THE FINANCIAL INNOVATION PROCESS: THEORY AND APPLICATION

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ABSTRACT

What is "financial innovation," and why should we care about it? This question has become increasingly important in the wake of the recent financial crisis, yet the nature of financial innovation remains poorly understood. Drawing on the "New Institutional Economics" literature, this article contends that financial innovation should be understood first and foremost as a process of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries (such as banks) and in markets, themselves. It argues that this reframing has important policy implications for the economics of regulating the financial innovation process and for understanding the dynamics of modern financial markets in general. As an illustration of these ideas, this article undertakes a critical analysis of a rule that would require banks that deal in over-the-counter derivatives to transfer the management of certain risks associated with these instruments to a highly regulated third-party called a centralized clearing party. This rule has been proposed in Europe and was recently adopted in the United States by the Dodd-Frank Wall Street Reform and Consumer Protection Act. This article argues that this rule is properly viewed as an attempt to regulate the process of financial innovation itself and that, when viewed in this light, the rule is neither as modest nor as obviously superior to the status quo as its adherents claim. Finally, this article sketches two alternatives to this rule that seek to navigate the trade-offs of what the article refers to as the "new" economics of financial regulation.

[1]Climenko Fellow and Lecturer on Law, Harvard Law School. Special thanks go to Mark Roe for helpful early discussions about regulatory challenges in the face of modern financial markets and to Lucian Bebchuk for encouraging me to focus on the institutional structure of the OTC derivatives market. I am also appreciative for the thoughtful comments of John Coyle, Susannah Barton Tobin, Mike Burstein, Jake Brooks, Michael Coenen and Natalie Gubler. All errors are mine.

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I. INTRODUCTION

In sifting through the economic rubble caused by the global financial crisis of 2007 and 2008, one cannot help but be struck by the volume of

obscure financial products left in its wake: credit default swaps, residential mortgage-backed securities, and collateralized debt obligations, to name a few. The role that these products played in the financial crisis has generated a vigorous debate about the value of financial innovation and the proper regulatory response to the development of novel financial products. The battle lines in this debate are already forming. There are those who believe that financial innovation is largely useless.[2] Others, by comparison, take a more moderate position, arguing that some financial innovation is good and some is bad.[3]

Lost in this debate, however, is a more fundamental question about the nature of financial innovation itself and its effect on modern financial markets. This question is both timely and important. Lawmakers have been urged to draft new laws in the wake of the financial crisis that take into account "the special nature of the modern process of financial innovation,"[4] and the Securities and Exchange Commission ("SEC") recently announced the creation of a new division devoted in part to overseeing financial innovation in general.[5] Yet, the financial innovation process itself remains poorly understood. The economics literature on financial innovation tends to concentrate on "the diffusion of these innovations, the characteristics of adopters, and the consequences of innovation for firm profitability and social welfare."[6] The few accounts of the financial innovation process in legal scholarship focus exclusively on financial products and how market actors

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[2]Paul Volcker, the former Federal Reserve Board Chairman and current Chairman of President Obama's Economic Recovery Board, has implied as much. *See* Alan Murray, *Paul Volcker: Think More Boldly*, WALL ST. J., Dec. 14, 2009, at R7 (quoting Volcker's rhetorical question, "How many other [recent] innovations can you tell me that have been as important to the individual as the automatic teller machine, which is in fact more of a mechanical than a financial one?"). New York Times columnist and Nobel Prize winning economist Paul Krugman, has asserted that it is "hard to think of any major recent financial innovations that actually aided society, as opposed to being new, improved ways to blow bubbles, evade regulations and implement de facto Ponzi schemes." Paul Krugman, Op-Ed., *Money for Nothing*, N.Y. TIMES, Apr. 27, 2009, at A23.

[3]*See, e.g.*, Robert E. Litan, In Defense of Much, But Not All, Financial Innovation 1-3 (Feb. 17, 2010) (unpublished comment), *available at* http://www.brookings.edu/~/media/Files/rc/opinions/2010/0217_financial_innovation_litan/0217_financial_innovation_litan.pdf).

[4]Over-The-Counter Derivatives: Modernizing Oversight to Increase Transparency and Reduce Risks: Hearing Before the Subcomm. on Securities, Insurance, and Investment of the Comm. on Banking, Housing and Urban Affairs, 111th Cong. 64 (2009) (statement of Prof. Henry T.C. Hu).

[5]Press Release, U.S. Sec. & Exchange Comm'n, SEC Announces New Division of Risk, Strategy, and Financial Innovation (Sept. 16, 2009), *available at* http://www.sec.gov/news/press/ 2009/2009-199.htm.

[6]Josh Lerner & Peter Tufano, *The Consequences of Financial Innovation: A Research Agenda* 3 (Am. Econ. Ass'n Working Paper, 2009), *available at* www.aeaweb.org/aea/conference/program/retrieve.php?pdfid=351.

might misunderstand the risks created by these products.[7] This article builds on these important contributions, but takes an overall different tack in maintaining that financial innovation must be understood first and foremost as a *process* of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries and markets themselves. This article argues that this reframing has important policy implications for the economics[8] of regulating the financial innovation process and for understanding the dynamics of modern financial markets in general.

This article develops a theoretical framework (the "financial innovation framework") for understanding this financial innovation process that relies on an important insight from the "New Institutional Economics"

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[7]*See* Henry T.C. Hu, *Swaps, The Modern Process of Financial Innovation and the Vulnerability of a Regulatory Paradigm*, 138 U. PA. L. REV. 333, 341 (1989) [hereinafter Hu, *Swaps*]; *see also* Henry T.C. Hu, *New Financial Products, the Modern Process of Financial Innovation, and the Puzzle of Shareholder Welfare*, 69 TEX. L. REV. 1273, 1277 (1991) (noting the impact of complex financial innovation in equity securities on corporate law); Henry T.C. Hu, *Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism*, 102 YALE L.J. 1457, 1459-60 (1993) [hereinafter Hu, *Misunderstood Derivatives*] (reviewing PETER L. BERNSTEIN, CAPITAL IDEAS: THE IMPROBABLE ORIGINS OF MODERN WALL STREET (1992) and explaining how "novel, complex, and opaque" financial products can confound even sophisticated actors).

[8]What I refer to as "the economics of financial regulation" should not be confused with "the economic theory of regulation." While both concepts have certain superficial affinities – for example, they both examine the benefits and costs of regulation – they seek to explain different phenomena. The economic theory of regulation seeks to explain the distribution of regulation in the economy (why certain industries are heavily regulated and some are not) and treats legislation as the product and legislators and interest groups as the producers and consumers, respectively, of this product. *See* George J. Stigler, *The Theory of Economic Regulation*, 2 BELL J. OF ECON. & MGMT. SCI. 3, 3 (1971) ("The central tasks of the economic theory of economic regulation are to explain who will receive the benefits or burdens of regulation, what form the regulation will take, and the effects of regulation upon the allocation of resources."); *see also*, Richard A. Posner, *Theories of Economic Regulation*, 5 BELL J. ECON. & MGMT. SCI. 335, 343 (1974) (explaining that the economic theory of regulation includes "strong assumptions," including that "people seek to advance their self-interest and do so rationally."). On the other hand, the economics of financial regulation is concerned with the trade-offs involved in addressing a particular issue of public policy in the financial markets. Thus, I am concerned in this article not with predicting how new financial regulation will look given the composition of the various interests involved, but rather with understanding how to analyze any proposals for financial regulation reform in light of recent tectonic shifts in the financial markets. *See* Richard A. Posner, *The President's Blueprint for Reforming Financial Regulation: A Critique: Part I*, FinReg21, July 20, 2009, http://www.finreg21.com/lombard-street/the-president's-blueprint-reforming-financial-regulation-a-critique-part-i (discussing the weaknesses of a Treasury Department report released June 17, 2009, entitled "Financial Regulatory Reform: A New Foundation: Rebuilding Financial Supervision and Regulation").

literature.[9] Specifically, this article relies on the theory that organizations and markets act as both substitutes and complements for organizing and governing economic transactions.[10] Banks provide financial products to firms and individuals and manage the risk inherent in these products, but markets do so as well. Because markets act as substitutes for banks, banks may be able to transfer assets and their accompanying risks from their balance sheets to trade in markets, thus freeing up room for banks to assume new, more profitable (and often more complex) risks. It was precisely this desire to remove assets from banks' balance sheets by packaging them so they can be freely traded on markets which was the primary motivation behind the creation of the now infamous "collateralized debt obligation," a concept that played a significant role in the financial crisis.[11]

Not only do markets act as substitutes for banks, but banks also act as complements to markets. When banks successfully transfer assets from their books to markets, these "new" markets create opportunities for banks to develop novel financial products that seek to solve firms' business objectives (such as the hedging of risk) with respect to these new markets.[12]

This article explores the determinants of the market's substitutability for banks and banks' complementarity with respect to markets. This relationship between financial intermediaries and markets, in turn, has complicating effects on instruments, institutions, and markets. First, it leads to increasing product complexity, because before banks can transfer products to markets, they must fine-tune the products so that they are capable of being traded in relatively high volume at arm's length. This fine-tuning process can introduce considerable complexity in the products themselves. Second, the relationship between banks and markets increases the complexity of financial intermediaries. When banks remove assets from their balance sheets and transfer them to markets to be traded in arm's-length transactions, banks replace the transferred risk with more profitable risk, which also tends to be risk that is more complex and more difficult to manage.[13] Further, in their role as a complement to markets, banks become interconnected with new

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[9]For an excellent overview of this literature, see NEW INSTITUTIONAL ECONOMICS: A GUIDEBOOK (Éric Brousseau & Jean-Michel Glachant, eds., 2008).

[10]*See id.* at xlii-xliii (explaining the issues created by the coordination between organizations and markets).

[11]*See infra* notes 27-30 and accompanying text.

[12]*See* Litan, *supra* note 3, at 41 (explaining how "innovation has enhanced access to instruments that facilitate risk management" for banks).

[13]*See* Raghuram G. Rajan, *Has Financial Development Made the World Riskier?* 326-29 (Nat'l Bureau of Econ. Research, Working Paper No. 11728, 2005) (showing through statistical analysis that banks prefer to manage "more complicated risks, which pay more and better utilize its distinct warehousing capabilities").

markets, which can further increase the risks assumed by these institutions.[14] Third, the financial innovation process affects markets by giving rise to new markets that are relatively inefficient and therefore subject to severe realignments in the wake of exogenous shocks and untested in dealing with the stress that results from such shocks.

What are the policy implications of this account of the financial innovation process? This article suggests that this process, and in particular its effect on instruments, institutions, and markets, complicates the economics of financial regulation by increasing the information asymmetries that exist between regulators and market participants, particularly with respect to the management of risk. This "new" economics of financial regulation defies simplistic New-Deal-era dichotomies between bottom-up solutions and top-down prescriptions and argues in favor of a middle road that emphasizes increased coordination and collaboration between market actors and regulators.

As a real-world illustration of these implications, the article adopts a "case study" approach by analyzing one potential approach for regulating the financial innovation process: a mandatory requirement that the management of a certain type of risk inherent in over-the-counter ("OTC") derivatives called "counterparty risk," which is currently carried out by banks, be transferred to a heavily regulated third-party known as a centralized clearing party ("CCP").[15] This approach has been adopted in the United States by the Dodd-Frank Wall Street Reform and Consumer Protection Act (the "Dodd-Frank Act")[16] and is still the subject of considerable debate in Europe.[17]

Many believe the mismanagement of counterparty risk in the OTC derivatives market played an important contributing role in the financial

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[14]*See infra* Part II.C. (explaining the catastrophic effect of interconnectedness between banks and other financial institutions in the context of the 2008 financial crisis).

[15]*See* Department of the Treasury, Financial Regulatory Reform: A New Foundation: Rebuilding Financial Supervision and Regulation 46-47 (June 17, 2009), *available at* http://www.financial stability.gov/docs/regs/FinalReport_web.pdf.

[16]Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 723(a), 124 Stat. 1376, 1675-81 (2010).

[17]In the United Kingdom, the mandatory rule is a part of the British Treasury's financial reform proposals. *See* Financial Services Authority & HM Treasury, Reforming OTC Derivative Markets: A UK Perspective 11 (Dec. 2009), *available at* http://www.fsa.gov.uk/pubs /other/reform_otc_derivatives.pdf. The mandatory CCP-clearing rule has also been proposed in an official European Commission Communication. *See* Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Central Bank, Ensuring Efficient, Safe and Sound Derivatives Markets: Future Policy Actions 4-5 (Oct. 20, 2009), *available at* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM: 2009:0563:FIN:EN:PDF.

crisis.[18] The financial innovation framework developed in this article, however, suggests that important dimensions of the debate over mandatory CCP clearing have gone almost entirely unnoticed. In particular, the financial innovation framework implies that the management of counterparty risk in the OTC derivatives market should be transferred to markets (or in this case, a regulated market institution like a CCP) only if markets are an efficient substitute for banks. This is a highly contestable proposition, especially considering that the financial innovation process has a tendency to increase informational asymmetries between banks and market institutions. This article sketches two alternative reform possibilities that seek to mediate between the trade-offs of the new economics of financial regulation created by the financial innovation process. These alternatives are unlike the traditional top-down nature of the mandatory CCP-clearing rule.[19]

The discussion is organized as follows: Part II develops an account of the modern process of financial innovation, characterizing it as involving a dynamic interplay between financial intermediaries and markets. Equipped with this account, it then explains how the financial innovation process may lead to increased complexity with respect to new products and the institutions that develop these products while at the same time creating certain fragilities in new markets. Part III applies this framework to a current policy proposal: the mandatory CCP clearing of OTC derivatives through a CCP. The account developed in Part II suggests that there are possibly significant information asymmetries that exist between market participants and a CCP in this market, particularly with respect to the pricing of counterparty risk through the use of collateral. Part IV explores policy implications. In particular, Part IV proposes two alternatives to a mandatory CCP-clearing rule, each of which highlights increased coordination and collaboration between regulators and market participants. Part V briefly concludes.

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[18] *See, e.g.*, Darrell Duffie et al., Policy Perspectives on OTC Derivatives Market Infrastructure 1 (Fed. Res. Bank of N.Y. Staff Rep. No. 424, 2010), *available at* http://ssrn.com/abstract= 1534729; Brian J.M. Quinn, *The Failure of Private Ordering and the Financial Crisis of 2008*, 5 N.Y.U. J. L. & BUS. 549, 609 (2009).

[19] *See* Communication from the Commission to the European Parliament, *supra* note 17, at 5 (discussing the benefits of uniform OTC regulation across Europe).

II. TOWARD A FRAMEWORK FOR UNDERSTANDING MODERN FINANCIAL MARKETS

A. *Financial Innovation as a Process of Change*

Financial innovation must be understood first and foremost as a *process* of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries and markets themselves. The next subsection describes the nature of these changes and how they explain some of the key features of modern financial markets. This subsection, by contrast, focuses on the process itself. Central to the process-based view of financial innovation is the nature of the relationship between financial intermediaries and markets. In particular, financial intermediaries and markets are at once substitutes and complements for performing a particular function: the origination and management of risk.

1. Banks and Markets as Substitutes

When a financial intermediary, such as Wells Fargo or J.P. Morgan, extends a loan to a corporate client who needs financing to make an investment, that loan contains a number of risks. There exists, for example, the risk that changes in the market landscape will lead to a decrease in the value of the loan. Perhaps interest rates increase, which decreases the loan's value, because following the rate increase the bank will be receiving smaller interest rate payments relative to the market rate than it was entitled to receive before the rate hike. In addition to this market risk, the loan also contains firm-specific risks. For example, there is the risk that the borrower will decide to incur additional debt by borrowing from some other bank covertly, which clearly reduces its ability to pay off the bank's loan. Banks make money by managing these risks.[20]

Of course, banks are not the only providers of financial products and managers of risk. Markets can also serve these functions. There are important differences, however, between intermediaries, such as banks, and

[20]Moreover, banks manage not only risks that they originate themselves, but risks that are originated by others. For example, the now-infamous credit default swap, which is discussed in more detail below, had its genesis with a transaction in 1997 between the European Bank for Reconstruction and Development ("EBRD") and JP Morgan, under which the EBRD agreed to warehouse and manage the credit risk associated with a credit line that JP Morgan had extended to Exxon. GILLIAN TETT, FOOL'S GOLD: HOW THE BOLD DREAM OF A SMALL TRIBE AT J.P. MORGAN WAS CORRUPTED BY WALL STREET GREED AND UNLEASHED A CATASTROPHE 54-55 (2009).

markets. First, there is a difference in the types of products that the two institutions can provide. In order to be eligible for trading on financial markets, financial products must be traded in high volumes and have standardized terms.[21] By contrast, banks are better suited for low-volume products with highly customized terms.[22] Second, there is a difference in the way markets and intermediaries price risk. In markets, of course, risk is priced through the mechanisms of market efficiency.[23] Publicly available information becomes compounded into prices through the "bids" and "asks" of a large number of investors, each of whom places a particular value on the asset in question as a result of a set of publicly available information.[24]

Banks, by contrast, price and manage risk principally through models and non-public information that they acquire through relationships with customers.[25] These relationships are typically long-term and are guided, in part, by the bank's use of non-public financial information concerning the customer, which helps the bank monitor the borrower's financial stability.[26] This monitoring function is further served by a relational contract containing various covenants that allow the bank to assert certain rights in the event of a covenant violation.[27] Thus, while the market manages risk through risk-

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[21]*See* Robert C. Merton, *A Functional Perspective of Financial Intermediation*, 24 FIN. MGMT. 23, 26 (1995).

[22]*Id.*

[23]*See* Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549, 554-55 (1984) (explaining how prices reflect publically available information regarding the risk involved in investing).

[24]*See* JOHN DOWNES & JORDAN ELLIOT GOODMAN, DICTIONARY OF FINANCE AND INVESTMENT TERMS 61 (2006) (explaining that a bid is "the highest price a prospective buyer is prepared to pay at a particular time for a trading unit of a given security" and that an ask is "the lowest price acceptable to a prospective seller of the same security").

[25]*See* Bharat N. Anand & Alexander Galetovic, *Information, Nonexcludability, and Financial Market Structure*, 73 J. BUS. 357, 365 (2000).

[26]One challenge faced by banks is how to prevent the disclosure of this information to its rivals in order to appropriate the returns from information gathering. The answer may lie in the cooperative nature of banking markets themselves. *See* Bharat N. Anand & Alexander Galetovic, *Information, Nonexcludability, and Financial Market Structure*, 73 J. BUS. 357, 358-59 (2000) (noting that "the short-run gains of free riding on other intermediaries' information-gathering efforts are less than the long-run profits of cooperation.").

[27]For example, in a private loan agreement, there are typically covenants restricting the borrower's ability to incur additional debt (because additional indebtedness will adversely affect the borrower's ability to repay the bank) and requiring the lender to maintain cash flow above a certain threshold (because cash flow enhances the borrower's ability to repay the loan). A covenant violation gives the lender influence over the borrowing firm's financial or investment policy. For example, a violation of a covenant against additional debt incurrence might result in a blanket prohibition on the borrower's ability to take out additional loans. Lenders can influence borrowers in other ways as well. For example, there is some evidence that lenders have an important role in ousting CEOs of poorly performing companies. *See* Frederick Tung, *Leverage in the Board Room: The Unsung Influence of Private Lenders in Corporate Governance*, 57 UCLA L. REV. 115, 156-57

spreading, diversification, and the reliance on publicly available information, banks manage risk largely through models and monitoring,[28] facilitated by the bank's use of costly, borrower-specific information that the bank gathers over the course of repeated client interactions.[29]

Capital adequacy requirements place constraints on the amount of risk that banks can carry on their balance sheets.[30] These requirements, embodied in two different international accords known as "Basel I" and "Basel II," require banks to maintain a certain ratio of risk to capital.[31] Thus, if a bank wishes to increase the risk that it manages, it must also increase its capital cushion, which imposes a real cost on the bank.[32] Banks also have internal credit limits that place further constraints on the amount of risk that they can assume.[33] In the face of these constraints on the amount of risk that banks can carry on their balance sheets, banks have a strong incentive to focus on managing only those risks for which they have a comparative advantage over markets. As the market becomes a more perfect substitute for a bank in the managing of risk related to a given product, the bank removes that product from its balance sheet and the relationship in which it is embedded, and transfers it to an arm's-length transaction in the financial markets, thereby creating a "new market."[34] Of course, not all products are

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(2009) (noting the greater "likelihood of forced CEO turnover" that accompanies the assumption of private debt).

[28]It is worth noting that it is also by virtue of this monitoring role that banks are viewed as one of the levers of corporate governance. *See, e.g.*, Douglas G. Baird & Robert K. Rasmussen, *Private Debt and the Missing Lever of Corporate Governance*, 154 U. PA. L. REV. 1209, 1211 (2006) (labeling the "control that creditors exercise through elaborate loan covenants" the "missing lever of corporate covernance"); Michael C. Jensen, *Agency Costs of Free Cash Flow: Corporate Finance and Takeovers*, 76 AM. ECON. REV. 323, 324 (1986) (explaining how debtholders can control a company's operations); George G. Triantis & Ronald J. Daniels, *The Role of Debt in Interactive Corporate Governance*, 83 CAL. L. REV. 1073, 1077 (1995) (explaining the screening and monitoring benefits of lending through financial intermediaries); Tung, *supra* note 27, at 119 ("Banks not only constrain these managerial decisions but on occasion dictate them.").

[29]*See* Arnoud W.A. Boot, *Relationship Banking: What Do We Know?*, 9 J. FIN. INTERMEDIATION 7, 10 (2000) (identifying two "critical dimensions" of relationship banking: "proprietary information and multiple interactions").

[30]*See* JONATHAN R. MACEY ET AL., BANKING LAW AND REGULATION 276-306 (2001) (discussing how capital adequacy requirements regulate private risk-taking).

[31]For a capsule summary of the Basel accords, see Eric Y. Wu, Recent Development, *Developments in Banking Law: 2004—Basel II: A Revised Framework*, 24 ANN. REV. BANKING & FIN. L. 150, 150-51 (2005); *see also* Robert F. Hugi et al., *U.S. Adoption of Basel II and the Basel II Securitization Framework*, 12 N.C. BANKING INST. 45, 48 (2008).

[32]*See* MACEY ET AL., *supra* note 30, at 277 (explaining that by definition, "a depository institution's capital – its excess of assets over liabilities—helps protect the institution's depositors and other creditors").

[33]*See* William F. Treacy & Mark Carey, *Credit Risk Rating Systems at Large US Banks*, 24 J. BANKING & FIN. 167, 167-68 (2000) (describing the increasing use of internal credit-risk-rating systems at banks).

[34]*See* Merton, *supra* note 21, at 26-27.

eligible to be transferred to markets. In particular, a product must have sufficient demand to be traded in relatively high volume, which requires it to have standardized contractual terms.[35] Perhaps even more importantly, there cannot be any information asymmetries between the bank and the market.[36]

Thus, everything else equal, products with more standardized terms and lower information asymmetries will migrate from banks to markets.[37] A useful analogy might be made to venture capital.[38] Venture capital funds serve as incubators of new companies. They invest in start-ups with the goals of testing and preparing them for a début on markets, which venture capital funds accomplish through an initial public offering in the capital markets.[39] Banks do the same with respect to new financial products.[40]

Up to this point, the discussion has been extremely conceptual. Let me illustrate the market migration process described above with a concrete example taken from the recent financial crisis. While commentators who have studied the financial crisis might disagree on the ultimate causes of the crisis, they tend to agree that a particular type of financial instrument played a crucial role in the events that roiled global markets in 2007 and 2008 and the resulting aftershocks.[41] This security is called a collateralized debt

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[35] *See id.* at 26.

[36] *See id.*

[37] *See id.* Of course, this product migration does not mean that substitute products will not be provided by both banks and markets. This equilibrium might occur if there are a set of end-users of a given product that would benefit more from interacting with a bank than with a market. Consider, for example, public debt markets. These markets provide corporations with debt financing through arm's-length transactions in the same way that banks provide corporations with debt financing through heavily-negotiated, private bank loans. One explanation for the co-existence of these two substitute products is that corporations that are particularly difficult to value, and that are, therefore, undervalued by markets, may find that banks, by virtue of their access to borrower-specific non-public information, will develop more accurate valuations than markets. Thus, for these difficult-to-value firms, private bank loans would be less expensive than going to the public debt markets. *See* Charles J. Hadlock & Christopher M. James, *Do Banks Provide Financial Slack?*, 57 J. FIN. 1383, 1383-84 (2002) (observing "the information benefit of bank debt will dwarf the small or negative relative contracting costs" for firms mispriced by the public).

[38] Robert Merton was the first to draw this analogy. *See* Merton, *supra* note 21, at 26.

[39] *See* D. Gordon Smith, *The Exit Structure of Venture Capital*, 53 UCLA L. REV. 315, 317 (2005).

[40] *See, e.g.*, Frank Partnoy, *The Siskel and Ebert of Financial Markets?: Two Thumbs Down for the Credit Rating Agencies*, 77 WASH. U. L.Q. 619, 672-74 (1999) (describing the aggressive marketing schemes used in connection with asset-backed securities).

[41] *See* Gretchen Morgenson, *Behind Biggest Insurer's Crisis, A Blind Eye to a Web of Risk*, N.Y. TIMES, Sept. 28, 2008, at A1 ("Although America's housing collapse is often cited as having caused the crisis, the system was vulnerable because of intricate financial contracts known as credit derivatives, which insure debt holders against default.").

obligation ("CDO"). The CDO is a bond[42] that is backed by the cash flows on underlying pools of debt or debt-like instruments, such as corporate loans, other asset-backed securities,[43] or credit default swap ("CDS") contracts.[44] Historically, banks held these debt or debt-like instruments that underlie the CDO on their own balance sheets.[45] Banks would then do what they do best: manage the market and credit risk inherent in these assets, relying on models, borrower-specific, non-public information, and relational contracting. Yet, because of the risk constraints created by capital adequacy rules and internal credit limits, holding these assets on its own balance sheet prevents a bank from managing other, potentially more profitable risks.

Thus, there was an incentive on the part of banks to move these assets, and their associated risks, to markets, which, as discussed above, can act as a substitute for these risk-managing functions. The principal challenge, however, was in overcoming the information asymmetries and lack of standardization in these debt instruments.[46] The mortgage loans that made up these instruments had been extended to a variety of different parties with different credit histories and business prospects.[47] Furthermore, by virtue of relationships with the borrowers of these loans, banks had superior information regarding these credit histories and business prospects, compared to markets.[48] In order to overcome these information asymmetries, banks needed a way to assuage investors' fears regarding the risks underlying

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[42]Therefore, the relevant "security" in the securitization process is the security that is backed by the cash flow of the underlying debt instrument, not the underlying debt instrument itself. In fact, in some cases (e.g., mortgage-backed securities), the underlying debt instruments (e.g., the mortgage contract) are not technically "securities" for purposes of the federal securities laws, although some argue that they should be so construed. *See* Jonathan Macey et al., *Helping Law Catch up to Markets: Applying Broker-Dealer Law to Subprime Mortgages*, 34 J. CORP. L. 789, 806-07 (2008) (arguing that "subprime mortgages, but not prime mortgages, *are* 'notes' for securities regulation purposes" (emphasis in original)).

[43]The literature draws a distinction between CDOs, which are typically viewed as securities backed by bonds or loans but in any case non-mortgages, and other asset-backed securities, such as mortgage-backed securities ("MBS"). Yet, at the level of generality required for our purposes here, there is very little difference between a CDO and an MBS—both are bonds that are backed by the cash flows on a pool of underlying assets; mortgages in the case of the MBS and other types of bonds and loans in the case of the CDO.

[44]A credit default swap is a contract that operates like insurance that covers the risk that a borrower will default on a loan. For a general description of credit default swaps, see Frank Partnoy & David A. Skeel Jr., *The Promise and Perils of Credit Derivatives*, 75 U. CIN. L. REV. 1019, 1021 (2007) (defining a credit default swap as "a private contract in which private parties bet on a debt issuer's bankruptcy, default, or restructuring").

[45]Gary Gorton, *The Panic of 2007* 3-4 (Yale ICF Working Paper No. 08-24, 2008), *available at* http://ssrn.com/abstract=1255362.

[46]*See* JOHN C. HULL, OPTIONS, FUTURES AND OTHER DERIVATIVES 514 (6th ed. 2006).

[47]*See* HAL S. SCOTT, THE GLOBAL FINANCIAL CRISIS 2 (2009).

[48]*See* HULL, *supra* note 46, at 514.

the loans being sold. The banks sought to accomplish this goal through "pooling" and "tranching," two core features of CDO design.[49] By pooling a number of different loans together, the banks were able to minimize risk by exploiting the principles of diversification, assuming, as they did, that the loans in the pool were not highly correlated.[50] Further, by dividing the CDOs into distinct tranches, each representing a different level of risk and return, the banks provided the investor with a measure of flexibility regarding the level of risk it was obligated to assume.[51] Finally, banks prevailed upon credit rating agencies to stamp a large portion of the total value of the deal with the much-coveted triple "A" rating.[52] These security design features allowed banks to move these assets to markets. Consistent with the market migration account, as these transactions migrated to markets, they were removed from bank relationships and placed in arm's-length transactions in markets. Investors could now buy and sell these loans with the same ease with which they traded stocks.

2. Banks and Markets as Complements

Markets serve not only as substitutes, but also as complements for banks in the provision of financial products and the management of risk. When a product migrates from financial intermediaries such as banks to markets, a new market is created; for example, the CDO market described in the previous subsection. The emergence of a new market creates new innovation opportunities, as banks can then create new products tied to the new markets in what Robert Merton has referred to as a "financial-innovation spiral."[53]

As an illustration of banks and markets as complements, consider the "credit default swap," a security that formed one of the fault lines

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[49]For an excellent description of the structure of CDOs, see Gorton, *supra* note 45, at 34-38.

[50]Of course, the financial crisis called into question this assumption, at least as it applied to CDOs backed by sub-prime mortgages.

[51]For example, a financial sponsor might purchase one hundred mortgages, each of which generates cash flows from the homeowner's mortgage payments but also is accompanied by the risk that the homeowner defaults on his payment obligations. The financial sponsor pools these mortgages together and then sells securities backed by the mortgage pool in three different tranches, each of which represents a different level of risk and return with respect to the cash flows from the pool. If an investor purchases the "junior" tranche, which is the tranche with the highest risk and return, then losses arising from defaults on any of the mortgages in the pool would be charged against those junior-level securities first. If losses were so high that they were not covered by the junior securities, then the CDO investor who purchased the middle, or "mezzanine" level, tranche would be forced to suffer the additional losses.

[52]*See* TETT, *supra* note 20, at 55.

[53]*See* Merton, *supra* note 21, at 26.

underlying the financial crisis. A credit default swap is a contract that operates like insurance that covers the risk that a borrower will default on a loan.[54] A purchaser of credit protection under a credit default swap, a bank, for example, might be concerned about the credit risk posed by one of its borrowers. Or, more realistically, perhaps the bank is comfortable, by virtue of its diversification practices, managing the risk that market interest rates will increase (referred to as "market risk") and that, consequently, the value of its loan will decrease.[55] While the bank might wish to retain its exposure to market risk, it may not be comfortable managing the risk that its borrower will default on the loan (referred to as "credit risk"). To protect itself against the credit risk posed by its relationship with the borrower, the bank might purchase protection from a third-party, an insurance company, for example, under a credit default swap contract. Like the purchaser of auto or homeowner's insurance, the bank must make periodic payments to the third-party insurance company, and the insurance company, in return, promises to make the bank whole in the event that the bank's borrower defaults on its obligation to repay the bank.[56]

The emergence of new markets in CDOs was accompanied by the emergence of new types of credit default swaps that insured against default risk in the new CDO markets.[57] These credit default swaps were highly customized products, embedded in relationships with banks and insurance companies, firmly planted on the "bank" side of the market migration spectrum. There were a number of reasons for buying these new derivatives that protected against the risks inherent in the new CDO markets. Banks that packaged asset-backed securities such as CDOs had to hold these securities before they were ready to market to the public in a process known as "warehousing."[58]

Even if the banks ultimately had no intention of retaining any of

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[54]Although for convenience and ease of explication it might be sensible to analogize credit default swaps to insurance contracts, this does not necessarily imply that they should be regulated like insurance contracts. *See, e.g.*, M. Todd Henderson, *Credit Derivatives Are Not "Insurance,"* 16 CONN. INS. L.J. 1, 7-9 (2009). For a general description of credit default swaps, see Partnoy & Skeel, *supra* note 44, at 1021-22.

[55]Bond prices move in the opposite direction as that of interest rates. *See* HULL, *supra* note 46, at 80-82.

[56]*See* Jan Job de Vries Robbé, *Synthetic Securitization*, *in* STRUCTURED FINANCE: A GUIDE TO THE PRINCIPLES OF ASSET SECURITIZATION 10-1, 10-3 (Steven L. Schwarcz ed., 3rd ed. 2007).

[57]*See* SCOTT, *supra* note 47, at 20-21.

[58]Kenneth W. Dam, *The Subprime Crisis and Financial Regulation: International and Comparative Perspectives*, 10 CHI. J. INT'L L. 581, 618 n.143 (2010) (defining warehousing as "accumulating pools of mortgage loans pending securitization and holding the resulting securities in inventory pending their sale").

these asset-backed securities themselves, they were exposed to risks during this warehousing process and would accordingly purchase credit default swaps to hedge these risks.[59] In addition to hedging risks in the new CDO markets, CDSs were also used to exploit price differences between CDSs and the CDO tranches they were insuring against. In a so-called negative basis trade, investors would purchase a CDO tranche while simultaneously purchasing a credit default swap that protected against the default risk on that particular tranche.[60] If the cost of protection was less than the expected payout on the CDO tranche, this trade was akin to purchasing the CDO and then immediately selling it for a profit.[61] These new credit derivatives products, which protected against the default risk attributable to CDOs, would never have existed but for the creation of these new CDO markets as a result of the market migration process.

The preceding thumbnail sketch of the financial innovation process owes a significant amount to Ronald Coase's important insight in *The Nature of the Firm*, which states that firms and markets are substitutes for coordinating economic production.[62] In that seminal article, Coase was interested in explaining what drives an entrepreneur's decision to purchase the tangible and intangible inputs necessary to transform raw materials into goods and services.[63] Does the entrepreneur purchase these inputs through arm's-length contracts in markets or does she source them internally in a firm? Coase's hypothesis, of course, was that in the absence of transaction costs, economic production would be coordinated entirely through markets, as firms entail higher production costs by virtue of the fact that transactions carried out within the firm are shielded from the market's price mechanism.[64] Similarly, the provision of financial products and the management of the attendant risks could be provided through flexible relationships with

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[59] *See* TETT, *supra* note 20, at 124.

> [J.P. Morgan] turned to the derivatives market to reduce its risk, by purchasing credit default swaps from other parties, which promised to redeem any default losses on the mortgage bonds it would begin selling. Such mortgage derivatives had barely existed a few years earlier, but they were among the products that had become so hot in the last years. Increasingly, banks were using them as insurance against losses from their mortgage-repackaging business.

Id.

[60] Gorton, *supra* note 45, at 39.

[61] *See id.*, at 38 (discussing this type of trade).

[62] Ronald H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937).

[63] *Id.* at 389-90.

[64] *Id.* at 390-92.

financial intermediaries or arm's-length transactions in markets. As is generally recognized, Coase's distinction between firms (hierarchies) and markets is best understood as two end-points on a spectrum, with considerable space in between.[65] The same is true of the distinction between financial intermediaries and markets drawn here. Importantly, there are different categories of institutions within the term "markets." In a broad sense, the term "markets," as referenced here, is simply used to draw a broad distinction between two types of financial products. When products are provided by a financial intermediary, they tend to be relatively customized to the needs of the client and embedded in a relationship with the intermediary.[66] When products are provided by "markets," by contrast, they are more like commodities—they are subject to less flexible, more uniform contracts—enabling the product to be traded in large volume in the same way that investors trade stock.[67] The term "markets" can also refer to specific types of market institutions, such as exchanges[68] and centralized clearing parties ("CCPs").[69] As discussed in greater detail in Part II, it is not necessarily the case that products that migrate to "markets," broadly defined, will inevitably trade on exchanges or through CCPs. The figure below captures the concepts developed in this subpart.

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[65]*See, e.g.*, Joanne E. Oxley & Brian S. Silverman, *Inter-Firm Alliances: A New Institutional Economics Approach*, *in* NEW INSTITUTIONAL ECONOMICS: A GUIDEBOOK 209, 209 (Eric Brousseau & Jean-Michel Glachant, eds., 2008) ("Thus, rather than a market or hierarchy dichotomy, it is more useful to think of transaction governance along a continuum, with market and hierarchy as the end points, and hybrid arrangements such as partnership and alliances making up the 'swollen middle'." (citation omitted)); George S. Geis, *The Space Between Markets and Hierarchies*, 95 VA. L. REV. 99, 107-10 (2009).

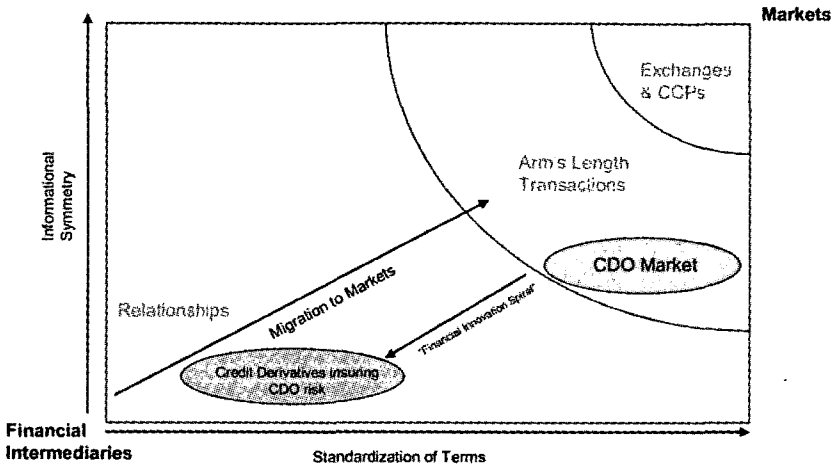
[66]Robert R. Bliss & Robert S. Steigerwald, *Derivatives Clearing and Settlement: A Comparison of Central Counterparties and Alternative Structures*, 30 ECON. PERSP. 22, 27-28 (2006).

[67]*Id.*

[68]An exchange is an organized marketplace where buyers and sellers of a good gather to transact. Perhaps the most well-known example of an exchange is a stock exchange, which supports this organizing function with other functions as well. *See generally* Andreas M. Fleckner, *Stock Exchanges at the Crossroads*, 74 FORDHAM L. REV. 2541, 2545 (2006) ("[Stock exchanges] bring together sellers and buyers, investors and issuers, and, through information distribution, informed and uninformed market participants.").

[69]CCPs are discussed in greater detail in Part III. A CCP is an institution that is relied on by contractual parties to manage the "counterparty risk," or the risk of nonperformance, involved in a contract with a time lag between execution and performance. The CCP becomes, in effect, both the buyer and seller to a given contract. While the CCP takes over management of counterparty risk, the parties themselves still bear other risks, such as market risk. *See, e.g.*, Bliss & Steigerwald, *supra* note 66, at 22-23.

Figure 1: The Modern Financial Innovation Process



The figure above indicates that financial products migrate away from financial intermediaries (located in the lower left-hand corner of the grid) and toward markets (located in the upper right-hand corner of the grid) when they exhibit increasing informational symmetry between intermediaries and investors (as reflected by the arrow on the Y axis) and increasing standardization of terms (as reflected by the arrow on the X axis). The migration of CDOs away from banks is represented by its location closer to the "market" corner of the grid. Note that CDOs are not located all the way at the upper-right hand corner of the grid, where the terms "exchanges" and CCPs are found, because CDOs have not yet migrated to these market institutions. Finally, note that credit default swaps, particularly those that are tied to CDOs and discussed above, are still located at the lower-left hand corner of the figure, indicating that they are still in a nascent, testing stage, embedded in relationships with financial intermediaries. This diagram thus captures in broad strokes the intuitions regarding the financial innovation process as developed in this subpart. The next subpart discusses how the financial innovation process affects products, institutions, and markets. In short, the process itself may lead to increased complexity in products and institutions and create certain fragilities within the new markets created by the market migration process.

B. *The Effect of the Modern Financial Innovation Process on Instruments, Institutions and Markets*

1. Increasing Product Complexity

Central to the account of modern financial markets developed in the previous subsection is the notion that banks have an incentive to move financial products to markets. In the process of standardizing these products and resolving the information asymmetries that prevent these products from being traded at arm's length on markets, however, banks can introduce considerable complexity in the products themselves. For example, consider the structure of one of the simpler and more common types of CDOs, the rather clumsily named asset-backed security CDO ("ABS CDO"). This instrument is a CDO that is backed by the cash flows from a so-called residential mortgage-backed security ("RMBS"), which itself is a bond that is backed by the cash flows on a pool of residential mortgages.[70] Thus, the institution structuring the ABS CDO would start with a pool of RMBS tranches, perhaps "triple-A," "AA," and "A" tranches, for each RMBS, multiplied by 40 or 50 different RMBSs. Then the structuring institution would pool those tranches together to create a new security, the ABS CDO, which would consist of different tranches representing the right to receive cash payments from the underlying mortgage assets.[71] In this manner, the structuring institution would create market-ready securities consisting of complicated chains of risk that ultimately lead back to the original assets.[72] Yet these complicated chains were extraordinarily difficult to navigate. In fact, one prominent commentator has suggested that these chains were constructed in such a way that the information necessary to value the underlying assets, for example, the mortgages at the very start of the chain, simply became "lost."[73] That same commentator explained that this complexity does not only defy market participants, but economists as well, because there are no economic models to explain the combination and diffusion of information resulting from such a structured financial product.[74]

Another way of illustrating the complexity inherent in a product like the ABS CDO would be to simply consider the due diligence challenge presented by these instruments. As a starting point, an investor truly

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[70] *See* Gorton, *supra* note 45, at 34-35.

[71] *See id.* at 34-35.

[72] *See id.* at 35.

[73] *See id.* at 45 (referring to the "loss of information" as a result of the complexity of ABS CDO design).

[74] *See* Gorton, *supra* note 45, at 46-47.

interested in scrutinizing the underlying risks of the ABS CDO would need to read the prospectus on file with the Securities and Exchange Commission ("SEC") not only for the ABS CDO, but also for each of the RMBSs underlying the ABS CDO. This would be no small task since the typical ABS CDO contains a pool of on average 150 RMBSs, which implies a reading requirement of over 30,000 pages.[75] This is actually one of the simpler types of CDOs. When one takes into account the existence of more complex variations of the CDO, such as the CDO "squared," which is essentially a CDO created from pools of ABS CDOs and which would literally require due diligence in excess of one million pages, one begins to sense how quickly complexity in product design can multiply as a result of the market migration process.

2. Increasing Institutional Complexity

The modern financial innovation process leads not only to increasing complexities in the products created by institutions, but also in the institutions themselves. Because they rely on non-public, borrower-specific information to manage the risks inherent in assets located on their books, banks are thought to be particularly difficult institutions for outsiders to value.[76] The financial innovation process does not improve this opacity. To the contrary, the financial innovation process tends to increase outsiders' difficulty in measuring and modeling institutional risks by increasing the complexity of these risks.[77] This increasing institutional complexity arises by

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[75] *See* Andrew G. Haldane, Executive Dir., Fin. Stability, Bank of Eng.: Rethinking the Financial Network (April 2009), *available at* http://www.bankofengland.co.uk/publications/ speeches/ 2009/speech386.pdf. As another measure of complexity, Haldane calculates that the maximum number of mortgages underlying an ABS CDO and a CDO "squared" is 750,000 and 93,750,000, respectively. *See id.*

[76] *See, e.g.*, Raghuram G. Rajan, *Insiders and Outsiders: The Choice Between Informed and Arm's-Length Debt*, 47 J. FIN. 1367, 1392 (1992); Steven A. Sharpe, *Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships*, 45 J. FIN. 1069, 1069 (1990); *see also* Donald P. Morgan, *Rating Banks: Risk and Uncertainty in an Opaque Industry*, 92 AM. ECON. REV. 874, 874 (2002).

[77] While there is no direct evidence that financial institutions have grown increasingly complex, there is indirect evidence. For example, one study found that the incidence of disagreement among credit rating agencies regarding a bank's debt has increased markedly since the mid-1980s. *See* Morgan, *supra* note 76, at 884. For additional evidence that banks are more opaque than non-bank firms, see K. Stephen Haggard & John S. Howe, *Are Banks Opaque?* 1-2 (January 11, 2007) (unpublished comment, on file with author) (demonstrating that banks have less firm-specific information in their equity returns and that these institutions are more likely to experience significant declines in stock price). *But see* Mark J. Flannery et al., *Market Evidence on the Opaqueness of Banking Firms' Assets*, 71 J. FIN. ECON. 419, 421 (2004) (presenting evidence that analysts' forecasts of bank earnings are actually more accurate than the earnings of non-bank firms).

virtue of the bank's role as both a substitute for, and complement to, markets.

Let us consider the "banks as complements" case first. As described in the preceding subpart, banks act as complements to markets when they develop new products aimed at hedging risk in new markets created by the market migration process. These new products expose banks to the risks in these new markets, which as discussed in the next subpart, can exhibit fragilities when placed under economic stress.

The "markets as substitutes" case can similarly expose banks to increasing risks. Because capital adequacy requirements and internal credit limits constrain the amount of risk that banks can hold on their balance sheets, banks have an incentive to only manage those risks over which they have a comparative advantage. As products work their way through the financial innovation process, becoming more standardized and less affected by information asymmetries, the risks associated with those products become correspondingly less profitable for banks to manage relative to the next best alternative.[78] These rising opportunity costs compel banks to offload these risks to the market and replace them with more complex, customized risks that are not as easily handled by the market.[79] Additionally, while market migration results in the transfer of financial assets from the balance sheets of banks to markets, it does not always remove all risk from banks. There is often a slice of risk that banks retain.[80] Sometimes this slice will be the riskiest portion of the product, which the bank will retain as a signal to market participants that they should not be concerned about information asymmetries that favor the bank.[81] Other times, the bank will retain what it believes to be a less risky portion, perhaps even the least risky. Because of the product complexity concerns discussed in the preceding subpart, however, that portion will turn out to be unexpectedly, and possibly devastatingly, risky.[82] A prominent example of this latter scenario is the so-called super senior risk associated with CDO tranches.[83] This curious phenomenon, consisting of a tranche of a CDO that was even senior to the "triple A" rated tranche, was created as a way of increasing the interest rate, and therefore the demand, on the triple A-rated tranche by subordinating it to another tranche.[84] Banks retained the super senior risk on their own balance sheets, assuming that it was completely risk-free, and investors in "triple-A"

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[78]Rajan, *supra* note 13, at 326.
[79]*Id.*
[80]*Id.* at 326-27.
[81]*See id.*
[82]*See infra* notes 27-30 and accompanying text.
[83]*See* TETT, *supra* note 20, at 61.
[84]*Id.* at 61-62.

tranches received higher yield as a result of the structure. Of course, as it turned out, the super senior tranches were riskier than the banks thought, and when the default rate on the underlying mortgage assets began skyrocketing, banks were exposed to the ensuing risk.[85]

3. Increasing Market Fragility

The financial innovation process affects the structure not only of financial products and financial intermediaries, but of markets as well. The migration of products from banks to markets results in the creation of new markets that are beneficial as they serve the needs of a broader group of investors.[86] These new markets, however, are typically less robust than more traditional markets for three main reasons. First, they replace flexible, relational agreements with rigid, standardized contracts without establishing a clear blueprint for workouts in the event of unexpected economic shocks.[87] Second, they may exhibit less informational diversity than more traditional markets, particularly where the costs of obtaining less-public sources of information are high relative to the likely benefits.[88] Finally, these new markets may be particularly susceptible to herd behavior, leading to less diversity not only in investment strategies, but also in the risk assessment processes underlying those investment strategies.[89] Taken together, these market features may cause the new markets created by the financial innovation process to fracture in times of stress. The risk that these stress fractures will result in the market buckling altogether, as it did in the financial crisis of 2008, is heightened by the interconnectedness of financial intermediaries and these markets.[90] Each of these three factors is discussed at greater length below.

a. *Replacing Flexible Relationships with Rigid Contracts*

As discussed in Part II.B.2, relationship banking is defined in large part by a flexible, relational contract[91] between the bank and the client. The

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[85] *Id.* at 65.

[86] *See* Merton, *supra* note 21, at 26-27.

[87] *See id.*

[88] Rajan, *supra* note 13, at 327.

[89] *See* David S. Scharfstein & Jeremy C. Stein, *Herd Behavior and Investment*, 80 AM. ECON. REV. 465, 465-66 (1990).

[90] *See* Charles K. Whitehead, *Reframing Financial Regulation*, 90 B.U. L. REV. 1, 6-7 (2010).

[91] For a classic treatment of relational contracts, see Robert E. Scott, *Conflict and Cooperation in Long-Term Contracts*, 75 CAL. L. REV. 2005 (1987).

inherent incompleteness of these contracts provides the parties with the flexibility to modify their bargain in light of new information regarding the economy in general or the borrower in particular.[92] This flexibility is not just theoretical. A large percentage of these agreements are in fact modified, and one of the key triggers for modification is the macroeconomic condition of credit and equity markets.[93]

When, as part of the financial innovation process, transactions go from being embedded in a long-term relationship between a client and a bank to being conducted at arm's length in a market, the flexible agreements that are the hallmark of relationship-banking[94] are effectively replaced with more rigid, standardized contracts more resistant to modification in light of market fluctuations. One example of a rigid contract that underlies one of these new markets is the "Pooling and Servicing Agreement" ("PSA") at the heart of the residential mortgage-backed securities ("RMBS") market.[95] In contrast to the contracts involved in relationship banking, the structure of the PSA creates substantial barriers to modification. For example, PSAs typically require the consent of a super-majority of each affected "tranche" of holders in order to effect a modification, and the holders of any particular tranche are likely to number in the hundreds if not thousands and spread throughout the world.[96] At first blush, this consent requirement may not seem unusually burdensome. After all, super-majority vote provisions are not uncommon in other contexts where vote holders are numerous and widely dispersed.[97] In fact, under the Trust Indenture Act ("TIA"), public bond issues require unanimity among their holders in order to modify key terms.[98] The PSA's super-majority vote provision, however, must be

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[92]One way of thinking about relational contracts as applied to financial intermediaries is that relational contracting provides financial intermediaries with the flexibility to decide whether to honor or repudiate a claim (for example, a loan commitment) and therefore trade off its reputation against its financial capital. *See* Arnoud W.A. Boot et al., *Reputation and Discretion in Financial Contracting*, 83 AM. ECON. REV. 1165, 1169 (1993) (developing a model of the trade-off between reputational capital and financial capital).

[93]*See* Michael R. Roberts & Amir Sufi, *Renegotiation of Financial Contracts: Evidence from Private Credit Agreements*, 93 J. FIN. ECON. 159, 177-78 (2009).

[94]*See supra* notes 46-52 and accompanying text.

[95]*See* SCOTT, *supra* note 47, at 65-66.

[96]For a useful classification of the rigidities inherent in the PSA, see Anna Gelpern & Adam J. Levitin, *Rewriting Frankenstein Contracts: Workout Prohibitions in Residential Mortgage-Backed Securities*, 82 S. CAL. L. REV. 1075, 1087-1112 (2009).

[97]For example, under Delaware corporate law, corporations can elect to have certain issues voted on by shareholders decided by a super-majority vote. *See* Brett W. King, *The Use of Supermajority Voting Rules in Corporate America: Majority Rule, Corporate Legitimacy, and Minority Shareholder Protection*, 21 DEL. J. CORP. L. 895, 918-20 (1996).

[98]*See* Gelpern & Levitin, *supra* note 96, at 1091. Whether RMBS themselves are subject to the Trust Indenture Act is the subject of some controversy. *See id.* at 1092-93.

understood within the structural context of securitization. Unlike the case of corporate bonds, where the credible threat of bankruptcy helps overcome the coordination problems of a unanimous vote requirement, securitizations are shielded from bankruptcy.[99] The mortgage assets that underlie the RMBS are held in a special purpose vehicle that cannot file for bankruptcy and is shielded from the bankruptcy of the financial institution that packaged the securities in the first place.[100] Without the threat of bankruptcy to act as an incentive to modify the terms of a PSA, the contract's super-majority consent requirement becomes a nearly insurmountable hurdle.

Of course, the new markets are not the only ones to exhibit these types of contractual rigidities. More settled markets, such as the corporate bond market, do as well.[101] These settled markets, however, have usually had the time to develop fairly clear blueprints for conducting workouts. The public debt market in particular has a long, established history of restructurings outside of bankruptcy.[102] The new markets that result from the financial innovation process, by contrast, lack this track record. In the absence of a blueprint for conducting workouts, let alone an established track record, contractual rigidities can amplify the effects of exogenous shocks to the economy.

b. *Lack of Informational Diversity*

Markets are information exchanges.[103] They match buyers and sellers for whom there are positive gains from trade; through the prices negotiated in these transactions, the buyers and sellers convey important information regarding the value of the asset being traded. This asset-value information is aggregated across all transactions in the market and is broadcasted to other potential market participants through the price mechanism.[104] The more effectively the market absorbs and reflects all

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[99] *See* Gelpern & Levitin, *supra* note 96, at 1093-95.

[100] *Id.* at 1094-95.

[101] These contractual rigidities may occur not only in bond indentures but also in the TIA, which is the background legislation that governs public debt issues. *See, e.g.*, Mark J. Roe, *The Voting Prohibition in Bond Workouts*, 97 YALE L.J. 232, 250-51 (1987) (arguing that the TIA's prohibition on a binding vote by bondholders to change any core term of a bond issue could cause unnecessary bankruptcies during recessionary periods).

[102] *See* Jonathan Sedlak, *Sovereign Debt Restructuring: Statutory Reform or Contractual Solution?*, 152 U. PA. L. REV. 1483, 1488-89 (2004).

[103] *See* Saul Levmore, *Efficient Markets and Puzzling Intermediaries*, 70 VA. L. REV. 645, 645 (1984) (citing Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549 (1984)).

[104] *See* Gilson & Kraakman, *supra* note 23, at 643.

publicly available information, the more accurately it will predict future prices.[105] Markets are not dispassionate automatons, however. They are inherently human institutions that are subject to human incentives. For this reason, the effectiveness of a market in absorbing all publicly available information depends on the incentives of the market participants in incurring the costs necessary to gather the information and rely on it in their trading activities. Accordingly, market efficiency is a function, at least in part, of the costs of processing and evaluating information in the market.[106] As we saw in Part II.B.1, however, information costs in the new markets can be extremely high as a result of financial product complexity.[107] The publicly available information on a single ABS CDO is measured in the tens of thousands of pages, whereas more exotic CDO spinoffs number in the millions.[108] One commentator described the task of sifting through this informational morass "to some extent akin to the difficulty that would be posed by searching the Internet without a search engine."[109] Thus, while this information is publicly available as a technical matter,[110] the costs of processing and evaluating it are substantial, if not prohibitive. Therefore, even professional traders are unlikely to undertake the Herculean task necessary to ensure that this information is incorporated into market prices.

In the absence of such professionally-informed trading, the new markets must rely, for their efficiency, primarily upon what Professors Gilson and Kraakman refer to as "universally informed trading,"[111] or trading on information that all market actors know, which in the new markets largely consists of informational heuristics, such as credit ratings. Certainly, it is now widely known that credit ratings themselves can exhibit fundamental

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[105]The definition used here assumes that efficient markets absorb only "publicly available information" and therefore it is a version of the "semi-strong" form of market efficiency. This can be contrasted with the "strong" form of market efficiency, which assumes that in order to be efficient, a market must absorb all information, including non-public information held by insiders, and the "weak" form of market efficiency, which assumes that in order to be efficient, a market must only absorb historical information. I adopt the weak-form of market efficiency here, because it is the most common in the literature and has the most empirical support.

[106]Although overly simplified, this was one of the central points of the most famous and influential article (at least in the legal literature) on market efficiency, *The Mechanisms of Market Efficiency* by Professors Gilson and Kraakman. *See* Gilson & Kraakman, *supra* note 23.

[107]*See supra* notes 70-74 and accompanying text.

[108]Steven L. Schwarcz, *Regulating Complexity in Financial Markets*, 87 WASH. U. L.R. 211, 221-22 (2009).

[109]*Id.*

[110]*Id.* ("Prior to the subprime crisis, for example, except for anticipating quite how profoundly home prices would drop, virtually all of the risks giving rise to the collapse of the market for securities backed by subprime mortgages appear to have been disclosed.").

[111]*See* Gilson & Kraakman, *supra* note 23, at 569-72.

flaws as a result of conflicts of interest in the credit ratings market,[112] or by virtue of the structure of the market itself.[113] Various reforms for correcting these problems have been proposed.[114] Yet, the important point here is that even with reliable informational heuristics, such as conflict-free credit ratings, the new markets may exhibit limited informational diversity and consequently low relative efficiency.

The limited informational diversity of the new markets may in and of itself lead to a relatively inefficient market as important bits of publicly available information fail to be incorporated into market prices. But in the new markets, limited informational diversity can cause deviations from fundamental value through another channel as well: by exacerbating the tendency of professional traders to travel in herds. While herd models are not particularly new,[115] they are becoming increasingly accepted among financial economists and legal academics.[116]

c. *Susceptibility to herd behavior*

The idea behind herd models is deceivingly simple: "brains and resources are separated by an agency relationship."[117] Most professional traders, such as hedge fund managers, must rely on outside capital to fund their arbitrage activities. While the investor must select a fund to invest with

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[112]*See* Claire A. Hill, *Regulating the Rating Agencies*, 82 WASH. U. L.Q. 43, 45-46 (2004).

[113]Partnoy, *supra* note 40, at 622-23.

[114]*See, e.g.*, Press Release, U.S. Securities and Exchange Commission, SEC Votes on Measures to Further Strengthen Oversight of Credit Rating Agencies (Sept. 17, 2009), *available at* http://www.sec.gov/news/press/2009/2009-200.htm.

[115]For example, Keynes's famous quote about how "[w]orldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally." JOHN MAYNARD KEYNES, THE GENERAL THEORY OF EMPLOYMENT INTEREST AND MONEY 158 (Harcourt, Brace and Company) (1936). *See* Scharfstein & Stein, *supra* note 89 (describing more recent examples of herd models); *see also* Andrei Shleifer & Robert W. Vishny, *The Limits of Arbitrage*, 52 J. FIN. 35 (1997).

[116]*See* Ronald J. Gilson & Reinier Kraakman, *The Mechanisms of Market Efficiency Twenty Years Later: The Hindsight Bias*, 28 J. CORP. L. 715, 734 (2003) (expressing sympathy for models of herd behavior); Rajan, *supra* note 13, at 338 (acknowledging the increased acceptance of herding among fund managers). While some might have the inclination to group herd models with behavioral finance in general, this would be a mistake. While behavioral finance tends to consider the cognitive biases that undermine the rationality of market actors, herd models instead focus on the agency and incentive problems that result from the separation of capital from control among professional traders. For this reason, many who are left unpersuaded by behavioral finance's focus on cognitive biases nevertheless are sympathetic to herd models. *See* Gilson & Kraakman, *supra*, at 734-35 (discounting the value of behavioral finance but expressing sympathy for agency-cost and incentive analyses of the structure of professional trading markets).

[117]ANDREI SHLEIFER, INEFFICIENT MARKETS 89 (2000).

ex ante, the same investor can re-assess ex post in light of the arbitrageur's performance, which is typically measured against some benchmark, such as the S&P 500 or the performance of other funds. The problem is that poor performance can be the result of either bad judgment or bad luck, and the investor cannot distinguish very well between the two. Regardless of the explanation behind the outcome, if the fund underperforms with respect to the relevant benchmark—be it an index like the S&P 500 or peer funds—the investor withdraws his investment and re-deploys it with another fund.[118] Consequently, the arbitrageur tends to adopt strategies that do not deviate much from the relevant benchmark, which, when multiplied across all funds, leads to increasingly imitative and homogeneous arbitrage strategies. Perhaps most importantly for an analysis of the new markets, the greater the deviation of the asset's market price from its fundamental value, the greater the risk the arbitrageur's trade will underperform as a result of bad luck.[119] Consequently, herd behavior tends to be particularly acute in markets, like the new markets, that are prone to deviations from fundamental value.

To summarize, when markets are inefficient, exogenous shocks, like a marked increase in foreclosures, that affect these markets cause the markets to experience dramatic fluctuations in value. The new markets are susceptible to these sorts of fluctuations, which can cause stress fractures in these markets as they undergo dramatic realignment. Combined with the brittleness of the new markets—they are propped up by rigid, standardized contracts that resist modification and lack a plan for workouts, like more settled markets—these stress fractures can cause a market to buckle. In short, liquidity freezes up. These effects are amplified by the financial innovation process, which increases the interconnectedness between these new markets, more settled markets and financial intermediaries.

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[118]This discussion tends to follow the model presented in Shleifer & Vishny, *supra* note 115, at 35-36.

[119]To be sure, there will be some intrepid souls who are willing to run this risk. Alternatively, their fund's structure allows them to wait out a trade for a substantial amount of time before an investor has the right to withdraw funds. A few investors, however, will not necessarily be enough to correct substantial fundamental inefficiencies. For examples of the activities of such contrarian traders in the most recent financial crisis, see MICHAEL LEWIS, THE BIG SHORT: INSIDE THE DOOMSDAY MACHINE (2010); GREGORY ZUCKERMAN, THE GREATEST TRADE EVER: THE BEHIND-THE-SCENES STORY OF HOW JOHN PAULSON DEFIED WALL STREET AND MADE FINANCIAL HISTORY (2009).

C. *The Framework Under Stress: Application to the Global Instruments, Institutions and Markets*

This article has thus far developed a framework for understanding modern financial markets through an account of the effect that the "financial innovation process" has on products, institutions, and markets. New financial products revolutionize the ability to transfer risk and promote increasing efficiency through market completeness, but in addition to transferring risk, they also transfer uncertainty that many end-users have difficulty in managing. Further, they create new information problems as a result of the complexity of product design and opaque market structures. For their part, financial institutions that develop new financial products are increasingly innovative, but also increasingly complex in the face of growing competition with markets over risk management. Markets themselves exhibit increased breadth with the emergence of new markets, but potentially also increased fragility as the new markets are both (i) relatively inefficient and therefore subject to severe realignments in the wake of exogenous shocks, and (ii) untested in dealing with the stress that results from such shocks.

Before exploring the regulatory implications of this framework, first, we need to informally test its explanatory power by evaluating how well it explains the global financial crisis of 2007-2008. The crisis is an extraordinarily complicated phenomenon that is destined to keep economists and legal scholars occupied for years, and any diagnostic attempts at this early date are certain to be preliminary and incomplete.[120] What follows cannot hope to be (and in fact is nothing) more than an informal sketch of the crisis. Its limited purpose is to highlight how the framework developed in Part II can be used to understand how a relatively modest shock[121] in one corner of the financial world mushroomed into a full-blown systemic event.

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[120]Of course, this has not stopped commentators from opining. For example, one catalogue of proposed causes of the crisis includes everything from regulatory failure, monetary policy, budget deficits and banking deregulation to "collective madness." *See* Richard A. Posner, *The President's Blueprint for Reforming Financial Regulation: A Critique: Part I*, FinReg21, ¶4, July 20, 2009, http://www.finreg21.com/lombard-street/the-president%E2%80%99s-blueprint-reforming-financial-regulation-a-critique-part-i.

[121]Subprime mortgage originations in 2005 and 2006 totaled about $1.2 trillion, which, although certainly a large number, is not alone large enough to cause a systemic crisis. Gary B. Gorton, *Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007*, at 32 (Yale Sch. of Mgmt., Working Paper No. 1401882, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1401882.

The financial crisis began in August 2007[122] with the bursting of the housing bubble. After years of continuous gains, home prices first leveled and then began to fall.[123] Waves of cascading defaults on subprime mortgages, whose very existence depended on rising home prices, then followed, which began to affect the actual and perceived value of subprime-mortgage-backed securities, such as CDOs and RMBs.[124] These new markets, plagued by inefficiencies resulting from a lack of informational diversity exacerbated by herd behavior, plummeted in value.[125]

The new markets were interconnected with financial institutions and other more settled markets. First, they were interconnected with financial institutions. Although as part of the financial innovation process, these institutions had transferred the assets underlying CDOs and RMBs from their balance sheets to the market, they had retained exposure to these assets through new, customized products such as credit derivatives and the residual risk of the asset-backed securities themselves.[126] As the value of the subprime-mortgage-backed securities plummeted in value, banks and other financial institutions were required to make substantial write-downs of assets on their balance sheets.[127] These actions had feedback effects at certain firms, such as Bear Stearns, where the firm's counterparties in OTC derivatives contracts withdrew the cash collateral they had posted pursuant to the agreement, reducing the firm's liquidity and accelerating its failure.[128] At firms that dealt in credit derivatives, such as American International Group Financial Products ("AIGFP"), the unexpected increase in the likelihood of having to make its counterparties whole triggered obligations on the part of AIGFP's parent and guarantor, American International Group ("AIG"), to post billions of dollars in collateral that it did not have.[129]

Perhaps even more significantly, the new markets were interconnected with other more settled markets because banks relied on

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[122]Of course, some might argue that the true origins of the financial crisis reach further back to the beginning of the era of easy credit for homeowners.

[123]*See* SCOTT, *supra* note 47, at 2-3 (noting that between 2006 and 2007 housing prices fell twenty seven percent).

[124]*Id.* at 3.

[125]A striking piece of evidence of the fall in value of these securities is a line graph developed by Gary Gorton depicting the decrease in the amount that lenders were willing to lend in the repo market on collateral consisting of subprime-mortgage backed securities. *See* Gorton, *supra* note 45, at 29.

[126]*See* Rajan, *supra* note 13, at 326-27.

[127]*See, e.g.*, Paul Mizen, *The Credit Crunch of 2007-2008: A Discussion of the Background, Market Reactions, and Policy Responses*, 90 FED. RES. BANK OF ST. LOUIS REV. 531, 542 (2008) (noting that Merrill Lynch and Citigroup alone wrote down $82.9 billion in losses).

[128]*See infra* Part III.A.

[129]*See infra* Part III.A.

asset-backed securities in the "sale and repossession" ("repo") market as collateral for short-term loans that were necessary for the banks' solvency.[130] In the repo market, large institutional investors deposit significant amounts of cash with banks, which insure the cash with collateral.[131] This collateral often took the form of senior tranches of subprime-mortgage-backed securities.[132] Although obscure, the repo market couldn't be more significant. At roughly $8 trillion to $10 trillion in value,[133] its size alone demands attention. And for banks, it provides a crucial source of short-term financing.

Yet, as the value of mortgage-backed securities declined, the lenders in the repo market decreased the amount of cash they were willing to lend the banks for a given amount of collateral.[134] Because the banks were not able to borrow as much off the same pool of collateral, they were required to finance their balance sheets in some other way. As demonstrated in Part II.B.2, the financial innovation process increases the institutional complexity of banks, and in the financial crisis, this increased institutional complexity made it nearly impossible for potential bank investors to determine which banks were more exposed to subprime risk than others, which created a lemons market[135] with virtually no investors willing to lend to the banks.[136] With no short-term financing alternative to the repo market, the banks faced potential (or actual) insolvency. The failure or threat of failure of these large institutions prompted unprecedented federal intervention.[137]

Although brief and overly simplified, this informal sketch of the financial crisis illustrates how the framework developed in Part II, which

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[130] *See* Bryan J. Orticelli, *Crisis Compounded by Constraint: How Regulatory Inadequacies Impaired the Fed's Bailout of Bear Stearns*, 42 CONN. L. REV. 647, 656 (2009) (detailing the prevalence of repo market trading prior to the collapse of Bear Stearns).

[131] *See id.* ("Repos are secured by collateral (including [mortgage backed securities]) that the borrowing institution promises to buy back at a specified date and at a specified price.").

[132] *Id.*

[133] *See* Michael J. Fleming et al., *Repo Market Effects of the Term Securities Lending Facility* 7 (Fed. Res. Bank of N.Y. Staff Rep. No. 426, 2010) (noting that "primary dealers reported financing $4.5 trillion in fixed income securities with repos as of March 4, 2008"), *available at* http://www.ny.frb.org/research/staff_reports/sr426.pdf; Gary Gorton & Andrew Metrick, *Securitized Banking and the Run on Repo* 12 (Yale ICF Working Paper No. 09-14) (pegging $10 trillion as the upper bound of the repo market's size prior to the crisis).

[134] *See* Fleming et al., *supra* note 133, at 7 (explaining the negative relationship between the riskiness of collateral and the amount of money lent).

[135] *See* George A. Akerlof, *The Market for "Lemons": Qualitative, Uncertainty and the Market Mechanism*, 84 Q. J. ECON. 488, 489-90 (1970) (introducing the lemon analogy in the context of car sales).

[136] *See supra* Part II.B.2.

[137] *See* SCOTT, *supra* note 47, at 1 (explaining the Federal Reserve's response to the financial crisis in 2007 and 2008).

focuses on the effects of the financial innovation process on products, institutions, and markets, played a significant role in the dénouement of the global financial crisis.

While these elements of modern financial markets give rise to problems that will certainly have to be addressed through regulation, they also complicate the economics of financial regulation by creating significant informational barriers for regulators. In this way, the financial innovation process has effectively "re-wired" the regulatory switch. Part III explores this claim through the lens of one current policy proposal: the regulation of the financial innovation process through the mandatory CCP clearing of OTC derivatives. The following analysis demonstrates how the framework developed in Part II calls into question certain fundamental assumptions regarding the benefits of subjecting OTC derivatives to a mandatory CCP clearing structure. Part IV then explores policy implications that emerge from this analysis.

III. REGULATING THE FINANCIAL INNOVATION PROCESS: THE CASE OF MANDATORY CCP CLEARING FOR OTC DERIVATIVES

Part II developed an account of the financial innovation process and the effect that this process has on instruments, institutions, and markets. It traced a market migration pattern that begins with the creation of a new financial product by a financial intermediary and ends when banks find it more profitable for the product to be provided for by markets, commoditize the product and then remove it from both the relationships in which it is embedded as well as its balance sheet, and let the markets take over. This part analyzes how the framework developed in Part II sheds light on the regulation of the OTC derivatives market.

A derivative is a type of financial contract that *derives* its value from some other asset, financial indicator, event, or condition.[138] This so-called "underlying" includes plain-vanilla equity and debt, exchange rates, and commodities, but also more exotic things like hurricanes and other natural disasters.[139] While some derivatives trade on exchanges, where investors can buy and sell them without worrying about who is on the other side of the transaction, many derivatives are traded without the use of exchanges in what is known as the OTC market.[140] Unlike their exchange-traded cousins,

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[138] HULL, *supra* note 46, at 1.

[139] *Id.*

[140] *See* Carola von Schenk, *An Overview of the Evolution of the Over-the-Counter Derivatives Market*, *in* MODERN RISK MANAGEMENT: A HISTORY 11 (2003).

OTC derivatives are individually negotiated among financial institutions and between financial institutions and their sophisticated clients.[141] These financial institutions are referred to as "dealers" in such derivatives, and the major derivatives dealers tend to be banks located in large financial centers.[142] The size of the OTC derivatives market is significant and growing. Notional amounts[143] of all categories of OTC contracts at the end of December 2007 reached almost $600 trillion.[144]

Derivatives are used for a number of different functions, not the least of which is to hedge the risk of a particular asset. Derivatives, however, contain risks themselves largely because there is typically a significant time lag between the execution of a derivatives contract and the ultimate performance of the contract, which typically entails a cash payment by one of the parties.[145] During this time, the value of the derivative will fluctuate with the value of the "underlying," which is referred to as "market risk."[146] Additionally, because a derivatives contract is "executory," and because at the outset of the contract the parties do not know which of them will have a payment obligation at the time of performance or in what amount, derivatives contracts also contain "counterparty risk," the risk that the party will not perform under the contract.[147] Many consider that poor management of the counterparty risk associated with OTC derivatives contracts was a substantial contributing factor to the financial crisis.[148] One

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[141] *Id.* at 12.

[142] The major derivatives dealers include Bank of America, Barclays Capital, BNP Paribas, Citigroup, Credit Suisse, Deutsche Bank, Dresdner Kleinwort, Goldman, Sachs & Co., HSBC Group, JPMorgan Chase, Morgan Stanley, The Royal Bank of Scotland Group, Société Générale, UBS AG and Wachovia Bank N.A. (Wells Fargo). *See* Darrell Duffie, *How Should We Regulate Derivatives Markets?* 2 (Aug. 25, 2009) (Pew Financial Reform Project Briefing Paper #5), *available at* http://www.pewfr.org/project_reports_detail?id=0017.

[143] "The 'notional amount' of a derivatives contract is the market value (or, in the case of fixed-income markets, the principal amount) of the asset whose risk is transferred by the derivative. For example, an option to buy 1 million shares of an equity whose price is $50 per share represents a notional derivatives position of $50 million dollars." *Id.* at 2.

[144] Miguel A. Segoviano & Manmohan Singh, *Counterparty Risk in the Over-the-Counter Derivatives Market* 3 (IMF Working Paper No. WP/08/258, 2008), *available at* www.imf.org/external/pubs/ft/wp/2008/wp08258.pdf.

[145] *See, e.g.*, Viral Acharya & Alberto Bisin, Centralized Versus Over-The-Counter Markets 4 (May 5, 2009) (unpublished manuscript), *available at* http://papers.ssrn.com/sol3/papers.cfm? abstract_id=1573355.

[146] *See* Barbara Kavanagh, *A Retrospective Look at Market Risk*, *in* MODERN RISK MANAGEMENT: A HISTORY 252 (2003).

[147] Acharya & Bisin, *supra* note 145, at 3-5.

[148] *See, e.g.*, Acharya & Bisin; *supra* note 145, at 4; Darrell Duffie et al., *supra* note 18, at 1; Quinn, *supra* note 18, at 609 (concluding that "[o]n balance, a mandatory clearinghouse for derivatives trades . . . would be socially desirable and would reduce many of the negative social