and legal rules. Financial firms are the most basic units of the financial system. They perform intermediation services.⁷⁵ Financial firms consist of commercial banks and other financial market participants, such as investment banks, insurance companies, and investment funds.⁷⁶ They also include government-sponsored enterprises (GSEs), which purchase, guaranty, and securitize mortgages.⁷⁷ Collectively, financial firms are important sources of financial capital for economic activity.⁷⁸

Financial markets are another important element of the financial system. Financial markets are markets in which financial assets are traded.⁷⁹ These markets facilitate the allocation of capital.⁸⁰ Increasingly, financial markets are also supplanting the use of intermediaries as a source of financing. This trend is the result of disintermediation—the ability to access capital directly through markets; that is, without going through banks or other financial intermediaries.⁸¹

Both financial firms and financial markets operate within the context of various bodies of regulation, which govern the provision, allocation, and deployment of financial capital.⁸² While these regulations are highly

74. See generally Robert C. Merton & Zvi Bodie, *A Conceptual Framework for Analyzing the Financial Environment*, in *THE GLOBAL FINANCIAL SYSTEM* 3, 5 (Dwight B. Crane et al. eds., 1995) (stating that the primary purpose of the financial system is resource allocation).

75. See Whitehead, *supra* note 70, at 3 (referring to securities firms, banks, and insurance companies, among other financial institutions, as intermediaries).

76. JEFF MADURA, *FINANCIAL MARKETS AND INSTITUTIONS* 11–13 (Joe Sabatino et al. eds., 10th ed. 2010).

77. GSEs are privately owned corporations established by a charter from Congress. U.S. GEN. ACCOUNTING OFFICE, *GAO/AFMD-91-17, BUDGET ISSUES: PROFILES OF GOVERNMENT-SPONSORED ENTERPRISES 1* (1991). They serve to direct funds to particular financial sectors in which private credit markets are insufficient. *Id.* at 6. In particular, they “engage in business operations in the private sector to increase the flow of credit to home buyers, farmers, students, and colleges.” *Id.* Examples of GSEs include the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), and the Financing Corporation (FICO). *Id.*

78. See MADURA, *supra* note 76, at 10 (describing how financial firms serve an important purpose by “accept[ing] funds from surplus units and channel[ing] the funds to deficit units” and asserting that “[w]ithout financial institutions, the information and transaction costs of financial market transactions would be excessive”).

79. *Id.* at 3.

80. See *id.* (“Financial markets transfer funds from those who have excess funds to those who need funds.”).

81. See WESLEY B. TRUITT, *THE CORPORATION* 107–09 (2006) (describing two direct methods through which companies can access capital directly from the market: “issuing stock and undertaking debt”). Firms often use capital markets to turn illiquid assets into cash. For instance, through securitization, banks can turn long-term mortgages into easily tradable securities. MEIR KOHN, *FINANCIAL INSTITUTIONS AND MARKETS* 381 (2d ed. 2004). Also, firms often can borrow more cheaply through bonds and commercial paper than they can from banks. See *id.* at 145.

82. More broadly, the financial system is “legally constructed.” Katharina Pistor, *A Legal Theory of Finance*, 41 *J. COMP. ECON.* 315, 317 (2013). Contract law specifies the rights and

fragmented among administrative authorities,⁸³ they fall into four basic types. Market-integrity regulation promotes fairness in the interactions among financial market participants.⁸⁴ It encompasses disclosure requirements, oversight of trading exchanges, and prohibitions on unfair trading practices and market manipulation.⁸⁵ A second category of financial regulation is competition regulation. Competition regulation addresses the structure of financial markets.⁸⁶ It seeks to cause financial markets to behave competitively by overseeing both market conduct and market conditions.⁸⁷ Prudential regulation, or regulation that aims to ensure that financial firms behave “prudently,” addresses the risks to which financial firms are subject.⁸⁸ It is concerned primarily with whether financial firms are able to meet their obligations to their counterparties.⁸⁹ Prudential regulation includes capital adequacy, solvency, and liquidity requirements; investment guidelines; and procedures for undertaking risk management.⁹⁰ Finally, consumer-protection regulation governs the relationship between financial firms and their retail customers.⁹¹ Its scope includes the adequacy of information disclosure, the reasonableness of the terms of products and services, and the fairness of procedures for resolving disputes.⁹² Collectively, the pervasiveness of the foregoing types of financial regulation establish law as another integral element of the financial system.⁹³

obligations of the parties to financial instruments; corporate law limits the liability of investors; and bankruptcy law allocates losses among competing creditors. *See generally id.* at 315–21.

83. *See generally* Alejandro Komai & Gary Richardson, *A Brief History of Regulations Regarding Financial Markets in the United States: 1789 to 2009* (Nat’l Bureau of Econ. Research, Working Paper No. 17443, 2011), available at <http://www.nber.org/papers/w17443> (arguing that “fragmented regulatory authority is . . . the root cause of financial instability”).

84. JEFFREY CARMICHAEL & MICHAEL POMERLEANO, *THE DEVELOPMENT AND REGULATION OF NON-BANK FINANCIAL INSTITUTIONS* 26 (2002).

85. *Id.* at 26, 35.

86. Paul B. Stephan, *Global Governance, Antitrust, and the Limits of International Cooperation*, 38 CORNELL INT’L L.J. 173, 178–79 (2005).

87. *Id.*

88. Kristin N. Johnson, *Macroprudential Regulation: A Sustainable Approach to Regulating Financial Markets*, 2013 U. ILL. L. REV. 881, 884.

89. *Id.* at 884–85.

90. *Id.* at 883–85.

91. *See, e.g.*, Susan Block-Lieb, *Accountability and the Bureau of Consumer Financial Protection*, 7 BROOK. J. CORP. FIN. & COM. L. 25, 30 (2012) (tracing U.S. consumer-protection regulation back to acts that prohibited deceptive consumer lending practices).

92. *See, e.g.*, Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, §§ 1011, 1028, 1032, 124 Stat. 1376, 1964, 2003–04, 2006–07 (2010) (codified at 12 U.S.C. §§ 5491, 5518, 5532 (2012)) (establishing the Bureau of Consumer Financial Protection to regulate consumer financial products and giving the Bureau the power to, *inter alia*, prescribe rules to ensure accuracy of disclosures and limit the use of arbitration agreements with consumer financial products).

93. *Cf. Pistor, supra* note 82, at 325 (“[L]aw is essential to the very existence of contemporary finance . . .”).

The various elements of the financial system are highly interconnected.⁹⁴ Their linkages give the financial system the characteristics of a network.⁹⁵ In a network, the relationships among elements are the means by which a change in the state of one element is transmitted to the other elements.⁹⁶ The Financial Crisis was in large part a story about the relationships among the elements of the financial system, many aspects of which were previously underappreciated.⁹⁷ The most explicit of these relationships are direct contracts, such as derivatives.⁹⁸ Derivatives, including credit-default swaps (CDS),⁹⁹ allow firms to trade credit risks on a variety of exposures.¹⁰⁰ Because of these interconnecting contracts, one party's default on its obligations may cause its counterparties to default on their own obligations, leading to a domino-effect collapse.¹⁰¹

The domino model of contagion describes a mechanism by which shocks are transmitted directly between financial firms in a network.¹⁰² Another way that shocks can affect the financial system is through financial markets. In a market-based financial system, an asset's price responds to supply and demand.¹⁰³ When financial firms are simultaneously seeking liquidity in order to meet regulatory requirements, margin calls, or withdrawal requests, risky assets may need to be sold at market prices

94. Markus K. Brunnermeier, *Deciphering the Liquidity and Credit Crunch 2007–2008*, 23 J. ECON. PERSP. 77, 96 (2009) (describing the modern financial system as an “interwoven network of financial obligations”).

95. Olufunmilayo B. Arewa, *Financial Markets and Networks—Implications for Financial Market Regulation*, 78 U. CIN. L. REV. 613, 613 (2009).

96. *Id.*

97. *Id.*

98. Steven L. Schwarcz, *Regulating Complexity in Financial Markets*, 87 WASH. U. L. REV. 211, 235 (2009) [hereinafter Schwarcz, *Regulating Complexity*].

99. In a credit-default swap, one party (the credit “seller”) agrees, in exchange for the payment to it of a fee by a second party (the credit “buyer”), to assume the credit risk of certain debt obligations of a specified borrower or other obligor. STEVEN L. SCHWARCZ, *STRUCTURED FINANCE: A GUIDE TO THE PRINCIPLES OF ASSET SECURITIZATION* § 10:1.1 (Adam D. Ford ed., 3d ed., rev. 2010). If a “credit event” (for example, default or bankruptcy) occurs in respect of that obligor, the credit seller will either (a) pay the credit buyer an amount calculated by reference to the post-default value of the debt obligations or (b) buy the debt obligations (or other eligible debt obligations of the obligor) for their full face value from the credit buyer. *Id.* § 10:3.1.

100. Schwarcz, *Regulating Complexity*, *supra* note 98.

101. *Id.*; Schwarcz, *Systemic Risk*, *supra* note 1, at 198–99; *see also* Hal S. Scott, *Interconnectedness and Contagion*, COMMITTEE ON CAPITAL MARKETS REG. 5, (Nov. 20, 2012), http://www.capmksreg.org/pdfs/2012.11.20_Interconnectedness_and_Contagion.pdf (asserting that interconnectedness of financial institutions can pose a systemic risk to a financial firm's liabilities).

102. *See* MARKUS BRUNNERMEIER ET AL., *THE FUNDAMENTAL PRINCIPLES OF FINANCIAL REGULATION* 16 (2009) (explaining the domino effect through a hypothetical involving three banks); *see also* Thijs Markwat et al., *Contagion as a Domino Effect in Global Stock Markets*, 33 J. BANKING & FIN. 1996, 1996 (2009) (discussing domino patterns in which local stock market crashes evolve into regional, and then global, crashes).

103. *See* BRUNNERMEIER ET AL., *supra* note 102, at 19 (explaining the supply and demand response of assets and the impact of these changes on economic shocks).

below their fundamental values, or “fire-sale” prices.¹⁰⁴ The decline in the market value of those assets can then lead to further asset sales and price declines precipitated by additional demands for funds.¹⁰⁵ Markets thus provide channels through which pressure on the price of an asset can be transmitted throughout the financial system.¹⁰⁶

In addition to having interrelated elements, systems have functions, or goals, that are distinct from those of their individual elements. As we discussed in section II(A)(3), a system’s functions may be described in either positive or normative terms. The positive function of a system is whatever outcome the system in fact produces. The normative function of a system, on the other hand, is the outcome that policy makers believe the system ought to produce. When the positive and normative functions of a system differ, the system is departing from its target outcome.¹⁰⁷

We alluded above to the financial system’s basic functions of providing, allocating, and deploying financial capital.¹⁰⁸ More specifically, the financial system aggregates savings from disparate sources, originates financial instruments for use in transferring risk, provides liquidity for holders of financial instruments, furnishes credit to finance consumption and investment spending, and provides a mechanism for making payments.¹⁰⁹ The financial system serves these ends as a positive matter.

In addition to identifying the financial system’s positive functions, we can attribute a normative function, or goal, to it. In *Thinking in Systems*, Donella Meadows pointed out how dramatically a change in a system’s designated function can alter the system’s behavior.¹¹⁰ She suggested imagining keeping the players and rules of a game the same, but changing its goal from winning to losing.¹¹¹ In Meadows’s example, reversing the

104. See Yesha Yadav, *Looking for the Silver Lining: Regulatory Reform After the “Credit Crunch,”* 15 STAN. J.L. BUS. & FIN. 314, 320 (2010) (illustrating how lack of liquidity can lead to the sale of assets at fire-sale prices when a bank experiences a bank run).

105. See *id.* (“Where firms hold similar types of assets, the fall in market value will impact the economy as a whole and throw a number of firms into the same state of crisis as the originally troubled institution(s).”).

106. In financial markets, where risk exposures are continually adjusting in the presence of information uncertainty, systemic transmission of localized shocks need not even require that firms be contractually linked or that they conduct fire sales. If it is not possible to determine which firms are exposed to securities that have become distressed, market participants may assume that all similarly situated firms have such exposure and refuse to extend credit to them. See Jeffrey N. Gordon & Christopher Muller, *Confronting Financial Crisis: Dodd-Frank’s Dangers and the Case for a Systemic Emergency Insurance Fund*, 28 YALE J. ON REG. 151, 160 (2011) (noting that lenders will see similar institutions as having similar risk and discussing the importance for institutions to signal that they are not subject to these same risks).

107. See *supra* section II(A)(3).

108. See *supra* note 74 and accompanying text.

109. PETER S. ROSE & MILTON H. MARQUIS, *MONEY AND CAPITAL MARKETS* 7–10 (9th ed. 2006).

110. MEADOWS, *supra* note 4, at 16–17.

111. *Id.* at 16.

purpose of the system reverses its behavior. In our context, a clear identification of purpose provides the basis for evaluating the performance of, and prescribing alternative regulatory strategies for influencing, the financial system. Our assessment of how well the financial system behaves depends on how we want it to behave.

A central normative goal of financial regulatory policy is to promote economic efficiency.¹¹² Achieving efficiency entails correcting market failures.¹¹³ In the financial system, numerous market failures can lead to excessive risk taking.¹¹⁴ These include agency problems, behavioral biases, information uncertainty with respect to financial products and markets, and a type of tragedy of the commons in which finite capital resources are exploited.¹¹⁵ These market failures provide a basis, on efficiency grounds, for regulating the financial system.¹¹⁶

Arguably, financial regulatory policy should adopt the additional normative goal of financial stability.¹¹⁷ Financial stability exists when the financial system can sustain shocks without significant impairment to its activities.¹¹⁸ A crisis in the financial system imposes substantial social costs.¹¹⁹ Although these effects are encompassed under a broad view of economic efficiency, they are sometimes regarded as implicating non-efficiency considerations.¹²⁰

112. Steven L. Schwarcz, *Controlling Financial Chaos: The Power and Limits of Law*, 2012 WIS. L. REV. 815, 825 [hereinafter Schwarcz, *Controlling Financial Chaos*]. An allocation of resources is economically efficient if resources cannot be reallocated so as to “make one person better off without making another person worse off.” IVAN PNG & DALE LEHMAN, *MANAGERIAL ECONOMICS* 145 (3d ed. 2007).

113. Schwarcz, *Controlling Financial Chaos*, *supra* note 112, at 818; *see also* PAUL A. SAMUELSON & WILLIAM D. NORDHAUS, *ECONOMICS* 756 (15th ed. 1995) (defining market failure as “[a]n imperfection in a price system that prevents an efficient allocation of resources”).

114. *See* Iman Anabtawi & Steven L. Schwarcz, *Regulating Systemic Risk: Toward an Analytical Framework*, 86 NOTRE DAME L. REV. 1349, 1352 (2011) (arguing that market failures “collectively obscure or motivate firms to ignore the impact of their risk taking on systemic stability”).

115. Schwarcz, *Controlling Financial Chaos*, *supra* note 112, at 818–21, 822 & n.24, 824 & n.35; *see* Steven L. Schwarcz, Essay, *Protecting Financial Markets: Lessons from the Subprime Mortgage Meltdown*, 93 MINN. L. REV. 373, 379 n.35, 404–06 (2008) [hereinafter Schwarcz, *Protecting Financial Markets*] (arguing that the global financial crisis can be attributed in large part to conflicts, complacency, and complexity, as well as to a type of tragedy of the commons, within the financial system).

116. *See* Schwarcz, *Systemic Risk*, *supra* note 1, at 231–34 (explaining that, at best, market discipline is an attractive supplement to other regulatory mechanisms).

117. *See, e.g.*, Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, 124 Stat. 1376, 1376 (2010) (stating as its purpose “[t]o promote the financial stability of the United States”).

118. Schwarcz, *Systemic Risk*, *supra* note 1, at 207–08 (noting that systemic risk threatens the viability of a financial system’s stability).

119. *Id.* at 207.

120. *See id.* (arguing that systemic risk demands that goals for the system go beyond economic efficiency to include the preservation of the financial system’s stability).

Taking into account the value of financial stability, even an efficient financial system might produce financial crises too frequently.¹²¹ This Article assumes that preserving the financial system is socially desirable and that financial regulators should pursue its stability. We believe that an ideal financial regulatory regime would balance the dual normative goals of efficiency and stability of the financial system.¹²²

III. *Ex Ante* Versus *Ex Post* Financial Regulation in a Systems Paradigm

In Part II, we argued that financial regulation operates in a law-related system in which events in one period can affect conditions in later periods. We also argued that deterring harmful conduct through preventive measures is only one of the objectives that financial regulation can serve. Another important objective for financial regulation is to mitigate the adverse consequences of a harmful event after it has taken place and its effects have already been set in motion. In this Part III, we set forth more precisely our distinction between *ex ante* and *ex post* financial regulation and argue that *ex post* regulation will always be needed to mitigate systemic risk.

A. *Ex Ante* Versus *Ex Post* Financial Regulation

The distinction between *ex ante* and *ex post* regulation is a familiar one in legal scholarship.¹²³ The question whether a law is deemed *ex ante* or *ex post* is typically framed around conduct.¹²⁴ *Ex ante* measures target conduct before it occurs; *ex post* measures target conduct after it has already occurred.¹²⁵ Law and economics scholars, in particular, have devoted

121. See W.A. Brock et al., *More Hedging Instruments May Destabilize Markets*, 33 J. ECON. DYNAMICS & CONTROL 1912, 1912–13 (2009) (arguing that more hedging instruments may destabilize the market); Fabio Caccioli et al., *Eroding Market Stability by Proliferation of Financial Instruments* 2–3 (Oct. 1, 2009) (unpublished manuscript), available at <http://arxiv.org/abs/0910.0064> (arguing that the proliferation of financial instruments leads to market instability); Matteo Marsili, *Complexity and Financial Stability in a Large Random Economy* 2–3 (Sept. 8, 2011) (unpublished manuscript), available at <http://ssrn.com/abstract=1415971> (arguing that, even under ideal conditions, unregulated financial innovation can lead to financial instability); Fabio Caccioli & Matteo Marsili, *Information Efficiency and Financial Stability*, ECON.: THE OPEN-ACCESS, OPEN-ASSESSMENT E-JOURNAL 2 (July 14, 2010), <http://dx.doi.org/10.5018/economics-ejournal.ja.2010-20> (arguing that the closer a financial market is to ideal conditions, the more they are prone to imperfections).

122. In some circumstances, these goals will conflict because regulation that seeks to promote stability could have undesirable effects. See *infra* subparts III(B), IV(B). In these instances, policy makers will need to balance the value of financial market efficiency against that of systemic stability.

123. See, e.g., STEVEN SHAVELL, *FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW* 572–74 (2004) (discussing the fundamental dimensions of legal intervention).

124. See, e.g., Louis Kaplow, *Rules Versus Standards: An Economic Analysis*, 42 DUKE L.J. 557, 568–70 (1992) (discussing the effects of *ex ante* and *ex post* rulemaking on conduct).

125. *Id.* at 559–60.

substantial attention to whether social welfare is maximized through the promulgation of *ex ante* or *ex post* approaches.¹²⁶

Ex ante measures are often associated with rules or preventive regulation.¹²⁷ Rules and preventive regulation are laws, the content of which is provided before conduct occurs.¹²⁸ Their operation is resolved in advance of the targeted activity.¹²⁹ *Ex post* measures tend to be associated with standards or litigation.¹³⁰ Unlike rules, standards and litigation do not entail advance resolution of what constitutes permissible conduct.¹³¹ Their content is determined after the conduct to which it applies has taken place.¹³²

It is useful to organize the distinction between *ex ante* and *ex post* regulation around conduct if one assumes that deterrence is the law's primary objective. This assumption is often made with respect to many areas of regulatory law.¹³³ The problem addressed in each case is the same: How should the law be structured to regulate harmful conduct in a way that minimizes net social costs?¹³⁴

In a law-related system, however, the purpose of regulation is not only to prevent harmful *conduct*, but also to avoid harmful *consequences*.¹³⁵ Framing the distinction between *ex ante* and *ex post* regulation around conduct would thus be incomplete. While regulatory policy in a law-related system plays a role in deterring harmful behavior, it also has a role to play in addressing the systemic effects of that behavior should it nonetheless take place.

In order to account for the intertemporal dimension of law-related systems, whereby law can intervene at different junctures in a system's operation, it is necessary to move beyond the traditional conduct-based understanding of how law works. We do this by organizing the *ex ante*–*ex post* distinction around law's impact. In the context of the financial

126. See, e.g., *id.* at 568–71 (describing the social objectives of law structure to be the maximization of benefits net of costs).

127. See Richard A. Posner, *Regulation (Agencies) Versus Litigation (Courts): An Analytical Framework*, in REGULATION VERSUS LITIGATION: PERSPECTIVES FROM ECONOMICS AND LAW 11, 13 (Daniel P. Kessler ed., 2010) (stating that “regulation tends to use *ex ante* preventative means of control”).

128. See *id.* (providing traffic rules and regulations as examples of *ex ante* measures).

129. *Id.*

130. *Id.*

131. See *id.* (providing examples of *ex post* measures such as criminal prosecutions for drunk driving that do not provide for advance resolution of what constitutes permissible conduct).

132. *Id.* at 15.

133. Pierre Schlag, *Rules and Standards*, 33 UCLA L. REV. 379, 384 (1985).

134. See Kaplow, *supra* note 124.

135. See Robert Charles Clark, *The Soundness of Financial Intermediaries*, 86 YALE L.J. 1, 10–11, 23–26 (1976) (noting that reasons given for regulation include protection of particular classes of persons and the economic system as a whole from the consequences of failures).

system, regulation can have two effects. First, it can help to prevent negative financial shocks from occurring. Second, it can help to mitigate the harm from financial shocks after they occur. We refer to the former, preventive role of financial regulation as *ex ante* and to the latter, mitigative role of financial regulation as *ex post*.¹³⁶

B. *The Limits of Ex Ante Financial Regulation*

If *ex ante* regulation were always successful, the financial system would never experience a crisis. The elements of the financial system would never fail, and the interconnections among them would always function smoothly. Complete *ex ante* financial regulation, whereby regulators can prevent every failure, is an unrealistic goal, however. As we argue below, it is futile, impractical, and not necessarily desirable as a means for achieving an efficient and stable financial system.

1. *Normal Accidents*.—Accidents happen. Moreover, according to Charles Perrow, some systems are “high risk,” or “prone to system accidents.”¹³⁷ Accidents within these systems are uncommon, but this is hardly reassuring because, when they do occur, they can be catastrophic.¹³⁸

Perrow used the term “normal accidents” to characterize accidents, or failures, that occur within a system notwithstanding preventive measures.¹³⁹ The term describes not the frequency of failures but rather their inevitability.¹⁴⁰ As he put it bluntly, “[I]t is normal for us to die, but we only do it once.”¹⁴¹

The high-risk systems that Perrow argued were susceptible to normal accidents have two characteristics.¹⁴² They possess both “interactive complexity” and “tight coupling.”¹⁴³ A system is interactively complex if the relationships among its elements exhibit unexpected sequences—

136. Our use of the term *ex post* regulation is distinct from the way in which the term is used by other scholars—namely, as referring to the ad hoc institution of regulations following a financial crisis. See, e.g., Anna Gelpern, *Financial Crisis Containment*, 41 CONN. L. REV. 1051, 1064 (2009) (using *ex post* to describe regulations that are used to ensure firms have the financial cushion to withstand future economic downturns); Adam J. Levitin, *In Defense of Bailouts*, 99 GEO. L.J. 435, 439 (2011) (discussing the use of bailouts as an *ex post* regulation measure).

137. CHARLES PERROW, *NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHNOLOGIES* 16–18 (Princeton Univ. Press 1999).

138. *Id.* at 18.

139. *Id.*

140. *Id.*

141. *Id.*

142. See Herman B. “Dutch” Leonard & Arnold M. Howitt, *Understanding and Coping with the Increasing Risk of System-Level Accidents*, in *INTEGRATIVE RISK MANAGEMENT: ADVANCED DISASTER RECOVERY* 13, 13–26 (Simon Woodward ed., 2010) (noting the two characteristics of high-risk systems and advancing the view that forces in the ways that economic, financial, and physical systems co-evolve make system-level failures more prevalent over time).

143. PERROW, *supra* note 137, at 17–18.

sequences that are either unobservable or incomprehensible.¹⁴⁴ A tightly coupled system is one that is highly interdependent, so that a disturbance to one part of the system can spread almost instantaneously to other parts of the system.¹⁴⁵ Taken together, interactive complexity and tight coupling imply that high-risk systems pose a serious challenge for regulators: their elements will, rarely but surely, interact rapidly and in unanticipated ways.¹⁴⁶

Although Perrow developed normal accident theory in the context of high-risk technologies,¹⁴⁷ the theory is readily applicable to the financial system.¹⁴⁸ The financial system is comprised of firms and markets that are interactive and operate with incomplete information.¹⁴⁹ Participants within the financial system are not fully aware of either the characteristics of the financial instruments that others in the system hold or the topology of the network that describes the system's structure.¹⁵⁰ Such uncertainty makes it difficult to ascertain the vulnerabilities of individual firms and markets to external shocks.¹⁵¹ Difficulties in assessing these vulnerabilities can, in turn, lead to unanticipated failures—a consequence of interactive complexity.¹⁵²

The financial system also exhibits tight coupling. A failure by any given firm can reverberate throughout the financial system by way of a variety of avenues. Direct contracts are one such pathway. Under a credit-default swap, for example, the seller of the swap insures the buyer against the risk that a third party will default on its debt obligation to the buyer.¹⁵³ If the seller of the swap is unable to meet its obligation to the buyer and the

144. *Id.* at 130.

145. *Id.* at 17.

146. *See id.* at 18.

147. *Id.* at 17.

148. Michael Power, *Preparing for Financial Surprise*, 19 J. CONTINGENCIES & CRISIS MGMT. 28, 30 (2011); Andrew G. Haldane, Exec. Dir., Fin. Stability, Bank of Eng., *Rethinking the Financial Network* 11–12 (Apr. 28, 2009) (transcript available at <http://www.bankofengland.co.uk/archive/Documents/historicpubs/speeches/2009/speech386.pdf>).

149. Anabtawi & Schwarcz, *supra* note 114, at 1371 & n.86, 1393.

150. *See id.* at 1393–94 (stressing that firms are unaware of the ways in which they are interconnected and to what degree crises will spread through those connections).

151. *See* Michael J. Naylor et al., *A Network Theory of Financial Cascades* 5 (July 23, 2008) (unpublished manuscript), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1184604 (concluding that the impact of any disturbance to the financial system cannot be understood without examining both the characteristics of individual nodes and the entire topology of the financial system).

152. Schwarcz, *Regulating Complexity*, *supra* note 98, at 231–36. Kathryn Judge has observed that interactive complexity has increased with the proliferation of “fragmentation nodes”—the legal structures created upon the transformation of one type of asset into another. Kathryn Judge, *Fragmentation Nodes: A Study in Financial Innovation, Complexity, and Systemic Risk*, 64 STAN. L. REV. 657, 659–60, 676 (2012).

153. *See supra* note 99.

obligation is sufficiently large, the buyer might be forced to default on its own obligations, leading to a domino-effect collapse.¹⁵⁴

Markets serve as another pathway through which a failure can have network-wide effects. In a domino model of financial contagion, where asset prices are assumed to be fixed, counterparty default is the mechanism by which the distress of one firm is transferred to another firm.¹⁵⁵ In a market-based financial system, however, assets are often valued at their market prices.¹⁵⁶ As a result, firms subject to margin calls may be forced to engage in fire sales, depressing prices, requiring more forced sales, and further depressing prices in a positive feedback loop, or “loss spiral.”¹⁵⁷

Because firms continually adjust their risk exposures in response to new information,¹⁵⁸ systemic transmission of localized shocks need not even require that firms be linked through direct contracts or that they depress asset prices through fire sales. Opaqueness, such as information uncertainty attributable to indirect holding of securities,¹⁵⁹ can lead to the transmission of a local shock simply because it is not possible to identify the beneficial ownership of specific securities. Not knowing which firms are exposed to securities that have become distressed, market participants may attribute those securities to all similarly situated firms.¹⁶⁰ They may

154. Schwarcz, *Regulating Complexity*, *supra* note 98.

155. BRUNNERMEIER ET AL., *supra* note 102.

156. Anabtawi & Schwarcz, *supra* note 114, at 1372.

157. *See* Yadav, *supra* note 104. Professor Charles Whitehead has pointed out that such feedback loops can paradoxically be exacerbated by uniform practices or rules. *See* Charles K. Whitehead, *Destructive Coordination*, 96 CORNELL L. REV. 323, 326–27 (2011). For example, the use by financial market participants of standard-form contracts increases the likelihood that they will respond to a common exogenous shock in lockstep. *See id.* Financial regulation can have similar effects. *Id.*; *see also* Clifford De Souza & Mikhail Smirnov, *Dynamic Leverage: A Contingent Claims Approach to Leverage for Capital Conservation*, 31 J. PORTFOLIO MGMT. 25, 28 (2004) (arguing that, in a bad market, short-term pressure to sell assets to raise cash for margin calls can lead to further mark-to-market losses for remaining assets, which triggers a whole new wave of selling, the process repeating itself until markets improve or the firm is wiped out, and referring to this process as a “Critical Liquidation Cycle”). These spiraling events may well occur rapidly, within days. *See, e.g., Systemic Risk: Examining Regulators’ Ability to Respond to Threats to the Financial System: Hearing Before the H. Comm. on Fin. Servs.*, 110th Cong. 8 (2007) (statement of Richard Bookstaber, Author, *A Demon of Our Own Design: Markets, Hedge Funds, and the Perils of Financial Innovation*) (observing the “tendency for markets to move rapidly into a crisis mode” and referring to this tendency, by analogy to engineering, as “tight coupling”).

158. *See* Schwarcz, *Regulating Complexity*, *supra* note 98, at 237–38 (describing how financial institutions continually adjust their behavior to the new market situations created by the actions of all financial institutions).

159. Under the indirect-holding system, which applies to nearly all publicly traded securities, intermediaries, such as brokerage firms, hold interests in securities on behalf of investors. *See id.* at 231.

160. In economic terms, this can be seen as a variation of adverse selection. *See* George A. Akerlof, *The Market for “Lemons”: Quality Uncertainty and the Market Mechanism*, 84 Q.J. ECON. 488, 488 (1970) (describing the agency costs that arise when sellers have better information regarding the quality of a good than buyers).

then become reluctant to extend credit to these firms based on “similarity” concerns.¹⁶¹

Technological innovation has accelerated the speed with which local shocks can travel through the financial system.¹⁶² Recently developed trading technologies have greatly increased the speed of processing and trading on information. High-frequency algorithmic trading systems rely on computerized quantitative models that execute thousands of orders per second with little or no human involvement.¹⁶³ Because of the speed and automation with which high-frequency algorithmic trading occurs, events can move through the financial system too rapidly for there to be sufficient time or opportunity for regulators to respond.¹⁶⁴

Normal accident theory, in the context of the financial system, holds that even the most rigorously constructed *ex ante* regulatory measures cannot prevent the financial system from experiencing periodic crises.¹⁶⁵ Because the financial system possesses the features of both interactive complexity and tight coupling, it will, like all such systems, experience failures.¹⁶⁶ Moreover, on occasion, it will fail in spectacular fashion as the system’s elements interact unexpectedly and with little delay.¹⁶⁷

2. *The Political Economy of Financial Regulation.*—Various scholars have observed that it takes a crisis to reform financial regulation.¹⁶⁸ *Ex ante*—before a crisis emerges—proponents of enhanced financial oversight

161. See *supra* note 106.

162. See Schwarcz, *Regulating Complexity*, *supra* note 98, at 214–15, 231–32.

163. Carol L. Clark, *Controlling Risk in a Lightning-Speed Trade Environment*, CHI. FED. LETTER (Fed. Reserve Bank of Chi.), Mar. 2010. There are now numerous ways in which a large trade can be executed, allowing customers to choose how much human judgment is involved when executing such a trade. COMMODITY FUTURES TRADING COMM’N & SEC. & EXCH. COMM’N, FINDINGS REGARDING THE MARKET EVENTS OF MAY 6, 2010, at 14 (2010), available at <http://www.sec.gov/news/studies/2010/marketevents-report.pdf>.

164. See Clark, *supra* note 163 (explaining that the increased speed at which high-frequency trading occurs magnifies risks and presents a major issue for regulators).

165. See Levitin, *supra* note 136, at 461–78 (reviewing various approaches to regulating systemic risk *ex ante* and concluding that such measures are incomplete). Levitin concludes that the remaining risk must be addressed through *ex post* resolution that allows for definitive loss allocation. *Id.* at 479–80. Katharina Pistor attributes the “inherent instability” of the financial system to the combination of uncertainty and liquidity volatility. Pistor, *supra* note 82, at 316.

166. See PERROW, *supra* note 137, at 18 (asserting that accidents are inevitable in systems with characteristics such as interactive complexity and tight coupling).

167. See Leonard & Howitt, *supra* note 142, at 18 (describing system failures as frequently the result of unexpected simultaneous interactions between subsystems).

168. See, e.g., Stuart Banner, *What Causes New Securities Regulation? 300 Years of Evidence*, 75 WASH. U. L.Q. 849, 849–51 (1997); John C. Coffee, Jr., *The Political Economy of Dodd-Frank: Why Financial Reform Tends to Be Frustrated and Systemic Risk Perpetuated*, 97 CORNELL L. REV. 1019, 1020–24 (2012); Wulf A. Kaal, *Dynamic Regulation of the Financial Services Industry*, 48 WAKE FOREST L. REV. (forthcoming 2013) (manuscript at 5–6), available at <http://papers.ssrn.com/abstract=2273857>; James J. Park, *The Competing Paradigms of Securities Regulation*, 57 DUKE L.J. 625, 675 (2007).

confront a formidable asymmetry in political power between the financial industry and the general public. Special interests oppose meaningful constraints on risk taking, and the general public has neither the means nor the interest to compete with them.¹⁶⁹ Only in the wake of a severe economic downturn does public discontent tend to translate into regulatory reform.¹⁷⁰

The political influence of the financial services industry plays an important role in explaining the accumulation of risk in an economy. Public choice theories of regulation explain the production of regulation in terms of the various factors that influence the regulatory process.¹⁷¹ These factors include, among others, the industries being regulated and public sentiment.¹⁷² In the realm of finance, the financial services industry tends to dominate public policy during times of relative financial stability.¹⁷³ Because financial market participants are able to externalize significant social costs associated with their risk taking, it is in their interest to take on excessive risks and oppose regulatory efforts to curtail, or increase the costs of, their ability to do so.¹⁷⁴

Most of the time, the financial industry's preference for lax regulation encounters only weak resistance. Those who would benefit most from curbing excessive risk taking—namely, the general public—are widely dispersed, weakly organized, and enjoy only diffuse political power.¹⁷⁵ In addition, commonly held behavioral biases tend to dampen popular concern over the buildup of risk in the economy when markets are stable. For example, people are susceptible to “availability bias,” which reflects the tendency to be most aware of recent or vivid events.¹⁷⁶ Availability bias

169. See Park, *supra* note 168 (observing that economic downturns tend to cause public outrage which, in turn, leads to the passage of restrictive legislation).

170. See Coffee, *supra* note 168, at 1021–22 (arguing that under normal circumstances “smaller, cohesive interest groups [will] predictably outperform larger, citizen-based ‘latent’ groups”).

171. Park, *supra* note 168; see also BRONWEN MORGAN & KAREN YEUNG, AN INTRODUCTION TO LAW AND REGULATION 16–18 (2007) (“Public interest and private interest theories [of regulation] can be approached as accounts of what happens to make government actors pass detailed rules that govern the conduct of private actors.”).

172. See *id.* at 674 (“[I]n light of the respective preferences of the public and the regulated, public choice theory might contend that principles-based enforcement actions are more likely when public influence is high and rulemaking is more likely when the regulated have more influence.”).

173. See *id.* at 675 (arguing that industry players have more influence on securities regulation during boom times).

174. See Anabtawi & Schwarcz, *supra* note 114, at 1375–76 (describing how financial market participants pursue self-interest due to the uninternalized costs associated with risk taking).

175. Coffee, *supra* note 168, at 1021.

176. Under the availability heuristic, people overestimate the frequency or likelihood of an event when examples of, or associations with, similar events are easily brought to mind. Paul Slovic et al., *Facts Versus Fears: Understanding Perceived Risk*, in JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 463, 465 (Daniel Kahneman et al. eds., 1982). For

plays a role in explaining why individuals systematically underestimate the likelihood of rare but potentially catastrophic risks, a phenomenon sometimes referred to as “disaster myopia.”¹⁷⁷ In the presence of availability bias, assessments of the risk of a destabilizing financial shock are likely to be understated.¹⁷⁸ The problem is likely to be worst when markets are calm, allaying people’s fears of a financial crisis.¹⁷⁹ It should therefore not be surprising that the special interests of the financial services industry tend to dominate public policy during periods of financial stability.¹⁸⁰

Financial crises provide an impetus for reform. Popular sentiment against the financial industry, often in reaction to excesses that accompanied a preceding boom, weaken industry influence over regulators.¹⁸¹ As discontent galvanizes the public to demand reform, voters coalesce around so-called “political entrepreneurs” ready to provide it.¹⁸² These shifts in the relative political influence of the financial sector and the general public are associated with increased financial regulatory oversight.¹⁸³

Crises produce a critical moment at which it becomes practical to reform financial regulation, but the regulation that follows may be hasty and ill-conceived.¹⁸⁴ Sensitive to concerns about the shortcomings of

example, people typically overestimate the divorce rate if they can quickly find examples of divorced friends.

177. See, e.g., Lynne L. Dallas, *Short-Termism, the Financial Crisis, and Corporate Governance*, 37 J. CORP. L. 265, 315–16 (2012) (identifying disaster myopia as a phenomenon that occurs “because of the underestimation of low-frequency economic shocks”); David J. Matthews, *Ruined in a Conventional Way: Responses to Credit Ratings’ Role in Credit Crises*, 29 NW. J. INT’L L. & BUS. 245, 269–70 (2009) (defining disaster myopia as the “tendency for the subjective probability of a disaster to decline during long periods in which no disaster has occurred” (internal quotation marks omitted)).

178. Dallas, *supra* note 177, at 315.

179. See Matthews, *supra* note 177, at 270 (noting that when financial conditions are stable, disaster myopia causes lenders “to reduce capital positions and relax lending criteria”).

180. See Coffee, *supra* note 168, at 1021–22 (providing a theory explaining why Congress is usually only able to pass securities and financial reform legislation after a crisis and citing in particular the dominance of the financial services industry’s lobbying groups).

181. *Id.* at 1020–22.

182. *Id.* at 1021–22.

183. See *id.* at 1036–37 (citing examples of public sentiment driving increased financial regulatory oversight).

184. See STEPHEN M. BAINBRIDGE, *THE COMPLETE GUIDE TO SARBANES-OXLEY: UNDERSTANDING HOW SARBANES-OXLEY AFFECTS YOUR BUSINESS* 20 (2007) (asserting that Congress’s enactment of the Sarbanes-Oxley Act “in such a haphazard fashion” resulted in a “mishmash of mandates” that made compliance with the Act more costly than was expected); HENRY N. BUTLER & LARRY E. RIBSTEIN, *THE SARBANES-OXLEY DEBACLE: WHAT WE’VE LEARNED; HOW TO FIX IT* 16–18 (2006) (noting that one-sided testimony made by policy entrepreneurs “clearly contributed to Congress’s flawed policymaking” in its enactment of the Sarbanes-Oxley Act); Stephen M. Bainbridge, *Sarbanes-Oxley: Legislating in Haste, Repenting in Leisure*, 2 CORP. GOVERNANCE L. REV. 69, 70 (2006) (arguing that in enacting the Sarbanes-

“bubble laws,”¹⁸⁵ but frustrated by the practical constraints that face *ex ante* regulation posed by the financial industry, Professor John Coffee has concluded that it is better to enact even imperfect financial regulation in the wake of a crisis and rely on later corrective mechanisms to remedy its deficiencies than to miss the opportunity for reform entirely.¹⁸⁶

3. *Unintended Consequences.*—Even if complete *ex ante* financial regulation were possible, it would not necessarily be desirable because tight *ex ante* regulation can over-deter risk taking and lead to regulatory arbitrage. When markets operate imperfectly, regulation can improve the functioning of the economy.¹⁸⁷ Beyond correcting market failures, however, regulation can be counterproductive. Regulators attempting to prevent every failure would deter even socially desirable risk taking.

“Risk” is defined as the probability that an outcome will deviate from its expected outcome.¹⁸⁸ A risky investment carries with it the possibility that it will yield a return that is unexpected.¹⁸⁹ That surprise may be positive or negative.¹⁹⁰ Through risk exposure, firms can generate outsized returns, but they must also expose themselves to lower-than-expected returns.¹⁹¹

It is socially efficient for a firm to take on risk when the firm’s marginal return from assuming the risk exceeds the marginal social cost of

Oxley Act, Congress “threw a bunch of ideas into a single basket and rushed it into law so that angry investors would blame somebody [else] for the stock market bubble’s bursting and the corporate governance scandals”); Roberta Romano, *The Sarbanes-Oxley Act and the Making of Quack Corporate Governance*, 114 YALE L.J. 1521, 1526–27 (2005) (explaining that literature demonstrating that proposed mandates would be ineffective was available to legislators in the process of considering the Sarbanes-Oxley Act and either “went unnoticed or was ignored” resulting in “decisionmaking that . . . was, to put it mildly, less than optimal”).

185. See Larry E. Ribstein, Commentary, *Bubble Laws*, 40 HOUS. L. REV. 77, 79–83, 87–90 (2003) (discussing the “boom-bubble-bust-regulate cycle” in which financial market regulations take place, focusing specifically on the enactment of the Sarbanes-Oxley Act during a stock market panic and the Act’s resulting imperfections).

186. Coffee, *supra* note 168, at 1034–35. Professor Anna Gelpern has observed that the political economy of financial regulation may render any such imperfect financial regulation even more imperfect because, she suspects, “decisions on allocating between *ex ante* and *ex post* regulation are acutely political, and therefore biased in favor of *ex ante* regulation. Who wants to tell the voters that they cannot protect them?” E-mail from Anna Gelpern, Professor of Law, Am. Univ. Wash. Coll. of Law, to authors (June 28, 2013) (on file with authors).

187. See Schwarcz, *Systemic Risk*, *supra* note 1, at 198 (arguing that market regulations are necessary because without them, as with the tragedy of the commons, no single market participant will have an incentive to reduce risk taking).

188. ASWATH DAMODARAN, CORPORATE FINANCE: THEORY AND PRACTICE 151 (2d ed. 2001).

189. Anabtawi & Schwarcz, *supra* note 114, at 1362.

190. *Id.*

191. *Id.*

its doing so.¹⁹² In a perfectly competitive market, the expected return on an investment accurately reflects all the risks associated with it.¹⁹³ In an earlier article, we argued that market participants tend to take on socially excessive levels of risk because a series of market failures obscures, or motivates them to ignore, the impact of their risk taking on systemic stability.¹⁹⁴ As a result, financial firms trade off risk and return at socially suboptimal rates.¹⁹⁵ In other words, for any given return, they take on too much risk.

Complete *ex ante* regulation would tend to have the opposite effect. The more risk averse financial regulation is designed, the greater the expected return on an investment must be to justify any given level of risk taking. Extreme risk aversion would chill even socially beneficial risk taking. Financial market participants would reject investment opportunities that, on average, would enhance social welfare. At the limit, where regulation reflected infinite risk aversion, a firm would behave as if it were certain that any risk it assumed would produce the worst possible outcome. In such circumstances, firms would invest only in opportunities with expected returns that dominated worst-case scenarios. Under less extreme scenarios, regulation might still induce financial market participants to behave more risk averse than would be socially desirable. The more stringent the regulatory regime, the more likely that firms would take on too little risk. The result of any overdeterrence arising from *ex ante* regulation would be a decline in the economy's potential growth rate.¹⁹⁶

Another danger of attempting to impose complete *ex ante* financial regulation is that it is likely to lead to circumvention. In a law-related system, any change in the law causes other elements in the system to respond.¹⁹⁷ People can react to restrictive laws either by complying or by altering their behavior.¹⁹⁸ Restrictive laws often give rise to avoidance.¹⁹⁹ One way that people remove themselves from the law's reach is through regulatory arbitrage. Regulatory arbitrage is the process by which firms

192. See SAMUELSON & NORDHAUS, *supra* note 113, at 348–49 (noting that under cost-benefit analysis efficiency is determined by “balancing the marginal costs of an action against the marginal benefits of that action”).

193. Anabtawi & Schwarcz, *supra* note 114, at 1363.

194. *Id.* at 1352.

195. See *id.* at 1381–82 (arguing that without government regulation aimed at protecting social welfare “market participants would rationally trade off risk and return, and financial crises would serve as mechanisms for punishing excessive risk taking”).

196. See Lawrence G. Baxter, *Adaptive Regulation in the Amoral Bazaar*, 128 S. AFR. L.J. 253, 271 & n.77 (2011) (“Doctrinal conceptualism sometimes stands in the way . . .”).

197. See Samuel W. Buell, *Good Faith and Law Evasion*, 58 UCLA L. REV. 611, 612 (2011) (noting that “[t]he act of making a law alters the state of affairs to which the law will apply—only after the law is enacted and in a manner only that law could have caused”).

198. *Id.* (asserting that “laws change behavior” and that the law “cannot fully control the behavioral changes . . . unleash[ed]”).

199. *Id.*

obtain differential treatment of substantively similar activities.²⁰⁰ The phenomenon of regulatory arbitrage is especially evident in the financial regulatory arena, where “sophisticated and resourceful actors pair with complex law to produce at times maddening and costly games of regulatory cat-and-mouse.”²⁰¹

Regulatory arbitrage has been an important force behind the growth of shadow banking.²⁰² Many shadow-banking activities aim to circumvent bank capital requirements, thereby achieving higher leverage than is permissible for traditional banks.²⁰³ This behavior was particularly notable in the years preceding the Financial Crisis.²⁰⁴

Given the mobility of financial capital, the problem of regulatory circumvention extends beyond jurisdictional boundaries. International differences in regulatory policies affect the competitiveness of financial firms.²⁰⁵ When a jurisdiction unilaterally imposes costly regulations on its financial sector, it may be placing local firms at a competitive disadvantage.²⁰⁶ The regulations effectively act as a negative shock to competitiveness that can lead to the flow of capital to foreign jurisdictions with less stringent regulations.²⁰⁷ Financial globalization thus poses a “regulator[y] dilemma” for regulators who would like to benefit from international exchange but are wary of compromising their financial systems.²⁰⁸

To summarize, *ex ante* financial regulation, whereby regulators seek to prevent financial crises from materializing, is at best a partial solution to

200. Frank Partnoy, *Financial Derivatives and the Costs of Regulatory Arbitrage*, 22 J. CORP. L. 211, 227 (1997); see also Victor Fleischer, *Regulatory Arbitrage*, 89 TEXAS L. REV. 227, 229 (2010) (providing a broader definition of regulatory arbitrage).

201. Buell, *supra* note 197.

202. Steven L. Schwarcz, *Regulating Shadow Banking*, 31 REV. BANKING & FIN. L. 619, 626 (2012) (noting that regulatory arbitrage was a “contributing factor to the emergence of shadow banking”).

203. See Viral V. Acharya et al., *Securitization Without Risk Transfer 2–3* (Nat’l Bureau of Econ. Research, Working Paper No. 15730, 2010), available at <http://www.nber.org/papers/w15730> (finding that banks used shadow banking to reduce their capital requirements on their balance sheet); Guillermo Ordonez, *Sustainable Shadow Banking 2*, (Nat’l Bureau of Econ. Research, Working Paper No. 19022, 2013), available at <http://www.nber.org/papers/w19022> (explaining that banks used shadow banking “to go around regulations” including capital requirement regulations).

204. See Ordonez, *supra* note 203 (“In the years leading to the 2007-09 financial crisis in the United States, banks increasingly devised instruments to get around capital requirements, moving away from *traditional banking* into so called *shadow banking* . . .”).

205. See Ethan B. Kapstein, *Resolving the Regulator’s Dilemma: International Coordination of Banking Regulations*, 43 INT’L ORG. 323, 326–27 (1989) (observing that a country’s domestic regulatory policies have a direct impact on the competitiveness of their financial firms versus those in other countries).

206. *Id.*

207. See *id.* at 327 (using bank capital to illustrate this phenomenon).

208. *Id.* at 324, 326–27.

addressing systemic risk. Systemic risk must also be targeted *ex post*, after events that could trigger financial crises have occurred, because complete *ex ante* regulation is both impossible and unrealistic. Moreover, pursuing *ex ante* regulation as the only, or even primary, regulatory strategy aimed at controlling systemic risk would be inefficient. *Ex post* financial regulation should complement *ex ante* financial regulation to further the goals of systemic efficiency and stability.

IV. Regulating the Financial System *Ex Post*

Our aim in this Part is to illustrate how *ex post* financial regulation can be used as a tool for mitigating the impact of a failure within the financial system. We stress that such *ex post* financial regulatory measures do not have to be ad hoc.²⁰⁹ They can be designed and established before any failure occurs. What distinguishes *ex post* solutions from *ex ante* solutions is not the point in time at which they are adopted but rather the point in time at which they are directed.

Ex post financial regulation complements *ex ante* measures in at least three ways. Because normal accident theory teaches us that crises are bound to occur in complex, tightly-coupled systems, such as the financial system,²¹⁰ *ex post* regulation is needed to address those inevitable failures. Because public choice theory teaches us that the financial industry will inhibit regulatory efforts to curb excessive risk taking during times of economic stability,²¹¹ *ex post* regulation is needed to respond to the consequences of such risk taking. And because *ex ante* regulation can overdeter productive risk taking and provoke regulatory arbitrage,²¹² *ex post* regulation is needed to reduce the danger that policy makers, in their efforts to avert the next financial crisis, will overregulate financial markets.

A. *Ex Post Regulatory Strategies*

Systems analysis offers two types of defensive strategies against the spread of financial failures. The first approach is to prevent the failures from occurring in the first place.²¹³ The second is to act on the system's elements and interconnections in order to mitigate the systemic consequences of a failure should it nonetheless occur.²¹⁴ *Ex post* regulatory strategies would focus on the second type of defensive strategy.

209. See Levitin, *supra* note 136, at 491 (observing that *ex post* regulation can either be done ad hoc or institutionalized).

210. See *supra* notes 142–54 and accompanying text.

211. See *supra* notes 115, 170–80 and accompanying text.

212. See *supra* notes 188–201 and accompanying text.

213. See *supra* notes 58–59 and accompanying text.

214. See *supra* notes 60–61 and accompanying text.

1. *Financial Safety Nets*.—Ultimately, supporting the financial system involves the use of some form of financial safety net. By “financial safety net,” we mean the authority of a government or other publicly governed body, in the case of financial firms, to allocate the losses of an illiquid or insolvent²¹⁵ firm to itself and, in the case of financial markets, to stabilize supply and demand imbalances. A circus safety net is a useful metaphor for *ex post* financial regulation that targets the elements of the financial system. The direct purpose of the safety net is to protect acrobats from sustaining serious injury.²¹⁶ The safety net also has an indirect, less immediate purpose. That purpose is to make it “economically rational for circus acrobats to undertake difficult, but *do-able* stunts in which the danger of a spectacular fall seems very real.”²¹⁷ The term “do-able” underscores the point that the circus safety net is intended to encourage prudent, not reckless, risk taking on the part of the performers.²¹⁸

Like a circus safety net, a financial safety net has the immediate purpose of protecting against what might otherwise be a critical fall. More broadly, financial safety nets can protect the financial system as a whole by providing financial market participants with protection against the risk that their counterparties will default (in the case of financial firm safety nets) or against the risk that markets collapse (in the case of financial market safety nets).²¹⁹ Safety nets constitute an *ex post* regulatory strategy because their primary goal is not to deter harmful conduct, which is likely to have already taken place, but to mitigate the systemic consequences of financial failures once they have begun. Even one firm’s failure, if it is systemically significant, can result in a cascade of related failures.²²⁰ Markets that begin failing by ceasing to operate smoothly can simultaneously compromise multiple financial firms that participate in them.²²¹ Governmental safety nets may, of course, encourage moral hazard—a willingness on the part of

215. See Kenneth Ayotte & David A. Skeel, Jr., *Bankruptcy or Bailouts?*, 35 J. CORP. L. 469, 474–75 (2010) (discussing how the capital structure of certain financial firms can leave them vulnerable to illiquidity or insolvency); Levitin, *supra* note 136, at 481, 491, 513 (discussing the role of the government in allocating losses through bankruptcy or through bailouts).

216. Edward J. Kane, *Financial Safety Nets: Reconstructing and Modeling a Policymaking Metaphor* 3 (Nat’l Bureau of Econ. Research, Working Paper No. 8224, 2001), available at <http://www.nber.org/papers/w8224>.

217. *Id.*

218. *Id.*

219. Steven L. Schwarcz, Keynote Address, *Ex Ante Versus Ex Post Approaches to Financial Regulation* 15 CHAP. L. REV. 257, 263–65 (2011) [hereinafter Schwarcz, *Ex Ante Versus Ex Post*].

220. Jean Helwege, *Financial Firm Bankruptcy and Systemic Risk*, 20 INT’L FIN. MKTS., INSTS. & MONEY 1, 5 (2010).

221. See Viral V. Acharya et al., *Market Failures and Regulatory Failures: Lessons from Past and Present Financial Crises* 20 (Asian Dev. Bank Inst., Working Paper No. 264, 2011), available at <http://www.adbi.org/working-paper/2011/02/08/4377.market.regulatory.failures.lessons.gfc/> (arguing that a failure of one financial institution can have ripple effects throughout the financial market and that these ripple effects have a broader effect on the economy).

individuals to engage in imprudent high-wire acts because they believe that they will be rescued if they fall.²²² Nevertheless, as we discuss in subpart IV(B) below, we believe that such concerns can be managed effectively.

a. Firms.—Firm financial safety nets can transfer losses from a firm’s stakeholders to a government or other publicly governed body.²²³ Importantly, they do so outside the bankruptcy system.²²⁴ Indeed, this is their *raison d’être*. Bankruptcy law embodies its own framework in the event of liquidation or reorganization for determining how the resulting losses should be distributed.²²⁵

Bankruptcy has long been used as a resolution system for nonbank firms, including nonbank financial firms.²²⁶ In many cases, bankruptcy is an effective regime for addressing the difficulties confronting such firms.²²⁷ There are circumstances, however, in which regulators might prefer to opt out of the bankruptcy resolution process. One of these is where a financial firm is “too big to fail” (TBTF). TBTF firms are those whose failure pursuant to predetermined default schemes for loss allocation could reasonably be expected to “trigger socially unacceptable macroeconomic consequences.”²²⁸ The status of a financial institution as TBTF depends not on its legal characterization but rather on whether it is systemically important. A TBTF firm can be a critical financial intermediary, like a bank, or another type of organization, such as a hedge fund, with substantial exposure to other market participants.²²⁹ TBTF status “implicitly [is] a proxy for market consequences.”²³⁰ A financial firm is thus a suitable candidate for safety-net protection if regulators believe that it is TBTF.

222. See Jin Cao & Gerhard Illing, *Regulation of Systemic Liquidity Risk*, 24 FIN. MKTS. & PORTFOLIO MGMT. 31, 36–40 (2010) (“[F]ree-riding incentives encourage excessive risk taking.”).

223. See *infra* notes 238–39 and accompanying text.

224. *Id.*

225. Raymond T. Nimmer, *Negotiated Bankruptcy Reorganization Plans: Absolute Priority and New Value Contributions*, 36 EMORY L.J. 1009, 1013–14 (1987).

226. See, e.g., Ayotte & Skeel, *supra* note 215, at 477–83 (asserting that bankruptcy is “surprisingly well-designed to handle the failures of nonbank financial firms” and using the Drexel Burnham and Lehman Brothers bankruptcies as examples).

227. Professors Kenneth Ayotte and David Skeel would subject the vast majority of bankruptcy-eligible financial firms to the bankruptcy process. *Id.* at 471. While they acknowledge that “the most significant limitation of bankruptcy [is] that it does not address systemic risk concerns,” they consider worries about the systemic repercussions of bankruptcy to be overstated. *Id.* at 483. In cases in which regulators conclude that systemic risk warrants intervention, Ayotte and Skeel favor an “intermediate” strategy in which the firm files for bankruptcy protection and the government selectively guarantees liabilities. *Id.* at 491.

228. Levitin, *supra* note 136, at 452.

229. Schwarcz, *Systemic Risk*, *supra* note 1, at 202.

230. *Id.*

The failure of a TBTF firm can generate systemic consequences through multiple channels. In order to be TBTF, a firm must be linked to other financial firms, either through direct contractual relationships or through its potential to affect markets.²³¹ Default by a TBTF firm on its contractual obligations raises the possibility that its counterparties will be adversely affected in such a way that they, too, default on their contractual obligations, leading to a domino-effect collapse.²³² In addition, a TBTF firm that is in distress may be forced to sell financial assets, placing downward pressure on the prices of those assets.²³³ For example, “mark-to-market” or “fair value” accounting rules may require investors to adjust the accounting value of certain securities holdings to their current market prices.²³⁴ As those holdings decline in value, the initial distress of the TBTF firm can spread as it has to sell other assets to meet contractual or regulatory obligations that depend on its financial condition.²³⁵ Finally, the TBTF firm’s distress can spill over to other institutions by reducing financial market confidence in the financial condition of other, similarly situated firms.²³⁶

Safety nets can help protect financial firms that are in distress. When regulators deem a distressed firm to be TBTF, the government, for example, in its capacity as lender of last resort, can choose to absorb the firm’s losses rather than allow it to experience bankruptcy.²³⁷ By protecting TBTF financial firms, which are integral elements of the financial system, financial safety nets can mitigate the spread of a financial crisis.

The design of financial-firm safety nets can occur on a purely ad hoc basis, whereby the safety nets are implemented as a response to what regulators perceive as a failing TBTF firm. The bailouts of Bear Stearns, AIG, and Citigroup in response to the unfolding of the Financial Crisis fit this description.²³⁸ Because ad hoc approaches are not initiated until a potential failure is identified, however, they may arise too late to minimize systemic effects or without adequate time for regulators to fully consider how to optimize their design.

231. See Levitin, *supra* note 136, at 452 (stating that “the concern when a TBTF firm fails is to protect a particular set of counterparties” in order to protect against “spillovers that have direct or second-order macroeconomic effects”).

232. See *supra* notes 101–06 and accompanying text.

233. See *supra* notes 155–57 and accompanying text.

234. De Souza & Smirnov, *supra* note 157.

235. Whitehead, *supra* note 157, at 326–27.

236. See *supra* notes 160–61 and accompanying text.

237. Anabtawi & Schwarcz, *supra* note 114, at 1376.

238. See Schwarcz, *Systemic Risk*, *supra* note 1, at 248 (using Bear Stearns as an example of a safety net that occurred on an ad hoc basis); Steven M. Davidoff & David Zaring, *Regulation by Deal: The Government’s Response to the Financial Crisis*, 61 ADMIN. L. REV. 463, 498 (2009) (describing the additional government resources needed to rescue AIG as “showing the perils of ad hoc bailout”).

These concerns could be addressed by institutionalizing safety nets through a delegation of bailout authority to a governmental body charged with providing guarantees, making loans, or investing directly in distressed TBTF firms.²³⁹ Institutionalizing a safety net in this way would allow it to be designed in advance for the purpose of supporting firms pursuant to predetermined criteria. The safety net's sources of funding could also be specified. Safety nets would be activated only contingently, however—presumably around the same time that a looming crisis would make it politically feasible to implement.

The U.S. currently has no formal safety net mechanism for rescuing TBTF firms. The Department of the Treasury needs congressional approval to conduct bailouts.²⁴⁰ Under the Dodd-Frank Act, the Federal Deposit Insurance Corporation (FDIC) has the authority to resolve a failing financial firm but only through liquidation.²⁴¹ The Federal Reserve Bank (Federal Reserve) also is limited in its capacity to address systemic risk. Historically, the Federal Reserve has had the authority to act as a lender of last resort to financial institutions in “unusual and exigent circumstances,” under Section 13(3) of the Federal Reserve Act, but the Dodd-Frank Act drastically limited its authority to make emergency loans under Section 13(3).²⁴² The Act amended Section 13(3) to require the Federal Reserve to consult with and receive approval from the Secretary of the Treasury to ensure that any emergency lending is designed to provide liquidity to markets and not to aid a financially failing firm.²⁴³ Perversely, Dodd-Frank's limitation has actually increased the risk that an important financial firm will collapse, with systemic consequences.²⁴⁴

b. Markets.—While providing safety nets for firms addresses contagion that follows a domino model, it is an inadequate policy response to crises that arise in markets. When markets face a common risk factor, the rescue of one or even a few financial firms will do little to support other similarly situated firms. Outside the context of the domino model of contagion, the main transmission mechanism for systemic risk is not the default of a firm's counterparties. It is a negative shock to one or more

239. Levitin, *supra* note 136, at 491.

240. *Id.* at 493.

241. *Id.* at 487.

242. *Id.* at 495, 498 n.265.

243. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 1101(a)(6), 124 Stat. 1376, 2113–15 (2010) (codified at 12 U.S.C. § 343 (2012)).

244. See Dino Falaschetti, Fred Karlinsky & Richard Fidei, *Dodd-Frank and Board Governance: New Political-Legal Risks to Monetary Policy and Business Judgments?*, 29 BANKING & FIN. SERVS. POL'Y REP. 1, 5 (2010) (arguing that the increased accountability created by financial reforms can account for a source of risks by “empower[ing] one set of interests (e.g., shareholders, borrowers) to gain from others' losses (e.g., bondholders, lenders)”).

markets that affects many firms.²⁴⁵ Mitigating systemic risk transmission under these circumstances is most directly accomplished by stabilizing the prices of distressed financial assets using a safety net for markets.²⁴⁶

In retrospect, the collapse of the mortgage-backed securities (MBS) market was at least as important a factor in causing the Financial Crisis as the U.S. Government's refusal to rescue Lehman Brothers in 2008.²⁴⁷ Lehman Brothers filed for bankruptcy on September 15, 2008.²⁴⁸ It is difficult, if not impossible, to determine empirically the extent to which Lehman's bankruptcy led to the financial market turmoil that ensued because Lehman's bankruptcy occurred contemporaneously with numerous other disruptive financial events.²⁴⁹ The confluence of such shocks around the same time makes it difficult to identify the relationship between Lehman's failure and the Financial Crisis.

On the one hand, the systemic impact of Lehman's failure appears to have been powerful. The day after Lehman filed for bankruptcy, the Reserve Primary Fund, which held Lehman debt, announced that it had "broken the buck"—only the second time in history that a money-market fund's share value had fallen below a dollar.²⁵⁰ Lehman's bankruptcy also affected the credit-default-swap market, as there was a substantial amount of credit-default protection written against Lehman's debt.²⁵¹ On the other hand, the systemic importance of Lehman's failure should not be overstated. Lehman's bankruptcy occurred during a time when there were good reasons for market participants to question the solvency of a number of large financial firms, not because of their exposure to Lehman, but because they were exposed to the MBS market.

245. Anabtawi & Schwarcz, *supra* note 114, at 1372 (explaining that, aside from the domino model of contagion, "[m]arkets serve as another mechanism through which shocks can have network-wide effects").

246. *Id.* at 1404–05 (arguing that a market liquidity provider of last resort can attempt to "stabilize financial markets in times of panic, when securities prices have fallen below their intrinsic values" by "purchasing market securities at prices that are below their intrinsic values but above their then-current prices").

247. See Levitin, *supra* note 136, at 460–61 ("Common shocks to sectors of the economy can result in the mass failure of individual firms, thereby producing broader economic harm."); see also Anabtawi & Schwarcz, *supra* note 114, at 1359–60 (citing the failure of the MBS market as a major cause of the Financial Crisis).

248. Andrew Ross Sorkin, *Lehman Files for Bankruptcy; Merrill Is Sold*, N.Y. TIMES, Sept. 14, 2008, http://www.nytimes.com/2008/09/15/business/15lehman.html?pagewanted=all&_r=0.

249. See Anabtawi & Schwarcz, *supra* note 114, at 1359–61 (describing how financial events such as the collapse of the MBS market contributed to the Financial Crisis).

250. Diana B. Henriques, *Money Market Fund Says Customers Could Lose Money*, N.Y. TIMES, Sept. 16, 2008, http://www.nytimes.com/2008/09/17/business/17fund.html?_r=0.

251. See Mary Williams Walsh, *Insurance on Lehman Debt Is the Industry's Next Test*, N.Y. TIMES, Oct. 10, 2008, <http://www.nytimes.com/2008/10/11/business/11credit.html> (discussing the post-bankruptcy implications of the "huge value of credit-default swaps on Lehman Brothers").

MBS were a product of the alchemy that transformed individually risky mortgages into debt instruments, the senior tranches of which were considered by rating agencies to be of the highest credit quality.²⁵² When the value of residential real estate declined sharply, borrowers defaulted on their mortgages at unanticipated rates.²⁵³ Those defaults, particularly in the subprime mortgage market, in turn caused the defaults or downgrades of significant amounts of MBS.²⁵⁴ Investors responded by losing confidence in and withdrawing from MBS and other related markets.²⁵⁵ As a result, prices of MBS fell below their intrinsic value (the present value of the expected cash flows of the mortgage loans backing them).²⁵⁶ The collapse of the MBS market required financial firms to write down the value of their MBS holdings, impairing their balance sheets and causing them to appear less financially sound.²⁵⁷ Concerns arose with respect to all financial firms exposed to MBS. Thus, to a considerable degree, it was exposure to the MBS market generally that undermined confidence in financial firms during the Financial Crisis.

A liquidity provider of last resort (a market liquidity provider) can serve as a safety net for financial *markets*. The objective of a market liquidity provider would be twofold: *ex ante*, to reduce the likelihood that investors in financial markets panic,²⁵⁸ and *ex post*, “to stabilize financial markets to which financial firms are commonly exposed in times of panic, when securities prices have fallen below their intrinsic values.”²⁵⁹ A market liquidity provider could support panicked markets by purchasing market

252. See William Poole, *Causes and Consequences of the Financial Crisis of 2007–2009*, 33 HARV. J.L. & PUB. POL’Y 421, 424 (2010) (noting that the senior tranches of mortgage pools were rated AAA by the rating agencies).

253. *Id.* at 426.

254. Levitin, *supra* note 136, at 461.

255. Schwarcz, *Protecting Financial Markets*, *supra* note 115, at 378–79.

256. See U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-12-247, NATIONAL CREDIT UNION ADMINISTRATION: EARLIER ACTIONS ARE NEEDED TO BETTER ADDRESS TROUBLED CREDIT UNIONS 24 (2012).

257. Levitin, *supra* note 136, at 460–61.

258. Cf. William C. Dudley, President & Chief Exec. Officer, Fed. Reserve Bank of N.Y., Remarks at the New York Bankers Association’s 2013 Annual Meeting & Economic Forum: Fixing Wholesale Funding to Build a More Stable Financial System (Feb. 1, 2013) (transcript available at <http://www.newyorkfed.org/newsevents/speeches/2013/dud130201.html>) (describing the “two key functions performed by a lender of last resort,” the first being “to reduce the risk of a financial panic beginning in the first place” and the second being “to prevent the fire sale of assets . . . from spreading contagion across the [financial] system and disrupting the provision of credit to the economy”).

259. Anabtawi & Schwarcz, *supra* note 114, at 1405. The Troubled Asset Relief Program, commonly known as TARP, was initially intended to promote financial stability by allowing the U.S. Department of the Treasury to purchase troubled assets from financial firms but was replaced by programs under which the Treasury would invest directly in the equity of financial firms and guarantee new debt issuances. See Dinara Bayazitova & Anil Shivdasani, *Assessing TARP*, 25 REV. FIN. STUD. 377, 380–82 (2012) (constructing a timeline of events related to TARP).

securities at prices that are below their intrinsic values but above their then-current prices.²⁶⁰ A market liquidity provider could also try to stabilize markets by entering into derivatives contracts to take on those risks that markets are not hedging efficiently.²⁶¹

We have pointed out the ad hoc nature of the regulatory measures that were used to support financial firms during the Financial Crisis.²⁶² The regulatory response to the Financial Crisis in financial markets was similar in approach. The Federal Reserve acted as a market liquidity provider in several limited contexts. The largest liquidity program created by the Federal Reserve during that time was its MBS purchase program.²⁶³ The MBS that the Federal Reserve purchased were guaranteed by the two GSEs Fannie Mae and Freddie Mac,

as well as by Ginnie Mae, the U.S. Government-owned corporation within the Department of Housing and Urban Development. The program was set up with an initial limit of \$500 billion but was later expanded to \$1.25 trillion. It expired on March 31, 2010. The Federal Reserve also created a program to buy GSE debt—initially up to \$100 billion and later expanded to \$200 billion—and a program to purchase \$300 billion of medium-term Treasury securities. The Federal Reserve’s MBS purchases were in addition to an earlier-announced MBS purchase program by the Treasury.²⁶⁴

Beginning in September 2012, the Federal Reserve further increased “policy accommodation by purchasing additional [MBS] at a pace of \$40 billion per month.”²⁶⁵ Additionally, the Federal Reserve currently “purchases MBS under a policy announced on September 21, 2011, in which principal payments from its holdings of agency debt and agency MBS are reinvested in agency MBS.”²⁶⁶

260. Anabtawi & Schwarcz, *supra* note 114, at 1405. To induce holders of securities to sell them at such prices, the market liquidity provider could employ flexible pricing approaches such as those used in structured financing transactions to buy financial assets of uncertain value. Steven L. Schwarcz, *Too Big to Fail?: Recasting the Financial Safety Net*, in *THE PANIC OF 2008: CAUSES, CONSEQUENCES AND IMPLICATIONS FOR REFORM* 94, 99 (Lawrence E. Mitchell & Arthur E. Wilmarth Jr. eds., 2010).

261. Anabtawi & Schwarcz, *supra* note 114, at 1405. For example, in an effort to encourage private entities to purchase toxic assets from banks, the Treasury Department proposed guaranteeing a floor value of these troubled assets. Floyd Norris, *U.S. Bailout to Rely in Part on Private Money*, N.Y. TIMES, Feb. 8, 2009, http://www.nytimes.com/2009/02/09/business/09bailout.html?pagewanted=all&_r=1&.

262. See *supra* text accompanying notes 239–40.

263. Johannes Stroebel & John B. Taylor, *Estimated Impact of the Federal Reserve’s Mortgage-Backed Securities Program*, 8 INT’L J. OF CENT. BANKING 1, 1 (2012).

264. *Id.* at 1–2.

265. Press Release, Bd. of Governors of the Fed. Reserve Sys. (Sept. 13, 2012), *available at* <http://www.federalreserve.gov/newsevents/press/monetary/20120913a.htm>.

266. *Open Market Operations*, BD. OF GOVERNORS OF THE FED. RESERVE SYS., http://www.federalreserve.gov/monetarypolicy/bst_openmarketops.htm (last updated June 3, 2013).

The Federal Reserve further undertook to support the consumer asset-backed securities (ABS) market through the Term Asset-Backed Securities Loan Facility (TALF).²⁶⁷ ABS are securities similar to MBS but collateralized by nonmortgage loans, such as automobile, credit card, and student loan receivables.²⁶⁸ The ABS markets historically have funded a substantial share of credit to consumers and businesses.²⁶⁹ Concerned that “continued disruption of [the ABS] markets could significantly limit the availability of credit to households and . . . businesses and thereby contribute to further weakening of U.S. economic activity,” the Federal Reserve used TALF to provide nonrecourse funding to borrowers willing to issue new ABS.²⁷⁰

Confronted by strains in the commercial paper market, on which businesses rely heavily for short-term funding, the Federal Reserve established the Commercial Paper Funding Facility (CPFF) to provide liquidity to U.S. issuers of commercial paper in the event that they could not obtain it privately.²⁷¹ The CPFF effectively extended access to the Federal Reserve’s discount window, a lending facility traditionally available only to depository institutions, to issuers of commercial paper.²⁷²

The Federal Reserve thus responded to the Financial Crisis by implementing a number of newly created programs, including those described above, designed to support liquidity in financial markets. These programs led to a substantial expansion of the Federal Reserve’s balance sheet.²⁷³ In addition, the Federal Reserve has used open market operations—an activity traditionally used by it to implement monetary policy—to ease credit market conditions.²⁷⁴

The government’s response to the Financial Crisis is widely perceived to have averted an even deeper recession or outright depression.²⁷⁵

267. Press Release, Bd. of Governors of the Fed. Reserve Sys. (Nov. 25, 2008), available at <http://www.federalreserve.gov/newsevents/press/monetary/20081125a.htm>.

268. *See id.*

269. *Id.*

270. *Id.*

271. Tobias Adrian et al., *The Federal Reserve’s Commercial Paper Funding Facility*, 17 FED. RES. BANK N.Y. ECON. POL’Y REV. 25, 25 (2011).

272. *Id.*

273. Ben S. Bernanke, Chairman, Fed. Reserve, Speech at the Nat’l Press Club Luncheon, Nat’l Press Club, Washington, D.C.: Federal Reserve Policies to Ease Credit and Their Implications for the Fed’s Balance Sheet (Feb. 18, 2009), <http://www.federalreserve.gov/newsevents/speech/bernanke20090218a.htm>.

274. *Open Market Operations*, *supra* note 266.

275. *See, e.g.*, Alan S. Blinder & Mark Zandi, *Stimulus Worked*, FIN. & DEV., Dec. 2010, at 14, 14 (“The Great Recession in the United States gave way to recovery as quickly as it did largely because of the unprecedented response by monetary and fiscal policymakers.”); Paul Krugman, Op-Ed., *Averting the Worst*, N.Y. TIMES, Aug. 9, 2009, <http://www.nytimes.com/2009/08/10/opinion/10krugman.html> (crediting the financial bailout and economic stimulus with preventing another Great Depression); Deborah Solomon, *U.S. Economy Gets Lift from Stimulus*,

Contemporaneously with the MBS purchase program, mortgage interest rate spreads over U.S. Treasuries began declining, and, by July 2009, they had returned to slightly below their long-run average.²⁷⁶ Evidence is also consistent with the view that the TALF had a positive effect on the consumer ABS markets. In 2009, issuance of consumer ABS gradually began rising and spreads on AAA-rated credit card ABS had significantly narrowed.²⁷⁷ The CPFF also appears to have helped stabilize the commercial paper market.²⁷⁸ Interest rate spreads between high-quality commercial paper and comparable U.S. Treasuries spiked just prior to operation of the program, then gradually moderated and eventually returned to normal levels.²⁷⁹ These correlations, although they do not establish a causal link between the government's market interventions and easing credit conditions, are consistent with the view that the programs were effective.²⁸⁰

On the other hand, the government's response to the Financial Crisis was not as well-conceived or prompt as it might have been. It consisted largely of a series of crisis-driven deals. With the exception of its traditional tool of open market operations, each of the foregoing policy responses was *adopted* after the market that the government was seeking to support had effectively collapsed.²⁸¹ Even the Federal Reserve's open market operations did not, at the inception of the Financial Crisis, constitute an existing safety-net mechanism for financial markets because government purchases of securities in the open market had historically been aimed at stimulating the economy, not at supporting the functioning of credit markets.²⁸² If a market liquidity provider had existed at the outset of the Financial Crisis, it could have stepped in as credit conditions began to deteriorate to strategically purchase or hedge sufficient quantities of

WALL ST. J., Sept. 2, 2009, <http://online.wsj.com/article/SB125185379218478087.html#articleTabs%3Darticle> (noting that economists agreed that U.S. Government spending had turned the recession around).

276. Stroebel & Taylor, *supra* note 263, at 2.

277. William C. Dudley, President & Chief Exec. Officer, Fed. Reserve Bank of N.Y., Remarks at the Securities Industry and Financial Markets Association and Pension Real Estate Association's Public-Private Investment Program Summit, New York City: A Preliminary Assessment of the TALF (June 4, 2009) (transcript available at http://www.newyorkfed.org/news_events/speeches/2009/dud090604.html).

278. Adrian et al., *supra* note 271, at 35, 36 chart 7.

279. *Id.* at 36, 37 chart 9.

280. See Stroebel & Taylor, *supra* note 263, at 3–7 (contending that it is important to determine whether such statements can be supported by econometric analysis that controls for nongovernmental influences on markets).

281. Cf. Dudley, *supra* note 258 (noting that government interventions were post hoc, emergency actions taken in response to the financial crisis).

282. See *supra* note 281 and accompanying text.

securities to stabilize the MBS and ABS markets, thereby mitigating the credit meltdown that ultimately impacted the real economy.²⁸³

As in the case of firm safety nets, institutionalizing financial market safety nets ahead of another financial crisis would permit their design to be developed with the benefit of careful analysis. It would also provide a source of preexisting authority, as well as political legitimacy, to market liquidity providers. Finally, regulators could act swiftly and decisively in response to market breakdowns.

2. *Disrupting Transmission Chains.*—The failure of any one element of a system will be systemically significant to the extent that such failure is transmitted, directly or indirectly, to other elements of the system.²⁸⁴ Linkages among the elements of a system make a system fragile.²⁸⁵ An *ex post* paradigm for financial regulation should thus address systemic risk not only by providing safety nets for the elements of a system, but also by seeking to disrupt the mechanisms by which systemic risk travels.

As we explained in subpart III(B), the most dangerous systems—the ones that are prone to catastrophic failures—are systems that possess both interactive complexity and tight coupling. These types of systems obfuscate risk and present little opportunity for intervention following a local shock.²⁸⁶ Systems that possess neither, or only one of, the foregoing features do not pose the same level of systemic risk. A system that is interactively complex but only loosely coupled, for example, is likely to produce unpredictable interactions among its elements because of the system's interactive complexity.²⁸⁷ However, the ultimate damage to such a system from a failure at the level of its elements is likely to be manageable because loose coupling presents opportunities for early intervention.²⁸⁸ A system that is tightly coupled but not interactively complex should be

283. Cf. Dudley, *supra* note 258 (observing that although the Federal Reserve's market liquidity facilities implemented during the Financial Crisis "ultimately stabilized funding markets and crowded back in private funds. . . . They were an emergency response, not a sustainable, long-term solution").

284. John Downer, *When Failure Is an Option: Redundancy, Reliability, and Regulation in Complex Technical Systems* 13 (Ctr. for Analysis of Risk & Regulation at the London Sch. of Econ. & Political Sci., Discussion Paper No. 53, 2009), available at <http://www.lse.ac.uk/researchAndExpertise/units/CARR/pdf/DPs/Disspaper53.pdf> (asserting that the majority of fatal accidents occur "where the failure of one element propagates to others").

285. See, e.g., *supra* notes 94–101 and accompanying text.

286. See *supra* note 145 and accompanying text.

287. See PERROW, *supra* note 137, at 160–61 (describing universities as being loosely coupled but possessing interactive complexity that can cause their elements to "interact in unexpected ways").

288. See *id.* at 160–63 (asserting that in universities, which are interactively complex but loosely coupled, it is unlikely that failure of an element of the system will cause the system to fail because there is "ample slack to limit the impact" of the element's failure and "plenty of time for recovery").

susceptible to stabilization because its elements interact in ways that are predictable.²⁸⁹ When regulators understand the means by which systemic risk is transmitted, they can intervene to disrupt it. Indeed, they may even be able to design safety mechanisms into the system.

We also showed in subpart III(B) that the financial system is a high-risk system because it is both interactively complex and tightly coupled. As such, the financial system is bound to experience “normal” accidents.²⁹⁰ The *ex post* approaches we advance in this section would aim to reduce the breadth and depth of the consequences of financial crises. In our preceding discussion of safety nets, we considered *ex post* regulatory strategies that operated on the elements of the financial system. Here, we describe strategies that are applicable to the interconnections among those elements. These strategies involve reducing the interactive complexity of the financial system or reducing the tight coupling among the financial system’s elements.

a. Reducing Interactive Complexity.—Ex post strategies for reducing interactive complexity would focus on resolution mechanisms that simplify the system in ways that reduce systemic consequences. In the context of financial regulation, this can be illustrated by bankruptcy law and related approaches to resolving complex capital structures of troubled firms.²⁹¹ In each case, the goal would be to restructure the troubled firm’s debt in order to reduce the breadth and depth of the consequences of a default. Firms can find themselves in financial trouble for two reasons: their businesses are inherently unprofitable or they have taken on too much debt (or other liabilities).²⁹² In the former case, bankruptcy law generally provides a highly simplified resolution mechanism—liquidating the firm by selling its assets for cash and using the cash to pay down creditors according to the priorities of their claims.²⁹³ Although liquidation has consequences, they

289. See *id.* at 524–26 (noting that when failures occur, systems that lack interactive complexity, in other words, are linear, and are tightly coupled do “not interact in unexpected and incomprehensible ways, but in expected and visible ways”).

290. See *supra* notes 142–46 and accompanying text.

291. These resolution mechanisms apply mainly to firms but do not apply directly to markets. Schwarcz, *Ex Ante Versus Ex Post*, *supra* note 219, at 268.

292. See, e.g., Douglas G. Baird, Essay, *Bankruptcy’s Uncontested Axioms*, 108 YALE L.J. 573, 580 (1998). Professor Baird contrasts a firm that is “troubled because it cannot succeed in the marketplace, since competitors produce a better product at a lower cost,” with a firm that is “distressed because it cannot generate sufficient revenue to pay its debts.” *Id.* The first kind of distress “exists regardless of a firm’s capital structure.” *Id.* The second kind of distress is due to the firm’s poor capital structure: “the firm’s income is not enough to pay back what it has borrowed.” *Id.*

293. See, e.g., 11 U.S.C. §§ 721–727 (2012) (providing this type of liquidation scheme).

are, for an inherently unprofitable firm, generally less harmful than the consequences of trying to indefinitely subsidize a failing business.²⁹⁴

In the case of an inherently profitable firm that has taken on too much debt, however, the harmful consequences of liquidation—which not only would reduce jobs and destroy local communities, but also might trigger a systemic chain of defaults among unpaid creditors and suppliers—may well exceed those of a debt restructuring that returns the firm to a viable capital structure.²⁹⁵ Returning the firm to a viable capital structure also helps maintain financial market confidence by reducing counterparty risk.²⁹⁶

To that end, firms could attempt to restructure their debts by negotiation, without invoking bankruptcy law. However, as explained below, the interactive complexity of most firms would be difficult to address without the benefit of bankruptcy law. This interactive complexity results from the web of contracts between the troubled firm and its creditors. Many firms, and certainly most public firms, have numerous contracts with third parties, creating a multitude of obligations between the firm and those parties.

A troubled firm could attempt to restructure those obligations by negotiation alone, but that often is impractical. Not only are there too many contracts, but contracts—especially debt contracts—with multiple third parties typically require unanimity among those parties before essential provisions (such as principal due, interest rate, and payment maturities) may be changed.²⁹⁷ The unanimity requirement can motivate one or more creditors to strategically hold out from agreeing to reasonable changes.²⁹⁸ The holdouts hope that they either “will receive full payment of their claims or that the imperative of other creditors to settle will persuade those creditors to allocate the holdouts more than their fair share of the settlement.”²⁹⁹ Moreover, the problem is exacerbated because parties to a

294. See Baird, *supra* note 292, at 598 (theorizing that “subsidies for failed enterprises” may be more costly than current liquidation laws); *id.* at 580 (“Keeping a bad restaurant in business postpones the inevitable and delays a desirable shift of labor and capital to somewhere the inputs can be put to better use.”).

295. See Levitin, *supra* note 136, at 483 (noting that “[r]esolution of a TBTF firm in a bankruptcy system could produce the very harms sought to be avoided”); *cf. id.* at 478 (observing that “resolution system design is central to financial crisis management because its loss allocation function plays a critical role in restoring market confidence”).

296. *Cf. id.* at 478–79 (“Resolution system design is also critical for dealing with financial failure contagion. Successful resolution systems can limit financial failure contagion because they let the market see the end of the financial domino chain, and thus make clear which firms are sound, which creates the confidence necessary for investing.”).

297. Steven L. Schwarcz, *Sovereign Debt Restructuring Options: An Analytical Comparison*, 2 HARV. BUS. L. REV. 95, 99 (2012) (observing that “[f]inancing agreements often require unanimous consent of the parties to make these types of changes”).

298. *Id.* at 98.

299. *Id.* A holdout may also hope that other creditors will purchase the holdout’s claim. *Id.* at 98 n.17.

given contract who otherwise may be unanimously prepared to make changes may be reluctant to modify their contract's terms unless the troubled firm's other contracts are similarly modified.³⁰⁰ The interactive complexities thus effectively create a huge collective action problem.

One of the central goals of bankruptcy law is to help resolve this collective action problem.³⁰¹ In the United States, for example, bankruptcy law accomplishes this by providing that creditors of a firm in bankruptcy³⁰² are bound, notwithstanding the voting rights in their contracts, to a form of supermajority voting. The vote by the overwhelming majority of similarly situated creditors to change contractual terms would legally bind dissenting creditors.³⁰³

Although this might at first appear to be unfair to dissenting creditors, supermajority voting has proved to operate fairly in the bankruptcy context.³⁰⁴ Because only similarly situated creditors can vote to bind dissenting creditors, and because any outcome will bind all such creditors alike, the outcome of a vote should benefit the claims of holdouts and dissenters as much as the claims of the supermajority.³⁰⁵ To the extent creditors voting in the supermajority are found to have conflicts with other creditors voting in their class, the conflicted creditor votes could be disallowed.³⁰⁶

300. *See id.* at 98 (arguing that “the very existence of hold-outs can undermine the willingness of other creditors to agree to a reasonable restructuring plan”).

301. *See* Thomas W. Joo, *Who Watches the Watchers? The Securities Investor Protection Act, Investor Confidence, and the Subsidization of Failure*, 72 S. CAL. L. REV. 1071, 1105 (1999) (noting that scholars generally agree that “overcoming collective action problems and maximizing the recovery of creditors are key goals of bankruptcy law”). *But cf.* Daniel J. Bussel & Kenneth N. Klee, *Recalibrating Consent in Bankruptcy*, 83 AM. BANKR. L.J. 663, 746–47 (2009) (arguing that bankruptcy law may not be effectively resolving certain current collective action problems).

302. Bankruptcy law in the United States is governed by Title 11 of the United States Code, referred to as the Bankruptcy Code. Financial firms other than banks are generally subject to the Bankruptcy Code. *See* 11 U.S.C. § 109(b) (2012) (excluding banks and certain other financial firms from the Bankruptcy Code). Our Article does not engage the debate over whether financial firms more generally should be excluded from the Bankruptcy Code or whether the Bankruptcy Code should be amended to add a chapter dedicated to resolution mechanisms specifically adapted for financial firms. For that debate, see, e.g., Ayotte & Skeel, *supra* note 215, at 477–83 and Levitin, *supra* note 136, at 485–87, and see generally *BANKRUPTCY NOT BAILOUT* (Kenneth E. Scott & John B. Taylor eds., 2012).

303. 11 U.S.C. § 1126.

304. *See* David Arthur Skeel Jr., *The Nature and Effect of Corporate Voting in Chapter 11 Reorganization Cases*, 78 VA. L. REV. 461, 489–90 (1992) (comparing dissenting creditors in Chapter 11 proceedings to those in close corporations and arguing that in Chapter 11 proceedings supermajority voting is not necessary to protect dissenting creditors).

305. *See id.* (observing that minority creditors receive protection in the bankruptcy voting scheme because all creditors of the same class are bound to the outcome).

306. *See* 11 U.S.C. § 1126(e) (providing that the court may designate entities “whose acceptance or rejection of such plan was not in good faith, or was not solicited or procured in good faith or in accordance with the provisions of this title”).

Other *ex post* strategies for reducing interactive complexity similarly focus on resolution mechanisms that resolve complex capital structures of troubled firms. Although the Dodd-Frank Act requires banks and, to the extent designated as “systemically important,” other financial firms to be subject to a range of capital and similar requirements,³⁰⁷ the Act addresses the possibility that a firm could nevertheless end up failing by requiring these firms to submit a resolution plan—a so-called “living will”—that sets forth how the firm would liquidate in an orderly manner to minimize further systemic impact.³⁰⁸ This approach is not as flexible—and for a firm with an inherently profitable business, would not be as beneficial regarding nonsystemic consequences—as a debt restructuring that restructures the troubled firm to a viable capital structure. The approach nonetheless is intended to reduce the breadth and depth of the systemic consequences of a default.³⁰⁹ Whether this approach would be more effective at reducing systemic consequences than a debt restructuring would appear to be a factual determination that should be made on a case-by-case basis.³¹⁰

Similarly, another possible *ex post* resolution mechanism to resolve complex capital structures of troubled firms is to require at least some portion of their debt to be in the form of so-called contingent capital.³¹¹ Contingent-capital debt converts automatically into equity should certain specified events occur, such as a specified deterioration of a firm’s financial condition.³¹² Contingent capital operates effectively like a preplanned debt

307. See 12 U.S.C. §§ 5325(b), 5365(i), 5462–5463 (2012). The Dodd-Frank Act directs the Federal Reserve, for example, to set “prudential” capital standards for certain large financial firms, including a maximum debt-to-equity ratio of 15:1. § 5365(j).

308. See § 5365(d) (requiring a “resolution plan”).

309. See § 5365(a) (establishing prudential standards for nonbank financial companies and banks “in order to prevent or mitigate risks to the financial stability of the United States”).

310. See Ayotte & Skeel, *supra* note 215, at 491–93 (comparing orderly resolution with bankruptcy); cf. Levitin, *supra* note 136, at 468–69 (arguing that “[a]t best . . . a living will’s value would be through its effect on *ex ante* behavior of TBTF firms”).

311. See, e.g., John C. Coffee, Jr., *Systemic Risk After Dodd-Frank: Contingent Capital and the Need for Regulatory Strategies Beyond Oversight*, 111 COLUM. L. REV. 795, 805–06 (2011). Professor Coffee’s proposal for “bail in” contingent-capital conversion calls for conversion on a gradual, incremental basis. *Id.* at 830. Debt would convert to a senior, nonconvertible preferred stock with cumulative dividends and voting rights. *Id.* at 795. This structure would allow for the dilution of equity to deter excessive risk taking, the creation of a class of risk-averse preferred shareholders to counteract the risk-favoring tendencies of common shareholders, and the avoidance of an “all-or-nothing” transition. *Id.*; see also Wulf A. Kaal, *Contingent Capital in Executive Compensation*, 69 WASH. & LEE L. REV. 1821, 1844 (2012) (suggesting that the threat of dilution of equity positions combined with the conversion feature of contingent convertible bonds could affect corporate governance of systemically important financial institutions); Stan Maes & Wim Schoutens, *Contingent Capital: An In-Depth Discussion*, 41 ECON. NOTES 59, 72 (2012) (proposing triggering conversion by the rolling average stock price to combat short sellers “tempted to push down the stock price to profit from the resulting dilution of the bank’s stock”).

312. Coffee, *supra* note 311, at 805.

restructuring.³¹³ Contingent capital could be more effective at reducing systemic consequences than a debt restructuring if the amount of contingent capital that converts to equity is sufficient to restore the firm to a viable capital structure and the automatic conversion occurs precisely when needed. Whether contingent capital is more broadly economically efficient is less certain, however, depending on such factors as the costs imposed by a contingent-capital requirement.

In summary, in the context of financial regulation, *ex post* strategies for reducing interactive complexity would focus on resolving complex capital structures of troubled firms in order to reduce the breadth and depth of the consequences of a default. Although firms could attempt to consensually restructure their debts to achieve viable capital structures, the interactive complexity of most firms makes that difficult to accomplish without the benefit of bankruptcy and similar laws that address creditor collective action problems.

b. Reducing Tight Coupling.—*Ex post* strategies for reducing tight coupling would (as would *ex post* strategies for reducing interactive complexity) attempt to reduce the breadth and depth of the consequences of an accident. In the case of tight coupling, however, the focus would be on time—slowing or suspending a buildup of consequences.³¹⁴ These strategies could include the provision of liquidity, already discussed, to failing firms and markets,³¹⁵ which would suspend their collapse. As discussed below, however, there could be additional *ex post* strategies, depending on the context.

In the context of financial markets, for example, strategies for halting precipitous market declines could also include circuit breakers³¹⁶ and suspending mark-to-market accounting requirements. First consider circuit breakers, which in this context means mechanisms to suspend securities trading in order to mitigate volatile price changes.³¹⁷ Although increased speed in data transmission is generally associated with market efficiency, it also creates danger when algorithmically driven and automated securities

313. Requiring contingent capital might, however, have the perverse effect of exacerbating systemic risk. “For example, automatic conversions of debt claims to equity interests might create counterparty risk by reducing the value of firms holding those claims.” Schwarcz, *Controlling Financial Chaos*, *supra* note 112, at 837.

314. Recall that tight coupling can cause a disturbance to one part of a system to spread almost instantaneously to other parts of the system, and that, taken together, interactive complexity and tight coupling cause high-risk systems to pose a serious challenge for regulators. See *supra* notes 142–46 and accompanying text.

315. See *supra* section IV(A)(1).

316. Cf. Anabtawi & Schwarcz, *supra* note 114, at 1400 (observing the relationship between market circuit breakers and “instability in increasingly temporally complex markets”).

317. *Investor Bulletin: New Measures to Address Market Volatility*, SEC, <http://www.sec.gov/investor/alerts/circuitbreakersbulletin.htm> (last modified Apr. 9, 2013).

trading cause pricing disparities.³¹⁸ Circuit breakers would reduce those disparities by quickly suspending trading.

In May 2010, for example, the Dow Jones Industrial Average experienced a pricing failure, plunging nearly 1000 points in twenty minutes, that was precipitated by the algorithmically driven selling of several billion dollars' worth of derivatives contracts without regard to time or price.³¹⁹ The SEC responded with a universal circuit-breaker rule under which the trading of a security would be halted on all exchanges for five minutes if its price moved ten percent or more within a five-minute period.³²⁰ The assumption behind the rule is that the five-minute pause should give traders sufficient time to recognize and respond to obvious pricing disparities inadvertently caused by a trading algorithm.³²¹

Next consider *ex post* strategies for reducing tight coupling by suspending mark-to-market accounting requirements.³²² In its simplest form, mark-to-market accounting requires that a securities account be adjusted in response to a change in the market value of the securities.³²³ Consider an investor who purchases securities on credit from a broker-dealer using the securities as collateral. The broker-dealer requires the investor to maintain a minimum collateral value to protect itself if the investor defaults.³²⁴ If the market value of the collateral falls below this minimum, the broker-dealer will require the investor to put up additional collateral (a "margin call").³²⁵ If the investor fails to do so, the broker-dealer can foreclose on the collateral.³²⁶

Mark-to-market rules are generally believed to reduce risk.³²⁷ During times of extreme market volatility, however, they can cause "perverse effects on systemic stability."³²⁸ The tight coupling of forced sales of

318. Anabtawi & Schwarcz, *supra* note 114, at 1398–99.

319. *Id.* at 1399.

320. *Id.*

321. *Id.* In this Article, we do not purport to examine the validity of this assumption or the substantive merits of market circuit breakers generally. *But see id.* at 1399 n.206 (noting the "possibility that traders might mistakenly believe that a trading pause [resulting from a universal circuit breaker] was based on fundamental valuation issues," thereby aggravating the problem).

322. *See supra* notes 233–36 and accompanying text (describing mark-to-market accounting).

323. Schwarcz, *Regulating Complexity*, *supra* note 98, at 232.

324. *Id.*

325. *Id.*

326. ZVI BODIE, ALEX KANE & ALAN J. MARCUS, *INVESTMENTS* 71–72 (8th ed. 2008).

327. *See, e.g.,* Gikas A. Hardouvelis & Panayiotis Theodossiou, *The Asymmetric Relation Between Initial Margin Requirements and Stock Market Volatility Across Bull and Bear Markets*, 15 *REV. FIN. STUD.* 1525, 1554–55 (2002) (finding a correlation between higher margin calls and decreased systemic risk and speculating that higher margin calls may bleed the irrationality out of the market until only sound bets are left).

328. Rodrigo Cifuentes et al., *Liquidity Risk and Contagion* 9 (Bank of Eng. Working Paper Series, Working Paper No. 264, 2005), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=824166.

securities to meet margin calls exerting downward pressure on securities prices, in turn requiring more forced sales, can lead to a downward spiral.³²⁹ Such a spiral is especially likely to occur in the presence of leverage³³⁰ and appears to describe the behavior of mortgage-backed securities prices in the recent financial crisis.³³¹

A possible *ex post* strategy for reducing this tight coupling would be to suspend mark-to-market accounting when its application might distort value, such as when it would require a securities account—especially an account whose securities have long-term maturities—to be adjusted in response to short-term pricing fluctuations.³³² The critical question in applying this strategy, however, is how to distinguish between short-term pricing fluctuations and pricing fluctuations that represent real changes in the value of the securities.³³³

That question, in turn, raises an even broader question: Whatever mechanisms exist for reducing tight coupling, when should those mechanisms become operative? A mechanism that operates prematurely can interfere with otherwise efficient financial markets.³³⁴ On the other

329. *Id.*; see also De Souza & Smirnov, *supra* note 157 (arguing that in a bad market, short-term pressure to sell assets to raise cash for margin calls can lead to further mark-to-market losses for remaining assets, which triggers a whole new wave of selling, the process repeating itself until markets improve or the firm is wiped out, and referring to this process as a “Critical Liquidation Cycle”).

330. De Souza & Smirnov, *supra* note 157, at 26–27.

331. Rachel Evans, *Bankers’ Counsel Poll: Banks Tell of Downward Spiral*, INT’L FIN. L. REV., June 2008, at 16, 17–18; see also Ian Katz, *FASB Eases Fair-Value Rules Amid Lawmaker Pressure (Update 5)*, BLOOMBERG (Apr. 2, 2009, 17:21 EDT), <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=agfrKseJ94jc> (reporting that William Isaac, former chairman of the FDIC, has called mark-to-market accounting “a major cause” of the financial crisis).

332. See, e.g., R. Christopher Whalen, *The Subprime Crisis—Cause, Effect and Consequences*, 17 J. AFFORDABLE HOUSING COMMUNITY DEV. L. 219, 225 (2008) (“Fair value accounting is driving and increasing investor fears about the solvency of many financial institutions.”); Peter J. Wallison, *Fair Value Accounting: A Critique*, FIN. SERVS. OUTLOOK (Am. Enter. Inst. for Pub. Policy Research, Washington, D.C.), July 2008, at 2, available at http://www.aei.org/files/2008/07/28/20080728_23336JulyFSOg.pdf (“[M]arket-based movements in asset values can create substantial volatility in balance sheets and earnings reports—again, depending on a company’s business model.”); Adair Turner, Chairman, Fin. Servs. Auth., Address at the Cass Business School: Shadow Banking and Financial Instability 16 (Mar. 14, 2012) (transcript available at <http://www.fsa.gov.uk/static/pubs/speeches/0314-at.pdf>) (observing that the “interaction of secured lending practices and mark-to-market accounting . . . exacerbates the risk of procyclicality and the volatility of credit creation”).

333. In response to the recent financial crisis, the Financial Accounting Standards Board (FASB), which is delegated by the SEC authority to set accounting standards in the U.S., relaxed the mark-to-market accounting requirement by allowing firms to use “significant” judgment in gauging prices of debt securities on their books. See Katz, *supra* note 331 (recounting reactions to FASB’s decision to relax standards); *Facts About FASB*, FASB, <http://www.fasb.org/jsp/FASB/Page/SectionPage&cid=1176154526495> (noting that the SEC recognizes the FASB’s accounting standards as authoritative).

334. This principle applies even to the timing of the application of mechanisms to reduce interactive complexity, such as the timing of the conversion of contingent-capital debt to equity-

hand, it is important that the mechanism becomes operative before a systemic collapse becomes irremediable.

Professors Bill McKelvey and Rossitsa Yalamova have closely examined this question, which they call a question of financial resilience engineering.³³⁵ They argue that the intervention point—the point at which a mechanism for reducing tight coupling becomes effective—should be the financial system’s relevant “tipping point[.]”³³⁶ A tipping point means here a point at which a system radically changes behavior.³³⁷ For stock-market trading, for example, McKelvey and Yalamova contend that the relevant tipping point is the point at which “efficient market trading behaviour” becomes “the beginning of bubble-build-ups.”³³⁸ As with attempting to distinguish between short-term pricing fluctuations and pricing fluctuations that represent real changes in value,³³⁹ however, it may be difficult, except in retrospect, to know when that tipping point actually occurs.

Assuming that a relevant tipping point is, in fact, ascertainable in advance, McKelvey and Yalamova also argue that for the intervention (i.e., the mechanism for reducing tight coupling) to be effective, it must be automatically triggered when the tipping point occurs.³⁴⁰ This requirement is intended to obviate human delay,³⁴¹ especially that associated with a politically sensitive decision to intervene that could be influenced by “lobby-influenced politicians and government regulators.”³⁴² Although McKelvey and Yalamova recognize that, in retrospect, some interventions

based debt upon the occurrence of pre-agreed events. The more likely the conversion is to occur, the more expensive it likely would be to sell the debt to investors.

335. Bill McKelvey & Rossitsa Yalamova, *Financial Resilience Engineering: Toward Automatic Action Formulas Against Risk and Reckless Endangerment*, in GOVERNANCE AND CONTROL OF FINANCIAL SYSTEMS 133, 133 (Gunilla Sundström & Erik Hollnagel eds., 2011) [hereinafter McKelvey & Yalamova, *Financial Resilience Engineering*].

336. *Id.* at 137.

337. See MALCOLM GLADWELL, *THE TIPPING POINT* 9 (2002) (“The name given to that one dramatic moment . . . when everything can change all at once is the Tipping Point.”).

338. Rossitsa Yalamova & Bill McKelvey, *Using Power Laws and the Hurst Exponent to Identify Stock Market Trading Bubbles*, in GOVERNANCE AND CONTROL OF FINANCIAL SYSTEMS 85, 105 (Gunilla Sundström & Erik Hollnagel eds., 2011) [hereinafter McKelvey & Yalamova, *Using Power Laws*].

339. See *supra* note 333 and accompanying text.

340. McKelvey & Yalamova, *Financial Resilience Engineering*, *supra* note 335, at 134. This assumes, of course, that the relevant tipping points could not only be accurately determined, but also accurately determined *in advance*. The determination must be precise. If the intervention occurs prior to the tipping point, the intervention would “interfere with unimpaired operation of efficient-market trading” because “virtually all of the currently suggested anti-crisis measures are too strong before [the tipping point].” *Id.* at 144.

341. McKelvey and Yalamova appear to accept the possibility that an intervention could be effective even if applied shortly after a tipping point occurs, noting evidence that “suggests that there is a fair amount of time between [a stock-market trading tipping point] and [market] crash for the resilience interventions to be imposed.” Yalamova & McKelvey, *Using Power Laws*, *supra* note 338, at 103.

342. McKelvey & Yalamova, *Financial Resilience Engineering*, *supra* note 335, at 134.

may be unwise, regulators could later decide to rescind those interventions.³⁴³ This effectively represents a judgment call that the harm of making a mechanism for reducing tight coupling prematurely operative should be outweighed by the benefit of assuring against the possibility of an irreparable financial market collapse.

Such a judgment call may be analogized to the precautionary principle. Government agencies often go beyond strictly econometric cost-benefit modeling when designing regulation to address the risk of catastrophic events or large, irreversible effects where the actual level of risk is indeterminate,³⁴⁴ applying a precautionary principle that presumes benefits will outweigh costs.³⁴⁵ The analogy does not, however, follow the precautionary principle's most utilized form, in which regulators decide to regulate an activity notwithstanding lack of decisive evidence of its harm.³⁴⁶ Rather, the foregoing judgment call has a closer analogy to a stronger version of the precautionary principle—that when an activity (here, tight coupling) is shown to present a significant health or safety risk (here, a systemic risk), regulatory decisions should be made so as to prevent (here, through the mechanism for reducing tight coupling) the activity from being conducted notwithstanding scientific uncertainty as to the nature of the damage or the likelihood of its occurrence (here, by making that mechanism prematurely operative notwithstanding uncertainty as to if and when a tipping point will occur).³⁴⁷ This stronger version of the precautionary principle offers little practical guidance, however, to regulators.³⁴⁸ Moreover, application of the stronger version of the precautionary principle can sometimes lead to unintended consequences.³⁴⁹

343. *Id.* at 137.

344. This type of regulation is discussed in Cass R. Sunstein, *Irreversible and Catastrophic*, 91 CORNELL L. REV. 841, 848–50 (2006). A precautionary principle is often used when assessing the impact of human actions on complex systems, such as the environment and human health, where the consequences of actions may be unpredictable. See JAMES SALZMAN & BARTON H. THOMPSON, JR., ENVIRONMENTAL LAW AND POLICY 17 (3d ed. 2010) (discussing the precautionary principle as it relates to scientific uncertainty concerning environmental issues); Robert G. Chambers & Tigran A. Melkonyan, *Pareto Optimal Trade in an Uncertain World: GMOs and the Precautionary Principle*, 89 AM. J. AGRIC. ECON. 520, 520 (2007) (discussing the precautionary principle as it relates to genetically engineered corn).

345. Although this principle is often explicitly mentioned in international environmental regulations, it also is implicit in such domestic regulation as efforts to prevent terrorist attacks or regulation of the nuclear power industry, where high costs are justified even in the face of uncertain risk. See Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003, 1005–07 (2003) (discussing the precautionary principle's use in environmental regulation and terrorist attack prevention).

346. See *id.* at 1017–18 (discussing the European Commission's utilization of this form).

347. See Sunstein, *supra* note 344, at 849 (discussing Europe's strong understanding of the precautionary principle).

348. Sunstein, *supra* note 345, at 1020.

349. See, e.g., John D. Graham & Jonathan Baert Wiener, *Confronting Risk Tradeoffs*, in RISK VERSUS RISK I, 1–2 (John D. Graham & Jonathan Baert Wiener eds., 1995) (demonstrating that

Our Article does not purport to create formulas for determining relevant intervention points, nor do we attempt to assess the accuracy of the mathematical models advanced by McKelvey and Yalamova.³⁵⁰ We do observe, though, that those models appear to have been advanced in order to “prevent [financial market] bubble-build-ups and/or lessen their negative impact.”³⁵¹ Our analysis has identified additional normative goals that could justify intervention, such as halting precipitous market declines.³⁵²

B. *The Costs of Ex Post Financial Regulation*

Like its *ex ante* counterpart, *ex post* systemic risk regulation would introduce direct and indirect costs into financial markets. The costs associated with *ex ante* and *ex post* regulation differ, however. Whereas *ex ante* regulation is incomplete, faces industry resistance, chills risk taking, and encourages regulatory arbitrage, *ex post* regulation leads to moral hazard, burdens taxpayers, produces false alarms, and creates inefficiencies. Neither set of costs should be dismissed.

1. *Moral Hazard.*—Any *ex post* financial regulatory regime must confront the problem that it can have perverse *ex ante* consequences. In particular, mitigative *ex post* regulation can give rise to moral hazard. Moral hazard occurs when a decision maker is incentivized to take risks beyond the level that he or she would have otherwise taken because some or all of the negative consequences of taking those risks are shifted to third parties.³⁵³ If *ex post* regulation were to allow for such risk-transferring behavior, then its effectiveness in improving financial stability would be reduced.

interventions to reduce one risk may induce new countervailing risks); Jonathan B. Wiener, *Precaution in a Multirisk World*, in HUMAN AND ECOLOGICAL RISK ASSESSMENT: THEORY AND PRACTICE 1509, 1509 (Dennis D. Paustenbach ed., 2002) (arguing that although “precaution” can be a desirable strategy in some cases, strong versions of the precautionary principle can induce unintended countervailing risks, that the goal should be optimal rather than maximal precaution, and that actual regulation often moderates the degree of precaution in order to avoid these unintended risks).

350. McKelvey and Yalamova themselves admit that their algorithms will not always predict tipping points. Nonetheless, they observe that “[e]ven if only *half* of the . . . market crashes are predicted early on, the reduction of the impact on the broader economies would translate into savings of billions of US dollars.” McKelvey & Yalamova, *Financial Resilience Engineering*, *supra* note 335, at 148.

351. *Id.* at 133. Moreover, McKelvey and Yalamova argue that these bubble buildups are caused by herding behavior. *Id.* at 134. We do not purport to assess all the possible causes of market bubbles.

352. *See supra* notes 117–22 and accompanying text (suggesting the adoption of financial stability as a normative goal).

353. Karl S. Okamoto, *After the Bailout: Regulating Systemic Moral Hazard*, 57 UCLA L. REV. 183, 204–05 (2009).

The primary concern relating to moral hazard in financial firms is that the presence of safety nets for either those firms or the markets in which they participate will encourage them to take excessive risks.³⁵⁴ Safety nets shield financial firms from having to sustain the full downside of taking on risk.³⁵⁵ Asymmetrically exposed to the consequences of risk taking, decision makers will respond by ignoring that portion of the risk from which they believe they are protected and increase the fragility of the financial system.³⁵⁶

Market discipline is unlikely to curb excessive risk taking by firms that enjoy safety-net protection. Investors can generally be counted on to impose risk premiums on a firm that is suboptimally managed.³⁵⁷ In analyzing a firm's financial condition, however, investors consider the likelihood that the firm will be deemed TBTF.³⁵⁸ Investors in TBTF firms exhibit moral hazard when they treat those firms as safer than non-TBTF firms, accepting lower risk premiums in their transactions with them.³⁵⁹

Moral hazard is most severe when decision makers are insulated from any negative impact from their actions.³⁶⁰ Accordingly, efforts to control moral hazard typically involve techniques that allow market discipline to continue to play a role in influencing behavior.³⁶¹ This end could be

354. One could also argue that mitigative *ex post* regulation in any form can give rise to "regulatory moral hazard." Regulators may be more likely to be lax if they believe that any resulting negative financial market consequences will be contained than if they believe that they will be held accountable for allowing a systemic crisis to develop. Cf. Bert Ely, *Regulatory Moral Hazard: The Real Moral Hazard in Federal Deposit Insurance*, 4 INDEP. REV. 241, 247 (1999) (making the related point that deposit insurance fosters laxity among regulators who can be less diligent than if depositors or taxpayers were in a first-loss position with respect to bank insolvencies); Marco A. Espinosa-Vega et al., *Systemic Risk and Optimal Regulatory Architecture* 3 (IMF Inst., Working Paper No. WP/11/193, 2011), available at <http://ssrn.com/abstract=1910496> (describing regulatory forbearance as arising primarily because the failure of a financial firm under a regulator's watch is likely to be politically costly for the regulator and because, given time, the firm may recover). Thus, measures designed to contain a financial failure might promote regulatory forbearance.

355. See, e.g., Alison M. Hashmall, *After the Fall: A New Framework to Regulate "Too Big to Fail" Non-Bank Financial Institutions*, 85 N.Y.U. L. REV. 829, 840–41 (2010) (discussing the safety net of deposit insurance protecting against depositor runs on banks).

356. See *id.* at 841 (describing how deposit insurance creates a moral hazard by distorting the incentives of depositors, who "can no longer be relied upon to exert market discipline on the bank and curb overly risky behavior, as they lack the incentives to do so").

357. See *id.* at 840 (describing how uninsured bank creditors can demand higher rates of returns or withdraw funds entirely from banks engaged in risky activities).

358. See *supra* notes 228–38 and accompanying text.

359. See Hashmall, *supra* note 355, at 841 ("[M]oral hazard refers to the risk that shareholders, managers, or creditors of large financial institutions will take fewer precautions when they think the government will protect them.")

360. See Schwarcz, *Systemic Risk*, *supra* note 1, at 209 (predicting investors will be less cautious and companies will tolerate more risk as a result of a government bailout).

361. *Id.* at 238–39 (recommending that market discipline supplement other regulatory approaches).

accomplished with respect to *ex post* financial regulation in several ways. For example, the safety-net provider could adopt a credible policy of constructive ambiguity, not committing *ex ante* to whether or how it might attempt to support any given firm.³⁶²

Another approach to controlling moral hazard of firms is through the use of safety-net protection insurance in which TBTF firms are required to participate and pay premiums based on the systemic risk they pose.³⁶³ Such risk-based pricing would eliminate the moral hazard commonly associated with, for example, deposit insurance, because risk-sensitive premiums should induce financial firms to take more socially efficient risks.³⁶⁴

Alternatively, *ex post* financial regulation can be combined with bankruptcy-type discounts, or “haircuts,” that impose losses on a TBTF firm’s creditors as long as the haircut mechanism used is structured so as not to undermine the systemic-stability objectives of *ex post* financial regulation.³⁶⁵ Like risk-adjusted premiums, haircuts cause decision makers to internalize the systemic costs of their risk taking.³⁶⁶ Creditors who believe that they will suffer haircuts upon the failure of a firm should

362. *Id.* at 226. Constructive ambiguity can also be applied to the decision whether to stabilize any given financial market. Its effectiveness in reducing moral hazard depends on the extent to which it is unclear how the safety-net provider will respond to a potential failure. Moral hazard, at either the firm or the investor level, cannot be eliminated through constructive ambiguity because certain firms or markets may be so important that their stabilization is predictable with a high degree of certainty. *See id.* at 226–27 (discussing having a private liquidity provider of last resort follow a constructive ambiguity policy and the need for a priority system for determining which parties receive support).

363. For a discussion of how existing federal deposit insurance might be restructured along these lines, see Ely, *supra* note 354, at 250. In addition, Professor Steven Schwarcz has argued that a market liquidity provider of last resort can address market breakdowns while minimizing moral hazard. Schwarcz, *Systemic Risk*, *supra* note 1, at 225–30. The market liquidity provider would aim to stabilize financial markets in times of financial distress. *Id.* at 225. Schwarcz contemplates that the market liquidity provider would be funded by charging insurance-like premiums to market participants. *Id.* at 226. *But see* Levitin, *supra* note 136, at 473 (questioning the feasibility of using insurance schemes to address systemic risk). A separate, but related, question is whether the existence of a market liquidity provider of last resort might create a distortion by encouraging the growth of financial markets precisely to qualify for such liquidity protection. That might well be the case for formal markets, such as stock exchanges, but it would unlikely be the case for informal markets, such as most debt markets, which grow organically and not by command and control. This Article’s analysis of a market liquidity provider of last resort is primarily applicable to debt markets.

364. *See* Ely, *supra* note 354, at 250 (asserting that risk-sensitive premiums encourage better risk taking by banks, generally optimizing bank risk taking across the entire economy).

365. Professor Adam Levitin argues that to avoid placing undue stress on creditors during times of crisis, the haircut mechanism must be flexible, allowing haircuts to be imposed on some creditors immediately at the time of the bailout, while allowing other, systemically critical creditors “to take their haircuts over time.” Levitin, *supra* note 136, at 440–41, 510–13.

366. *See id.* at 508–09 (stating that haircuts distribute a portion of the cost of the bailout to the failed firms’ counterparties).

charge the firm a higher price to reflect that possibility.³⁶⁷ Thus, the more risky a firm is, the more costly it should be for the firm to obtain credit.

The likely tradeoff between *ex post* regulation and moral hazard does not mean that we should dismiss the notion of *ex post* regulation. Systemic-risk mitigation has a valuable role to play in supplementing market discipline³⁶⁸ and *ex ante* regulation³⁶⁹ in furthering systemic stability. On the other hand, it is reasonable to be concerned about, and to try to minimize, the moral hazard that might accompany *ex post* regulation.

2. *Taxpayer Burden.*—In proposing safety nets, we are sensitive to the concern that taxpayers may be called upon to fund them. The use of government resources to assist distressed firms or markets, whose need for support may have been self-inflicted, is justifiably troubling. Moreover, it has become politically unacceptable.³⁷⁰

It is beyond the scope of this Article to attempt to assess the expected costs to taxpayers of implementing safety nets.³⁷¹ Rather, we wish to point out that, to a limited extent, safety nets can be designed to apportion potential losses arising from insolvency among three constituencies, only one (government) of which relies directly on taxpayer support. The other two, creditors and private insurers, can also participate in funding safety nets for distressed firms and markets. We described in section IV(B)(1) how imposing haircuts on creditors of insolvent firms can impose market discipline on TBTF firms. Haircuts also serve to limit taxpayer losses when safety nets are used. When haircuts are imposed on a firm's creditors—that is, when haircuts are combined with safety nets—it is possible to apportion some losses resulting from a firm's failure to creditors.³⁷² Losses can also be allocated to TBTF firms through mutual insurance.³⁷³ Finally, one of us has suggested that yet another way to shield taxpayers from having to bear safety-net costs is to give private financiers priority on new loans to troubled firms.³⁷⁴

How losses attributable to safety nets will in fact be distributed is difficult to predict. We have described ways in which loss-distribution

367. See *id.* at 509 (arguing that haircuts cause TBTF firms to “bear the price of the haircut mechanism in the firms’ dealings with counterparties”).

368. See generally Anabtawi & Schwarcz, *supra* note 114 (discussing systemic risk and the considerations for regulating systemic risk).

369. See *supra* notes 187–96 and accompanying text.

370. It is for this reason that the Dodd-Frank Act approaches systemic risk regulation mainly through *ex ante* regulation. See Anabtawi & Schwarcz, *supra* note 114, at 1370 n.85.

371. For a detailed discussion of the measurement issues associated with government bailouts, see Cheryl D. Block, *Measuring the True Cost of Government Bailout*, 88 WASH. U. L. REV. 149, 196–225 (2010).

372. Levitin, *supra* note 136, at 440.

373. *Id.* at 473.

374. See Schwarcz, *Systemic Risk*, *supra* note 1, at 226–30.

schemes can be structured to limit the imposition on taxpayers of the costs of safety nets. It seems clear, however, that some form of taxpayer funding will always be needed to the extent that the nongovernmental resource pool from which safety-net funds can be drawn is insufficient to stabilize markets or that capital-market funding is unavailable.

3. *The Danger of False Positives.*—Limiting the harmful consequences of a firm or market failure makes it difficult to know with certainty whether those consequences would have been systemically significant. Committing to *ex post* mitigation of financial failures thus raises the possibility that firms or markets will be rescued unnecessarily. Such “Type I errors,” or “false positives,” occur when an indication is given that a condition exists when in fact it does not.³⁷⁵ In the context of the financial system, Type I errors would consist of false alarms prompting costly efforts to safeguard the financial system when it is not endangered.

As with taxpayer liability, Type I errors cannot be eliminated, but they can be reduced. The risk of Type I errors is related to the risk tolerance of the safety-net provider.³⁷⁶ Higher risk tolerance is associated with tighter criteria for deeming an event to be systemically significant and will lead to fewer Type I errors.³⁷⁷

Of course, decreasing the probability of Type I errors usually increases the probability of “Type II errors,” or “false negatives.”³⁷⁸ *Ex post* Type II errors would consist of failed alarms. In other words, they would occur when a safety-net provider responded too weakly or with undue delay to distress that proves systemically significant.

4. *Inefficiencies.*—We have already described the potential for one form of *ex post* regulation, safety nets, to produce financial market inefficiencies through moral hazard.³⁷⁹ The other form of *ex post* regulation we have set forth, disrupting transmission chains, can also undermine the goal of financial market efficiency through its impact on financial processes. We argued, for example, that one way to make the financial system safer would be to reduce its interactive complexity.³⁸⁰ Perrow described the dangers of complex interactions within a system as producing unfamiliar or unexpected sequences that are either hidden or not readily

375. Levitin, *supra* note 136, at 499.

376. *See id.* (describing agencies’ risk aversion as contributing to a higher number of Type I errors).

377. *Id.*

378. *See id.* at 500 (describing Congress’s greater reluctance to initiate bailouts as reducing Type I errors but leading to more Type II errors).

379. *See supra* section IV(A)(1).

380. *See supra* subsection IV(A)(2)(a).

understood.³⁸¹ Complexity, whether in financial assets, securities, or markets, makes it more difficult to understand and predict the effects of exogenous shocks.³⁸² It also makes it harder for firms to predict how exogenous events will affect their financial condition, and it makes it harder for regulators to predict whether the failure of a firm or market will have systemic effects.³⁸³

One could address these difficulties by creating resolution mechanisms to resolve complex capital structures of troubled firms.³⁸⁴ Unless carefully designed, however, these mechanisms might backfire, reducing efficiency. For example, the “living will” resolution plan approach would not be as flexible and, for a firm with an inherently profitable business, would not be as beneficial regarding nonsystemic consequences as a debt restructuring that restructures the troubled firm to a viable capital structure.³⁸⁵ And the effectiveness and efficiency of the contingent-capital approach would be subject to various factors, including whether the amount of contingent capital that converts to equity is sufficient to restore the firm to a viable capital structure and whether the automatic conversion occurs precisely when needed.³⁸⁶ One also could attempt to address these difficulties by simplifying the financial system through, for example, increased standardization of financial products.³⁸⁷ Complexity, however, can be used beneficially. It can, for example, arise in response to investor demand for securities that meet their peculiar commercial needs or risk preferences.³⁸⁸ In such instances, complexity enhances the functioning of financial markets.³⁸⁹

The other way to disrupt transmission chains that we have suggested, reducing tight coupling, may also tend to reduce the efficiency of the financial system if not designed carefully. Tight coupling implies minimal buffers between system components.³⁹⁰ Changes in the state of components are transmitted through the system directly and rapidly. Human judgment

381. PERROW, *supra* note 137, at 130.

382. *See id.* at 143–44 (stating that it is more difficult to predict or diagnose unanticipated interdependencies in the operation of complex systems).

383. *See* Anabtawi & Schwarcz, *supra* note 114, at 1389–90 (noting that complexities in “financial products and markets” can produce “information uncertainty”).

384. *See supra* notes 291–313 and accompanying text.

385. *See supra* notes 308–10 and accompanying text.

386. *See supra* notes 312–14 and accompanying text.

387. *See* Anabtawi & Schwarcz, *supra* note 114, at 1390 & nn.170–71 (discussing standardizing the features of exchange-traded securities as a means for reducing complexity in financial products and markets).

388. *See id.* at 1390 (indicating that complex financial instruments can enable firms to provide “a variety of options relating to risk, return, and timing of cash flows”).

389. *See id.* at 1390–91 (referencing the “efficiencies” complexity can create by allowing “market participants to design financial products that respond to or anticipate investor needs”).

390. PERROW, *supra* note 137, at 148.

is given little opportunity to intervene. Introducing buffers between components would diminish the ease with which component failures could travel. On the other hand, tight coupling in the financial system may arise over time because it can increase operating efficiency. In times of financial stability, buffers can be wasteful. For example, a mechanism that operates prematurely can interfere with otherwise efficient financial markets.³⁹¹ And it can be difficult to know, in advance, precisely when such a mechanism should become operational.³⁹²

V. Balancing *Ex Ante* and *Ex Post* Financial Regulation

Our analysis thus far has shown that, although both *ex ante* and *ex post* regulation can be effective at reducing systemic risk, neither is adequate, on its own, as a strategy for protecting the financial system. Regulators must therefore determine how to balance the two approaches in pursuing the goals of economic efficiency and financial stability.³⁹³ Our study of the financial system is also useful in addressing this question.

The limits associated with *ex ante* and *ex post* regulation discussed in subparts III(B) and IV(B), respectively, suggest that the factors relevant to choosing the optimal mix of *ex ante* relative to *ex post* regulation are the predictability of financial crises, the feasibility of adopting financial regulation,³⁹⁴ and the ability of regulators to implement their programs without giving rise to substantial market inefficiencies or regulatory arbitrage. More specifically, regulators' reliance on *ex ante* relative to *ex post* regulation should be greater, (1) the more confident regulators are in their ability to model the dynamics of the financial system, (2) the more controls exist for regulating systemically significant activities, and (3) the more capable regulators are at implementing their policies without giving rise to substantial market inefficiencies or regulatory arbitrage.

The better regulators understand and can accurately predict how the financial system behaves, the better they can identify how changes in the state of each element of the system affect each other system element and the system as a whole. In the course of the supervisory review process, regulators evaluate the safety and soundness of financial market participants in order to assess whether they pose a threat to financial stability because of their financial condition; their scope, size, scale, and concentration; their

391. See *supra* note 334 and accompanying text.

392. See *supra* note 333 and accompanying text.

393. For an indication, at least in the securities law context, that greater government *ex ante* regulatory involvement suggests less government *ex post* involvement in enforcement of those regulations, see John C. Coffee, Jr., *Law and the Market: The Impact of Enforcement*, 156 U. PA. L. REV. 229, 257 (2007).

394. This includes the feasibility of adopting *ex post* financial regulation. Cf. E-mail from Anna Gelpern, *supra* note 186 (observing that the political economy of financial regulation may be biased in favor of *ex ante* regulation).

interconnectedness; and the nature of their activities. Regulators who possess a sound grasp of the financial system's workings will be in a better position to identify and use their supervisory authority to prevent the collapse of critical but failing financial firms or markets.

There will always be a risk, however, that regulators will overestimate the soundness of their models, especially in a rapidly changing financial environment, or that they will overestimate their understanding of those models. In this regard, we note that the degree to which regulators can accurately model the financial system depends in large part on the transparency of financial firms and markets. The combination of market competition and regulatory arbitrage has led financial firms to develop increasingly complex financial products.³⁹⁵ These products have, in turn, added complexity to financial markets through their increased linkages within the financial system.³⁹⁶ Moreover, financial market participants are often better staffed than their regulators.³⁹⁷ The less opaqueness regulators confront in financial markets, whether because of complexity or relative capacity limits, the more successful they will be at monitoring the financial sector for early warning signs of a financial crisis.

It is not enough of course, for regulators to be able to identify the conditions that could give rise to a financial crisis. They must also possess the necessary tools to make the financial system robust. This implies that regulators be empowered to implement preventive regulation, both to reduce the likelihood that systemically significant firms or markets will fail and to disrupt their contagion effects should they nonetheless do so. The current challenge in this regard is that financial services interests will curb the Dodd-Frank Act administratively and legislatively. Going forward, the public's priorities are likely to turn away from financial systemic risk and the financial services industry is likely to reassert its dominance over financial regulatory policy.

Financial regulators also confront the difficulty of drawing the fine line between allowing firms and markets to operate freely and addressing market failures. As discussed in section IV(A)(2), for example, a mechanism for reducing tight coupling that operates prematurely can interfere with otherwise efficient financial markets, but it is important that the mechanism become operative before a systemic collapse turns

395. See Anabtawi & Schwarcz, *supra* note 114, at 1376–77 (describing how “investor demand for securities that more precisely match their risk and reward preferences” and regulatory arbitrage have led to increased complexity of financial products).

396. *Id.* at 1370–71, 1378 (asserting that “[o]ver time, innovations in financial products have increased the linkages between nodes,” which are institutions within the financial system).

397. Alan Murray, *Future of Finance (A Special Report)—Getting Started: Sir Howard Davies of the London School of Economics and Political Science Offers Action Items for Fixing the Financial System*, WALL ST. J., Dec. 13, 2009, <http://online.wsj.com/article/SB10001424052748704825504574585902675259622.html>.

irremediable.³⁹⁸ A further challenge to *ex ante* regulation is the potential for regulatory arbitrage. The easier it is for financial market participants to operate outside the regulatory reach of any given jurisdiction, the more likely it will be that systemically important activities will be located where they are least regulated.³⁹⁹ Even when the conditions are favorable for *ex ante* regulation, however, *ex post* regulation will remain a necessary component of a comprehensive regulatory strategy for addressing financial systemic risk. As we have emphasized, under conditions of interactive complexity and tight coupling, system accidents are inevitable.⁴⁰⁰ Unless *ex post* approaches are in place to deal with the onset of a financial crisis, regulators will be forced to respond with ad hoc measures, which are likely to be suboptimally designed or timed.

Recent financial regulatory developments in the United States are decidedly antagonistic to *ex post* approaches, however. The Dodd-Frank Act, which overhauled financial regulation following the Financial Crisis, embodies this attitude. According to one of the Act's provisions, if the Secretary of the Treasury designates a "covered financial company" that defaults or is at risk of default as systemically significant, that firm must be liquidated under Federal Deposit Insurance Corporation (FDIC) receivership.⁴⁰¹ Another provision prohibits federal assistance to swaps entities.⁴⁰² Yet another sharply limits the power of the Federal Reserve to make emergency loans to insolvent firms, thereby restricting the Federal Reserve's long-standing ability to act as a liquidity provider of last resort to financial firms.⁴⁰³ And no provisions appear to grant regulators the power to regulate markets, *per se*. On their face, these provisions (and the omission of others) seem to conflate *ex post* regulation with indiscriminate bailouts and taxpayer expropriation. As a result, they reject *ex post* regulation entirely, increasing the risk that a systemically important financial firm or market will collapse, with systemic consequences to other financial firms and markets and ultimately to the real economy.

As we have demonstrated in this Article, financial regulation aimed at mitigating the impact of financial failures can be explicitly designed to address the worst fears associated with *ex post* responses. Thoughtful regulatory design can control moral hazard and limit taxpayer liability, such as through risk-based insurance arrangements and loss-sharing with private creditors of firms that receive public support. It can also reduce, though not

398. See *supra* note 334 and accompanying text.

399. See *supra* notes 197–204 and accompanying text.

400. See *supra* notes 137–46 and accompanying text.

401. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, §§ 204–205, 124 Stat. 1376, 1454–58 (2010) (codified at 12 U.S.C. 5384 (2012)).

402. § 716, 124 Stat. at 1648–51 (codified at 15 U.S.C. 2305).

403. § 1101(a)(6), 124 Stat. at 2113–15 (codified 12 U.S.C. 343); see *supra* notes 240–44 and accompanying text.

eliminate, the possibility of ad hoc decision making in times of crisis by operating transparently, equitably, and with minimal taxpayer burden.

VI. Conclusion

We conclude that *ex ante*, or preventive, regulation is an incomplete policy approach to solving the problem of financial systemic risk. Designing a comprehensive systemic risk regulatory policy also requires implementing *ex post*, or mitigative, measures focused on limiting the harmful consequences of financial failures that are not prevented. Acknowledging the importance of both *ex ante* and *ex post* measures in regulating systemic risk is only the first step, however, toward safeguarding the financial system. Regulators must further decide how to balance the two approaches. Our Article has suggested guidelines for selecting an appropriate mix of *ex ante* and *ex post* regulatory strategies for safeguarding the financial system.