Credit Derivatives, Leverage, and Financial Regulation's Missing Macroeconomic Dimension

Erik F. Gerding
University of Colorado Law School
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Erik F. Gerding¹

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I. INTRODUCTION

Both policymakers and scholars have placed considerable blame for the Panic of 2008—the global financial crisis that reached full strength in that year—on over-the-counter ("OTC") derivatives. In turn, legislative and policy responses to the crisis, such as the Dodd-Frank Act, have introduced a host of new restrictions on these particular financial instruments. Among other things, the Dodd-Frank Act prohibits future federal government bailouts of certain entities that trade in derivatives. It requires the central clearing of many derivatives. The statute also authorizes federal regulators to set new collateral requirements for those derivatives exempted from the statute’s central clearing requirements.

Yet an analysis of both the role of derivatives in the financial crisis and the new rules on derivatives must avoid painting with too broad a brush. Several misconceptions threaten to confuse both the most serious risks posed by derivatives and the regulatory response. This Article argues that a certain species of derivatives—credit derivatives—pose particular concerns because of their ability to generate leverage that can increase liquidity—or the effective money supply—throughout the financial system. Credit derivatives are a form of derivative whose value is based on the credit risk of another firm or financial instrument. As explained below, a credit derivative involves one

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2. See, e.g., Karl S. Okamoto, After the Bailout: Regulating Systemic Moral Hazard, 57 UCLA L. REV. 183, 196-203 (2009) (blaming failure of Bear Steams, Lehman Brothers and AIG on credit default swaps); Kristin N. Johnson, Things Fall Apart: Regulating the Credit Default Swap Commons, 82 U. COLO. L. REV. 167, 205-15 (2011) (outlining systemic risk and other dangers of credit derivatives and describing role these derivatives played in the financial crisis). For a contrary view that credit derivatives did not play a significant role in the crisis, see Renee M. Stulz, Credit Default Swaps and the Credit Crisis, 24 J. ECON. PERSP. 73 (2010).


4. Dodd-Frank Act § 716.

5. Id. § 723(a)(3). See infra Part IV.b (explaining the mechanics and rationale of central clearing of derivatives).

6. Id. § 723(a)(2) adding 7 U.S.C. 2(h)(4)(B)(ii). See infra Part IV.a (discussing the explicit function and the unexplored potential macroeconomic effects of this new authority).

7. See infra Part I (explaining how credit derivatives generate leverage).

8. Credit risk represents the risk to a firm that a borrower or other obligor will default on payment of obligations to it. Credit risk includes "counterparty risk" in derivative transactions, which means the risk to a firm that its counterparty in a derivative contract will default on its contractual obligations to make future payments to the firm. Joel Bessis, Risk Management in Banking 12-13 (2d ed. 2002). Bessis notes that credit risk also covers the risk of losses to a firm from a decline in the credit quality of either obligors who owe money to the firm or assets owned by the firm. Bessis provides the example of a decline in the credit rating of a bond held by a firm which "triggers an upward move of the required market yield to compensate for" the higher risk and triggers a value decline of that security.

party (the credit protection seller) agreeing to make payments to another party (the credit protection buyer) should a "credit event" occur. The seller receives a premium from the buyer in exchange for taking this risk. The seller can become leveraged with a credit derivative by, among other ways, not committing all of the funds up front to cover its future obligations.

Mainstream analysis of the risks of leverage with credit derivatives has thus far focused on microeconomics. Many commentators have described how increased leverage, whether arising out of credit derivatives or otherwise, magnifies the fragility of financial institutions. To be sure, excessively leveraged financial institutions represent an important concern. By linking one financial institution to another, credit derivatives can increase counterparty risk, or the risk of one party to a financial transaction defaulting on its obligations. The web created by financial institutions entering into complex credit derivatives with one another in series raises the specter of leveraged institutions falling like dominos. In fact, system risk can manifest as a chain reaction of failing financial institutions. During the 2008 financial crisis, it was this fear of failing dominos that supposedly animated the extraordinary federal bailout of the insurance giant AIG. AIG had underwritten hundreds of billions of dollars in credit derivatives that provided guarantees to other large financial institutions. The looming failure of AIG left a myriad of other financial institutions with enormous exposure.

Yet the analysis described above presents but one side of the coin of the consequences of credit derivatives and their ability to create leverage. The
cocktail of credit derivatives and leverage also can have significant macroeconomic effects. By allowing financial institutions—those institutions that borrow to lend—to increase leverage, credit derivatives can operate to increase the overall amount of liquidity in financial markets. This increase in liquidity can be thought of as increasing the effective supply of money in the market, which can have a number of significant economic consequences. By increasing leverage and liquidity, credit derivatives can fuel rises in asset prices and even asset price bubbles. Rising asset prices can then mask mistakes in the pricing of credit derivatives and in assessments of the risk of overall leverage in the financial system. Furthermore, the use of credit derivatives by financial institutions can contribute to a cycle of leveraging and deleveraging in the economy.

This Article aims to move beyond the dominant analysis of the risks of credit derivatives (in terms of counterparty risk and the domino-like failing of financial institutions) to explore their potential macroeconomic effects. In so doing, this Article also argues for viewing many of the policy responses to credit derivatives, such as requirements that these derivatives be exchange traded, centrally cleared, or otherwise subject to collateral or “margin” requirements, in a second, macroeconomic dimension. These rules would affect not only counterparty risk and the safety and soundness of financial institutions, but would also have less visible, yet still significant macroeconomic effects. These rules have the potential to change the amount of liquidity and the supply of credit in financial markets and in the “real” economy. Moreover, what is true for credit derivatives applies equally to other financial instruments and regulations that can alter the leverage of financial institutions, ranging from regulatory capital rules for banks to requirements that lenders retain part of the loans they securitize. By examining credit derivatives, this Article illustrates the need to see a wide array of financial regulations in a macroeconomic

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18 See infra Part III.a. In the legal literature, Margaret Blair was one of the first to examine how increases in leverage can enlarge the effective money supply. Margaret M. Blair, Financial Innovation, Leverage, Bubbles, and the Distribution of Income, 30 REV. BANKING & FIN. L. 225, 229-32 (2010).

19 This Article uses “liquidity” in the sense of the total money supply, that is those financial instruments that have the characteristics of “money.” The three canonical characteristics or functions of money are serving as a medium of exchange, a unit of account, and a store of value. N. GREGORY MANKIW, MACROECONOMICS 75-77 (5th ed. 2003). This Article’s use of liquidity differs from, but is related to, other traditional definitions of liquidity, such as liquidity in terms of how quickly assets can be converted into cash. E.g., LOREN A. NIKOLAI ET AL., INTERMEDIATE ACCOUNTING 601 (11th ed. 2010) (providing text book accounting definition of liquidity). Cash has all the functions of money, but so do other financial instruments (which may, nonetheless, be less liquid in the accounting sense). The fact that financial instruments may have characteristics of money to a greater or lesser degree ties into the fact that economists and central banks have developed measures (from narrow to broad) of the money supply. See MANKIW, supra this note, at 80-81. Several problems with measuring “liquidity” or the supply of money in an economy too narrowly are discussed below. See infra notes 118-120 and accompanying text.

20 See infra Part III.c. See also Blair, supra note 18, at 268-69.

21 See infra Part III.d.

22 See infra Part III.e.
Understanding credit derivatives' macroeconomic effects also has implications for regulatory design. First, regulations that address financial institution leverage offer central bankers new tools to dampen inflation in asset markets and to fight potential asset price bubbles. Second, even if these regulations are not used primarily as monetary or macroeconomic levers, changes in these regulations, including changes in the effectiveness of these regulations due to regulatory arbitrage, can have profound macroeconomic effects. Third, the macroeconomic dimension of credit derivative regulation and other financial regulation argues for greater coordination between prudential regulation and macroeconomic policy.

In providing concrete examples of how prudential regulation can affect the macroeconomy, this Article aligns with the burgeoning literature on "macroprudential regulation." Recent macroprudential literature examines how traditional prudential regulation, which focuses on the safety and soundness of individual financial institutions, may not adequately address (and may even exacerbate) threats to the stability of financial markets as a whole. This Article draws a different and perhaps more direct link between financial regulation and the macroeconomy than does much of the macroprudential literature: instead of focusing on mass failure of financial institutions, this Article focuses on a monetary dimension. It argues that financial regulation can impact overall economic liquidity—in other words, the effective money supply. The link between regulation and liquidity has been scantily explored in legal literature. In that literature, law professor and economist Margaret Blair has been one of the first and few to explore how the leverage of financial institutions can increase the effective supply of money. This Article builds upon her insights and argues that effective...

23. See infra Part IV.c.
24. See infra Part IV.d.
25. See infra Part IV.e.
26. See infra Part IV.a.
28. Id.
29. See Blair, supra note 18. Professor Blair draws on some of the same literature as this article does to argue that U.S. financial firms have exploited deregulation and financial innovation to become too large and too leveraged. She argues that overly large and leveraged firms have spawned asset price bubbles and provided managers at those firms with excessive compensation. Professor Blair and the author together briefly looked at the potential of credit derivatives to create leverage in a short, earlier work. Margaret M. Blair & Erik F. Gerding, Sometimes Too Great a Notional: Measuring the "Systemic
coordination of macroeconomic policy and financial regulation requires further integration of the study of financial regulation and macroeconomics, as well as inclusion of macroeconomics in the legal academy. Before the crisis, macroeconomics was a rare subject in legal literature.30 Immediately before and

30 The study of law and economics tended to ignore macroeconomics before the global financial crisis, with a few notable exceptions in legal scholarship. A handful of legal scholars have previously called for a greater examination of the macroeconomic effects of securities laws and other financial regulation. The focus of the academic work described below differs from the focus of this Article on leverage, liquidity, and monetary policy.

Professor Steven Ramirez has argued that financial regulation plays a vital role in macroeconomic stability by promoting investor confidence. Steven A. Ramirez, Fear and Social Capitalism: the Law and Macroeconomics of Investor Confidence, 42 WASHBURN L.J. 31 (2002). He has also examined how the New Deal introduced various legal institutions that were designed to bolster, directly or indirectly, national economic output and other macroeconomic goals. Steven A. Ramirez, The Law and Macroeconomics of the New Deal at 70, 62 MD. L. REV. 515 (2003).

A number of other legal scholars have shared Professor Ramirez’s vision of a macroeconomic approach to law as an antidote to the perceived orthodoxy of microeconomic approaches to law. These scholars often write in a more philosophical and idealistic vein, finding in a macroeconomic approach to law and regulation a vehicle to achieve broader social goals. See, e.g., Mark Kelman, Could Lawyers Stop Recessions? Speculations on Law and Macroeconomics, 45 STAN. L. REV. 1215 (1993) (posing that law and legal interventions might provide a corrective to recessions and the resulting higher unemployment and economic misallocation); Douglas A. Kysar, Sustainability, Distribution, and the Macroeconomic Analysis of Law, 43 B.C. L. REV. 1 (2001) (framing the macroeconomic approach in terms of promoting environmental sustainability).

Other legal scholars have written on more concrete topics involving the legal institutions involved in macroeconomic policy making. For example, a number of scholars have written on the laws affecting central banks, bank regulators, and monetary policy generally. See, e.g., Heidi Mandanis Schooner, Comparative Analysis of Consolidated and Functional Regulation: Super Regulator: The Role of Central Banks in Bank Supervision in the United States and the United Kingdom, 28 BROOKLYN J. INT’L L. 411 (2003) (analyzing the compatibility of monetary policy and prudential supervision roles of central banks, and the legal structures supporting these twin roles). Some of this scholarship on macroeconomic (and particularly monetary) legal actors adopts a more critical perspective. See, e.g., Timothy A. Canova, Financial Market Failure as a Crisis in the Rule of Law: From Market Fundamentalism to a New Keynesian Regulatory Model, 12 HARV. L. & POL’Y REV. 369 (2009) (arguing for greater popular control of macroeconomic policy to reverse capture of the Federal Reserve by the financial industry). Another strand of scholarship on monetary policy looks at the architecture of the international financial system, such as the International Monetary Fund. See, e.g., ROSA M. LASTRA, LEGAL FOUNDATIONS OF INTERNATIONAL MONETARY STABILITY (2006).

Still other scholars have written about the macroeconomic dimension of law while analyzing the legal architecture of fiscal policy. See, e.g., Kate Stith, Rewriting the Fiscal Constitution: The Case of Gramm-Rudman-Hollings, 76 CALIF. L. REV. 595 (1988) (examining statutory regime designed to constrain federal spending); Neil H. Buchanan, Social Security, Generational Justice, and Long-Term Deficits, 58 TAX L. REV. 275 (2005) (analyzing shortfalls in Social Security, effects of federal budget
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after the crisis, a few legal scholars did explore select macroeconomic topics, such as asset price bubbles.31 This Article argues for a systematic exploration of the linkages between financial regulation and macroeconomic/monetary policy.

This Article proceeds as follows. Part I describes how credit derivatives function and how they can generate leverage. Part I also summarizes scholarship on how leverage can lead to counterparty risk and domino failures of financial institutions and outlines criticisms of credit derivatives that represent “pure bets.” Part II then argues that a second category of credit derivatives, those in which at least one party to a derivative is hedging a preexisting credit risk, poses a different kind of danger. These hedging credit derivatives can increase liquidity throughout financial markets, all the way back to consumer and commercial lending markets in the “real” economy. Hedging credit derivatives represent an important strand in the “shadow banking system,” a network of financial institutions and instruments—including asset-backed securities—that grew in the last three decades to link borrowers to investors in capital markets.32 The shadow banking system provides the same credit function as traditional lending by depository banks, but bypasses many of the regulatory costs on those banks.33 Part III outlines the

deficits, and tax policies).


The term “shadow banking” has entered the popular lexicon and may have broader definitions, such as any unregulated system of credit that provides an alternative to bank lending. Cf. Paul Krugman, Out of the Shadows, N.Y. TIMES, June 18, 2009, at A27 (arguing financial reform efforts fail to address “parallel financial system” of “largely unregulated institutions”).

macroeconomic effects that these hedging credit derivatives can have, including increasing overall liquidity in financial markets, contributing to asset price booms and even bubbles, and magnifying leverage cycles. Part IV then discusses some of the implications of credit derivatives’ macroeconomic dimension for policy and scholarship.

II. CREDIT DERIVATIVES, COUNTERPARTY RISK, AND THE CREATION OF LEVERAGE

An examination of the macroeconomic potential of credit derivatives must begin with a thorough understanding of the structure of credit derivatives and how one party can become highly leveraged through these financial contracts. The following overview of credit derivatives will also highlight an important distinction between two types of derivatives that is based on whether or not the parties to the contract are hedging an underlying risk.

Before any further analysis, it is important to examine closely what a credit derivative is. As mentioned above, credit derivatives represent financial instruments whose values are based on the credit risk of a firm or other financial contract. Although credit derivatives come in forms as varied and complex as financial wizadns can conjure, the basic economics can be understood through a common variant, the credit default swap (“CDS”). In a simple CDS, one party, the “credit protection buyer”, pays a premium to another party, the “credit protection seller.” In exchange, the credit protection seller agrees to make specified payments to the credit protection buyer should a specified “credit event” occur. For example, the credit protection seller might agree to make payments to the buyer should a payment default occur on specific bonds or other financial instruments. A CDS thus functions as kind of financial guarantee or “insurance” on those bonds. However, the CDS contract is not regulated as insurance due to the craft and lobbying of the lawyers who devised this type of instrument.

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34 Durbin, supra note 9, at 61-2, 65.
Diagram A below depicts the basic economics of this simple CDS example:

**Diagram A**

- **Credit protection** → **Credit protection**

  **“Premium”**

  **plus**

  **Credit risk on reference assets (such as risk of default on loans or bonds)**

  ⇐

  **Payment of specified amount if “Credit Event” occurs (such as default on loans or bonds)**

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**A. Hedging versus Pure Bet Derivatives**

This simple CDS example can also illustrate the distinction between two types of credit derivatives. In the first type of derivative, the credit protection buyer uses the CDS to hedge a credit risk that the buyer is already bearing. For example, the credit protection buyer may purchase credit protection to "insure" against the risk of default by bonds in its portfolio. This Article refers to this type of credit derivative as a "hedging" derivative. Hedging derivatives, like insurance policies, offer possible economic efficiencies by allocating credit risk to parties that are either able to spread the risk widely or otherwise bear the risk more efficiently.

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36. The following distinction between pure bet and hedging derivatives applies to all derivatives, not just credit derivatives. Frank Partnoy creates a third category of derivative, namely those used for "arbitrage." In Partnoy’s framework, this third category allows derivative users to make riskless profits by exploiting price differences between economically equivalent financial instruments. Frank Partnoy, *Corporate Finance: Adding Derivatives to the Corporate Law Mix*, 34 GA. L. REV. 599, 607-08, 615 (2000). One way these price differences may arise is because of instruments are subject to different regulatory treatment, which means those derivatives that attempt to make a profit off these regulatory differences are used as instruments of regulatory arbitrage. Frank Partnoy, *Financial Derivatives and the Costs of Regulatory Arbitrage*, 22 IOWA J. CORP. L. 211, 226-35 (1997).

In the second type of derivative, the credit protection buyer has no preexisting credit risk, nor does the credit protection seller. Following the above hypothetical, the credit protection buyer purchases a CDS on various bonds, but neither owns those bonds nor would suffer a loss should those bonds default. The credit protection buyer enters into the contract to speculate that the bonds will default and that the expected (present) value of the payment from the credit protection seller will exceed the premium it pays. The credit protection seller makes an equal and opposite gamble that the premium it receives outweighs the present value of its expected payout under the contract. The contract is thus a zero-sum game, and this Article labels this second form of credit derivative a "pure bet" credit derivative. The zero-sum nature of pure bet credit derivatives (and other derivatives in which neither party is hedging a risk) has attracted criticism from a number of scholars. For instance, law professor Lynn Stout argues that this form of credit derivative represents a form of gambling, which cannot have a net positive social value because of its zero-sum nature.  

B. Counterparty Risk

Even though pure bet credit derivatives are theoretically zero-sum, these speculative contracts can in fact have negative consequences by creating needless counterparty risk, or the risk of one of the parties—such as the credit protection seller—unexpectedly defaulting on its payment obligations under the contract. This concern about counterparty risk features prominently in scholarship on credit derivatives and OTC derivatives generally. A default under the contract may stem from the credit protection seller miscalculating its expected liability under the contract (for example by miscalculating the probability of a credit event occurring) and thus mispricing the premium, or price, of the derivative contract. A failure to predict the default of the credit protection seller may, in turn, lead to significant financial losses for the credit protection buyer.

These losses can be magnified system-wide because pure bet credit derivatives can themselves be hedged with hedging credit derivatives. In other words, a credit protection seller in a pure bet derivative may hedge the risk of

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39. Stout, Regulate OTC Derivatives, supra note 38, at 32.

40. See, e.g., Krawiec, supra note 15.
paying under this contract by purchasing a second credit derivative (and becoming a credit protection buyer) from a third party credit protection seller (Party C in the diagram below). This third party can itself hedge its risk of paying under the second credit derivative contract by purchasing credit derivative protection from a fourth party (Party D in the diagram below). Rinse, lather, repeat. This relatively simple example, depicted below in Diagram B, demonstrates how credit derivatives can connect together in chains of credit risk transfers.

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Diagram B

Contract 1
"Pure Bet"
Credit Derivative

\[ \text{Party A} \rightarrow \text{Party B} \rightarrow \text{Party C} \rightarrow \text{Party D} \]

"Premium" plus credit risk on reference assets (such as risk of default on loans or bonds)

\[ \rightarrow \]

Payment of specified amount if "Credit Event" occurs (such as default on loans or bonds)

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Contract 2
(Hedge of Credit risk of Contract 1)

"Premium" plus credit risk on Contract 1

\[ \rightarrow \]

Payment of specified amount if "Credit Event" occurs

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Contract 3
(Hedge of Credit risk of Contract 2)

"Premium" plus credit risk on Contract 2

\[ \rightarrow \]

Payment of specified amount if "Credit Event" occurs

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Furthermore, credit protection buyers (Party A in the above diagram) concerned with the counterparty risk of their credit protection sellers (Party B in the above diagram) can use credit derivatives to hedge this risk. Indeed, simple chains of credit risk transfers, like the one depicted above, can link together to form complex webs. Unexpected defaults in any contract can cause unexpected financial losses to cascade throughout the web. Of course, counterparties can attempt to calculate the risk of a default earlier in the chain (or elsewhere in the web) and either appropriately price their sales of credit protection or hedge the risk. Yet, the longer the chain (or more complex the web) of credit derivative contracts, the more difficult these calculations become. This difficulty stems in part from the tendency of information on underlying credit risk to deteriorate with each credit risk transfer. To complete the circle, improper pricing of credit risk means that a default on one credit derivative may ripple and cascade through a web of interconnected derivative contracts. Through this chain reaction of falling dominoes, counterparty risk can transform into systemic risk.

43. See supra note 14, and accompanying text. 44. See Joshua Coval et al., The Economics of Structured Finance, 23 J. ECON. PERSP. 3, 23 (2009). Moreover, information alone does not mean investors will use or process it effectively. Empirical studies show that investors did not factor in valuable publicly disclosed information on the exposure of firms to credit derivatives during the run-up to the global financial crisis. Robert P. Bartlett, Inefficiencies in the Information Thicket: A Case Study of Derivative Disclosures During the Financial Crisis, 36 IOWA J. CORP. L. 1 (2010).

45. Lynn Stout raises this concern to argue that pure bet derivatives should not be legally enforceable contracts. Stout, Regulate OTC Derivatives, supra note 38, at 33.
C. Leverage

The financial damage from counterparty defaults can increase exponentially to the extent that the parties to a derivative contract are leveraged.\textsuperscript{46} Per introductory corporate finance, leverage both magnifies potential returns on equity and potential losses for firms that invest with borrowed money.\textsuperscript{47} Leverage can enter the credit derivatives system in two ways. First, firms can borrow money from outside the system by making loan agreements, accepting deposits from customers (in the case of a bank), or borrowing using other financial instruments. A number of financial institutions dramatically increased their short-term borrowings over the last two decades through repurchase (repo) agreements.\textsuperscript{48}

Leverage can also enter the credit derivative system in a second, subtler way. The credit protection seller does not have to commit funds up front to cover its expected obligations to the buyer.\textsuperscript{49} This frees up capital that the seller can deploy elsewhere, including by underwriting additional credit derivatives.\textsuperscript{50} The credit protection buyer, however, may have concerns about the credit risk of its counterparty. Therefore, credit and other derivative contracts often include a margin feature, by which one party has to post certain collateral to secure its future payment obligations.\textsuperscript{51} A credit protection buyer, for example, may insist that a credit protection seller post cash or other assets as collateral for the seller's obligation to pay upon the occurrence of a credit event. The contract may provide for the ability of one party to demand more collateral should the creditworthiness of the counterparty decline.

\textsuperscript{46} By leverage, this Article means the extent to which a firm commits only a portion of its own capital to cover the full amount of an investment. The remainder is “borrowed” either in the form of a loan, or, as is explained below, when a counterparty to a derivative contract does not require the firm to commit capital to cover the full amount of future obligations under the contract.

\textsuperscript{47} WILLIAM A. KLEIN ET AL., BUSINESS ORGANIZATION AND FINANCE: LEGAL AND ECONOMIC PRINCIPLES 343-46 (11th ed. 2010).


\textsuperscript{49} There is a fascinating debate in finance literature on whether CDSs should be analogized to options or swaps. CDSs typically have an asymmetric payoff structure, which makes them resemble options. However, the price performance of CDSs is more like a swap than an option. See MARK J.P. ANSON ET AL., CREDIT DERIVATIVES: INSTRUMENTS, ASSETS, AND PRICING 56-7 (2004).

\textsuperscript{50} There is both theoretical and empirical evidence that financial institutions that off-load risk with credit derivatives make fresh loans rather than reduce their overall exposure. See infra notes 81-82 and accompanying text.

These contractual margin requirements have an exact analogue in the margin rules of futures exchanges and clearing companies, which parties use to trade and settle futures and derivatives. Exchange-traded futures, derivative contracts are generally settled and cleared through a central clearing organization affiliated with the exchange. This clearing company intermediates, acting as counterparty to both sides of every trade. To protect itself from counterparty risk, the clearing company typically imposes rules including margin requirements on participants. Margin rules also have a functional equivalent in the collateral features of repurchase agreements.

Taking a step back, lower collateral or margin requirements can result in a derivative counterparty enjoying higher leverage. Lower collateral means that a party to a derivative contract need deploy less of its own capital to cover its future payment obligations. Lower collateral also means that a firm may enter into more derivative contracts. When set too low, collateral requirements allow a firm to increase leverage excessively or to overinvest in underwriting fresh derivative contracts.

D. Leverage and Systemic Risk: Take One

By magnifying potential losses, high leverage can increase the financial fragility of firms. Again, the web of credit derivatives means that the financial fragility of one firm can increase the fragility of other firms or of the entire financial system. The interest of credit protection buyers in protecting themselves from counterparty risk imposes some discipline on the leverage of credit protection sellers. However, this discipline may prove insufficient for several reasons. First, the long chains of credit risk transfers make it difficult to calculate this risk. Moreover, the default of a major derivative counterparty

54. Cf. Gorton & Metrick, supra note 48, at 2-4 (describing these collateral or “haircut” provisions). Repo agreements and haircuts in those agreements are discussed below, infra notes 94-100 and accompanying text.
55. Frank Partnoy and David Skeel describe a related way in which interconnected credit derivative contracts may increase systemic risk. They argue that when investors such as hedge funds borrow (increase their leverage) to speculate in CDSs, they increase the risk that even small tremors in financial markets could cause a liquidity crisis as firms then rush to unwind a web of connected derivative contracts at the same time. Partnoy & Skeel, supra note 9, at 1040. Economist Markus Brunnermeier describes this phenomenon through the lens of network effects; many highly leveraged firms rushing to close out interconnected derivatives at once creates “network risk” or “gridlock risk.” Markus K. Brunnermeier, Deciphering the Liquidity and Credit Crunch 2007-2008, 23 J. ECON. PERSP. 77, 96-97 (2009). The rush to close contracts can cause liquidity to dry up in both credit derivative markets and financial markets more generally.
56. See supra notes 43-44 and accompanying text. Market participants may not use information on credit derivatives to price risk rationally or effectively in any case. See Bartlett, supra note 43 (providing empirical evidence that suggests financial markets did not factor in publicly available information on credit derivatives in assessing financial health of bond insurers with exposure to those derivatives).
may have severe spillover effects on entire financial markets, and looming systemic risk and the prospect of government bailouts mean that part of the cost of a default on derivatives can be externalized onto taxpayers.

III. HEDGING AND THE LINK TO CREDIT MARKETS: CREDIT DERIVATIVES IN THE SHADOW BANKING SYSTEM

The analysis in Part I, which focuses on counterparty risk and the microeconomic effects of credit derivatives, has been explored in the academic literature. However, it is but half the coin of the economic effects of these financial instruments and the leverage associated with them. This Article argues that credit derivatives and leverage in the credit derivatives market have additional, undescribed macroeconomic effects. To understand these effects, it is important first to see how credit derivatives can link back to consumer and commercial credit markets and thus impact the “real” economy.

This Part begins by outlining how credit derivatives represent a vital strand in the larger shadow banking system. The shadow banking system refers to a complex web of financial institutions and instruments that links borrowers in commercial and consumer credit markets to investors in capital markets. These instruments include asset-backed securities, shares in money market mutual funds, repurchase and reverse repurchase agreements, and credit derivatives. Developed by financial institutions in the 1970s and 1980s, such instruments enable borrowers in consumer and commercial credit markets to borrow indirectly from investors in capital markets. This creates by-passes around traditional bank lending, in which banks borrow from depositors and

57. See supra note 14 and accompanying text.
58. See Okamoto, supra note 2, at 200-10 (describing systemic risks created by financial institutions taking excessive risk through credit derivatives and moral hazard created by prospects of government bailout of those institutions).
59. To be sure, counterparty risk and the failure of a major financial institution, such as AIG, because of credit derivatives could have significant impacts on the real economy. The collective microeconomic effects of credit derivatives can impact the macro-economy. Policymakers have cited this as a reason for the bailout of AIG. See Ben S. Bernanke, Chairman, Federal Reserve System, Remarks at Morehouse College: Four Questions about the Financial Crisis (Apr. 14, 2009) (transcript available at http://www.federalreserve.gov/newsevents/speech/bernanke20090414a.htm).
60. See supra notes 32-33 and accompanying text. See also Blair, supra note 18, at 227-28, 251-52.
61. See infra notes 74-76 and accompanying text.
62. William A. Birdthistle, Breaking Bucks in Money Market Mutual Funds, 2010 Wis. L. Rev. 1155, 1156-81 (describing evolution of money market mutual funds and how the financial crisis affected these funds).
63. See infra notes 94-100 and accompanying text.
64. For descriptions of the shadow banking system, see supra note 32.
lend to consumers and businesses.\textsuperscript{65} Compared to traditional lending practices, these instruments not only offered new sources of credit to household and business borrowers, they also offered investors some of the same features of bank deposits, namely low risk, highly liquid investments.\textsuperscript{66}

Each of the various bypasses attracted enormous increases in traffic at various stages in the 1980s, 1990s, and 2000s.\textsuperscript{67} These instruments, which developed independently, grew together to form an extensive web (the "shadow banking system") that linked (and continues to link) financial institutions together in complex ways. The institutional intermediaries at the hubs of this web themselves enjoyed spectacular growth; in the United States by the eve of the crisis, the combined assets of these intermediaries surpassed the assets owned by traditional banks, savings institutions, and credit unions.\textsuperscript{68}

The volume of credit derivatives has also exploded in the three decades since their birth in the 1980s. The Bank for International Settlements estimated that the total worldwide notional value of CDSs (an instrument explained below) exceeded U.S. $57.4 trillion in June 2008, when the global financial crisis began metastasizing.\textsuperscript{69} This value dwarfed the value of debt securities worldwide at that same point, which was estimated at $25.3 trillion.\textsuperscript{70}

\textbf{A. A Primer on Credit Derivatives and Asset-Backed Securities}

The development of credit derivatives created an important new strand in the shadow banking web. To understand the role credit derivatives played in this system requires a return to the distinction between the two types of derivatives described above. Consider the chain of credit derivatives depicted above in Diagram B.\textsuperscript{71} In that chain, the first credit derivative was a "pure bet" derivative. The other derivatives represented iterations of hedging this initial speculative contract. Yet that first credit derivative in the chain could instead have been a hedging credit derivative. In other words, Party A could have entered into that first credit derivative to hedge an existing credit risk. Indeed, one significant use of CDSs is to allow firms to hedge the credit risk of bonds in their portfolio.\textsuperscript{72}

More particularly, many firms before the Panic of 2008 used CDSs to

\textsuperscript{65} Adrian & Shin, \textit{supra} note 32.

\textsuperscript{66} Gerding, \textit{supra} note 33.

\textsuperscript{67} Id.

\textsuperscript{68} Adrian & Shin, \textit{supra} note 32 These intermediaries include broker-dealer/investment banks, issuers of asset-backed securities, and government sponsored entities, such as Freddie Mac and Fannie Mae.

\textsuperscript{69} BANK FOR INT'L SETTLEMENTS, QUARTERLY REPORT: STATISTICAL ANNEX A121 (Dec. 2010).

\textsuperscript{70} BANK FOR INT'L SETTLEMENTS, QUARTERLY REPORT: STATISTICAL ANNEX A85 (Jun. 2008); see also Johnson, \textit{supra} note 2, at 196-99 (describing growth of credit derivative market).

\textsuperscript{71} \textit{See supra}. Part (b).

\textsuperscript{72} Durbin, \textit{supra} note 9.
Credit Derivatives, Leverage, and Financial Regulation’s Missing Macroeconomic Dimension

hedge the risk of asset-backed securities that they owned.\textsuperscript{73} Asset-backed securities are financial instruments created when multiple loans, mortgages, or other assets that produce a predictable future cash stream are pooled together and sold to an investment vehicle that issues securities to investors.\textsuperscript{74} The investment vehicle uses the cash from the sale to investors to purchase the pool of loans, mortgages, or other underlying assets. The vehicle later applies the cash received on those loans, mortgages, or assets, to make scheduled payments on the asset-backed securities to investors.\textsuperscript{75}

Diagram C below depicts the creation of a basic asset-backed securities transaction.\textsuperscript{76}

\begin{center}
\textbf{Diagram C}
\end{center}

\begin{center}
\begin{tabular}{ccc}
Stage 1 & Stage 2 & Stage 3 \\
\hline
Consumers & $\rightarrow$ & Originating Lenders & $\rightarrow$ & Special Investment Vehicle & $\rightarrow$ & Investors \\
\hline
Mortgages (or other product with obligation of future payments) & $\leftarrow$ & Cash & $\leftarrow$ & Cash & $\leftarrow$ & Cash \\
\hline
\end{tabular}
\end{center}

\begin{footnotesize}
\textsuperscript{73} Gerding, \textit{Code, Crash, and Open Source}, supra note 44, at 160.
\textsuperscript{74} Id. at 147-49 (describing process and purposes of securitization).
\textsuperscript{75} Id.
\textsuperscript{76} This securitization process can be repeated again as asset-backed securities themselves can be pooled together sold to a second investment vehicle and used to use another class of asset-backed securities (called collateralized debt obligations or “CDOs”). CDO securities can in turn be securitized. Just as with hedging credit derivatives with other credit derivatives, after rinsing, lathering, and repeating, long chains are created. Id. at 162-63. Professors Partnoy and Skeel categorize CDOs as another form of credit derivative. Partnoy & Skeel, \textit{supra} note 9, at 1022.
\end{footnotesize}
If the investors in Diagram C above want to hedge the risk of their asset-backed securities defaulting (and thus hedge the credit risk of the underlying mortgages), they can purchase a CDS. The chain of transactions in Diagram C would then would connect with Diagram A. Diagram D depicts this link.

Diagram D

For the sake of simplicity, this diagram removes the originator. If the originator is deemed to have made a “true sale” of the assets to the structured investment vehicle (SIV), the assets are no longer considered part of the estate of the originator in bankruptcy. The SIV is then the outright owner of the consumer mortgages, and the originator no longer has any impact on the risk being transferred from borrowers to the SIV and investors. For a discussion of “true sales” in securitizations, see Steven L. Schwarcz, Securitization Post-Enron, 25 CARDOZO L. REV. 1539, 1543-48 (2004).
In turn, the credit protection seller under that CDS can hedge its risk (which includes the risk of default on the asset-backed securities and the underlying mortgages), by purchasing its own CDS. Thus, the chain of transactions in Diagram D can be joined to the chain of credit derivatives in Diagram B. Diagram E below depicts this long concatenation of credit risk transfers:

Diagram E

Pooling of loans | Sale of Asset-backed Securities | First CDS | Second CDS | Third CDS

Loan Borrowers > Investment Vehicle > Investor > First Swap Provider > Second Swap Provider > Third Swap Provider

Credit risk < Credit risk on asset-backed securities < Credit risk < Credit risk < Credit risk

Cash Purchase “Insurance” “Insurance” “Insurance”

78. There are much more complex versions of asset backed securities and complex uses of CDSs. As the mortgage-backed securities market boomed right before the crash and financial crisis began, investment banks began producing more of a special kind of asset-backed security called a synthetic CDO. Unlike in a normal asset-backed security in which investors are paid from the cash stream of underlying assets (like mortgage-backed securities), investors in a synthetic CDO receive payments from a counterparty to a CDS. That counterparty makes payments to investors based on the performance of certain reference assets (like pools of mortgages or mortgage backed securities). The counterparty makes money if many of those reference assets default. This essentially means that the entire transaction is a pure bet, with the counterparty to the credit derivative betting against the underlying assets, and the investors in the CDO betting that those assets will perform. JEFFREY S. TOLK, MOODY’S INVESTOR SERVICE, STRUCTURED FINANCE: SPECIAL REPORT: UNDERSTANDING THE RISKS IN CREDIT DEFAULT SWAPS 3-4 (2001), available at http://www.securitization.net/pdf/MoodysSyntheticCDORisks.pdf. This synthetic CDO structure was at the heart of the SEC’s 2010 civil lawsuit against Goldman Sachs. See Felix Salmon, Why Did All Those Super-seniors Exist? REUTERS (Apr. 28, 2010), http://blogs.reuters.com/felix-salmon/2010/04/28/why-did-all-those-super-seniors-exist/; Erik F. Gerding, Two Types of Credit Derivatives: Two Types of CDOS: Two Dangers, THE CONGLOMERATE (Apr. 20, 2010), http://www.theconglomerate.org/2010/04/two-types-of-credit-derivatives-two-types-of-cdos-two-danger.html#tp.
B. Leverage and Funneling Credit Back to Consumer and Commercial Lending Markets

When credit derivatives are used to hedge loans or bonds and not just to speculate, they can increase the supply of credit to the "real" economy that produces assets and services. The long chain of transactions depicted in Diagram E demonstrates how credit derivatives can connect back to consumer and commercial credit markets. Moving left to right, each transaction represents a transfer of credit risk that originates with the loans or mortgages at the beginning of the chain. These transfers of credit risk allow more credit to flow in the opposite direction, ultimately all the way back to the loan or mortgage borrowers. To see how this works, consider what occurs when an investor in asset-backed securities hedges the credit risk with the first CDS. By off-loading credit risk, the investor frees up additional capital that it can deploy by purchasing additional asset-backed securities.

In addition, banks can use credit derivatives that hedge bonds to arbitrage regulatory capital rules. A CDS that hedges asset-backed securities can allow a bank to reduce the amount of capital it is required to hold against those securities well below the economic risk that the bank continues to bear even with the hedge. Regulatory arbitrage thus describes another avenue by which CDSs allow financial institutions to free up additional capital to make further loans and investments.

A number of economists have speculated that credit derivatives may encourage financial institutions to seek additional risk. Instead of using hedging derivatives to reduce their exposure, institutions can replace the risk they off-load through credit derivatives with new investments and fresh risk. Empirical work suggests that many banks have in fact used credit derivatives in this way; a number of studies document expanded lending by banks that use credit derivatives. Increased demand for asset-backed securities, in turn,

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79. Economists measure this regulatory arbitrage by comparing the regulatory capital requirement with credit spreads for a security adjusted for the hedge. Viral V. Acharya et al., Capital, Contingent Capital, and Liquidity Requirements, in REGULATING WALL STREET: THE DODD-FRANK ACT AND THE NEW ARCHITECTURE OF GLOBAL FINANCE 143, 149-50 (Viral V. Acharya et al. eds., 2011).


81. Beverly Hirtle, Credit Derivatives and Bank Credit Supply, 18 J. FIN. INTERMEDIATION 125, 126 (2009). Oddly, this study also finds that increased use of credit derivatives by a bank correlates with a decrease in the bank’s lending under existing commitments (such as extensions of existing loans). Id.; see also Benedikt Goderis et al, Bank Behaviour with Access to Credit Markets (Bank of Finland Research Discussion Paper No. 4, 2007), available at http://papers.ssrn.com/sol3/papers.cfm? abstractid=1010101. This study finds that banks that transfer risk via credit derivatives increased their lending levels by fifty percent. The authors compared banks that had issued at least one collateralized loan obligation to a control group that had not. Id.; see also Günter Franke & Jan Pieter Krahnen, Default Risk Sharing between Banks and Markets: the Contribution of Collateralized Debt Obligations, in THE RISKS OF FINANCIAL INSTITUTIONS 603, 628 (Mark Carey & René M. Stulz eds., 2006) (finding evidence that some banks use the risk reduction achieved through securitization to take new risks). These
increases demand for pools of loans or other mortgages, and thus funnels back
more credit to borrowers in consumer and commercial loan markets. Thus,
increased leverage all along the chain translates into more credit for consumer
and commercial borrowers.

How can leverage increase at each link of the credit transfer chain? Most
basically, investors in asset-backed securities can increase their leverage
by borrowing money directly. By contrast, credit derivatives can increase
leverage in the system more subtly, but with the same effect of increasing the
flow of credit to consumers and businesses. As noted above, when hedging
credit derivatives are priced too cheaply or when collateral requirements are
lowered, credit protection sellers provide more credit “insurance.” This allows
investors to off-load more risk to the chain of credit derivatives and to purchase
more asset-backed securities.

There are a few important differences between leverage achieved
by borrowing and a credit protection seller achieving leverage in credit derivatives
by committing less capital. The credit protection seller’s obligations are
contingent liabilities. To price the liability (and the premium it charges for the
derivative), a credit protection seller must make a reasonably good estimate of
the probability of the “credit event” occurring. As noted above, modeling credit
risk is a difficult endeavor. It becomes particularly difficult when the credit
risk of an instrument being insured depends on the credit risk of an underlying
instrument or chain of instruments, as in a CDS that hedges another CDS that

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findings are consistent with other empirical studies that show that banks use sales of loans to take on
new credit risk rather than reduce overall risk. See, e.g., A. Sinan Cebenoyan & Philip E. Strahan, Risk
82. See, e.g., Goderis et al., supra note 81; Franke & Krahnen, supra note 81, at 628.
83. Adrian & Shin, supra note 48 (documenting borrowing by financial institutions in repo markets).
84. CDSs that are not used for hedging, i.e., where no party owns the underlying reference assets,
can create their own problems. CDSs may be either physically settled (in which the credit
protection seller is obligated to purchase the reference assets upon a credit event) or cash settled
(in which the credit protection seller is obligated simply to make cash payment to the credit protection
Default Swaps, in THE CREDIT DERIVATIVES HANDBOOK: GLOBAL PERSPECTIVES, INNOVATIONS, AND
MARKET DRIVERS
3, 5 (Greg N. Gregoriou & Paul Ali eds., 2008). However, the large use of CDSs for speculation means
that the notional value of CDSs far exceeds the amount of underlying assets in the market. See Blair &
Gerding, supra note 29. The bankruptcy of Lehman Brother brought to the fore the problem of physical
settlement when there are far too few assets to settle all the related CDSs outstanding. Aline van Duyn &
http://www.ft.com/intl/cms/s/0/c1be9880-9407-11dd-b277-0000779fd18c.html#axzz1Pa7RRdkD.
85. Contingent liabilities are liabilities that a firm may incur depending on whether a future event
occurs. For one accounting definition of contingent liabilities, see INT’L ACCT. STANDARDS
BOARD, INT’L ACCT. STANDARD NO. 37 PROVISIONS, CONTINGENT LIABILITIES AND
86. See supra notes 8, 13 and accompanying text.
hedges default risk for a class of asset-backed securities. The counterparty risk that the credit protection buyer faces fluctuates according to changes in the creditworthiness of the seller and the probability of a credit event occurring. This changing counterparty risk and the contingent nature of the derivative necessitate the special contractual feature of credit derivatives—namely, the ability of the buyer to change the collateral that the seller must post during the term of the contract.

IV. THE MACROECONOMIC EFFECTS OF LEVERAGE

The individual decisions of financial institutions with respect to derivative contracts can begin to exert powerful macroeconomic effects when aggregated across thousands of transactions. Entering into these contracts, using them to off-load credit risk and make fresh loans or investments, and demanding more or less collateral from counterparties under the contracts can change not only the leverage of individual financial institutions, but, when aggregated, the leverage in entire financial markets as well.

A. Increasing Liquidity and the Effective Money Supply

The ability of credit derivatives to increase the leverage of financial institutions and the amount of credit that flows into loan markets can translate into increased liquidity, or an increased amount of money, in financial markets. When financial institutions, i.e. firms that borrow to lend, increase their leverage through credit derivatives, the effects mirror those produced when they increase their leverage through borrowing. The relationship between leverage and liquidity can be understood through the example of traditional banking. When financial institutions increase their leverage and lend to one another in series, the amount of liquidity increases geometrically.

Margaret Blair has explored how the increasing leverage of financial institutions can enlarge the effective money supply. The following hypothetical from introductory macroeconomics (similar to one Blair uses) captures the money multiplier effect created by fractional reserve banking. Assume that banks face a capital requirement that they hold 10% of their capital in reserve. If the Federal Reserve lends $1,000 to Bank A, Bank A then lends the maximum amount allowed (taking into account the reserve requirement) to Bank B, Bank B lends the maximum amount to Bank C, and Bank C finally lends the maximum amount to Company D, then the initial $1,000 loan from the central bank increased the effective money supply to

\[ \text{supra note} 45 \] and accompanying text.

\[ \text{Blair, supra note} 18, \text{ at} 229-31. \]

\[ \text{ld. at} 253-54. \]
$3,439. Ultimately, that initial $1,000 loan should create $10,000 assuming a 10% reserve requirement. If the capital requirement is lowered to 5%, the supply of money would increase by more than 5% over these same four loans to $3,709.88. Ultimately, the money multiplier effect would mean that the $1,000 loan creates $20,000 of money given a 5% reserve requirement.

Cutting edge macroeconomic research shows that this same logic translates from traditional banking to lending in the shadow banking system. Tobias Adrian and Hyun Song Shin have examined the repurchase ("repo") market, which has become a critical source of short-term credit for financial institutions. In a repo transaction, a borrower sells a security at below the current market price and agrees to repurchase it at a higher agreed price in the future. This sale and repurchase provides the same economics as a secured loan with the security serving as collateral. The difference between the current market price of the security and the price at which the borrower sells it represents the "haircut." Larger haircuts (when the security is sold to the

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90 Here is the simple arithmetic:
$1,000 (original amount loaned from Fed to A)
+$900 (amount that A loans to B while holding 10% in reserve)
+$810 (amount that B loans to C while holding 10% in reserve)
+$729 (amount that C loans to D while holding 10% in reserve)
$3,439

For a slightly more elaborate example, see GREGORY MANKIW, PRINCIPLES OF MACROECONOMICS 348-49 (2008).

91 Per introductory macroeconomics, the money multiplier is the inverse of the reserve ratio, as expressed by the following equation: Money multiplier = 1/reserve ratio. Id.

92 Here is the calculation:
$1,000.00 (original amount loaned from Fed to A)
+$950.00 (amount that A loans to B while holding 5% in reserve)
+$902.50 (amount that B loans to C while holding 5% in reserve)
+$857.38 (amount that C loans to D while holding 5% in reserve)
$3,709.88

See id.

93 Note that the money multiplier effect continues to operate even if money is not loaned from one bank to another as in the above examples. The only requirement is that money stay in the banking system. If Bank A were to lend the money to Farmer B, Farmer B used the money to purchase a tractor from Company C, and Company C placed the proceeds in its bank account with Bank X, the money has stayed in the bank system and will be recycled. It is only when a party stuffs the cash "under a mattress" that money stops recycling and the money multiplier effect cuts off. See Blair, supra note 18, at 253-54.


95 Adrian & Shin, supra note 94, at 602.

96 Gorton & Metrick, supra note 94.

97 Adrian & Shin, supra note 94, at 602.
lender for far below market price) mean more collateral for the lender and lower leverage for the borrower. \(^9^8\) Smaller haircuts translate into less collateral and more leverage. \(^9^9\) Smaller haircuts have the same economic effect of increasing leverage and freeing up capital as a lower reserve requirement for bank lending described above. \(^1^0^0\) The lending of financial institutions to one another in sequence via repos also generates the same money multiplier effect, which may be amplified when lenders decrease the haircut and dampened when they increase it. \(^1^0^1\)

This same logic also applies to credit derivatives and their collateral provisions. When collateral requirements are lowered along a chain of credit derivatives (such as in Diagram B), then credit protection sellers must commit less funds to cover their obligations under the contracts and can deploy more capital for underwriting new derivatives or making other investments. Lowering (or raising) the collateral or margin requirements geometrically increases (or decreases) the amount of credit risk that can be transferred by a chain of credit derivatives. \(^1^0^2\) By enlarging the carrying capacity of existing

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\(^9^8\) Id.

\(^9^9\) Id.

\(^1^0^0\) Id.

\(^1^0^1\) Id.

\(^1^0^2\) Returning to Diagram B above and modifying it to add a few additional credit transfers can illustrate this geometric effect. First, consider if all credit protection buyers demand that credit protection sellers post 10% of the maximum credit exposure as collateral. Assume all credit protection sellers have $100 in total capital to invest in credit derivatives or otherwise. If Party A “insures” $100 in bonds with Party B (the second column in the table below), Party B must post $10 in collateral (the third column in the table below), but still has $90 in capital to deploy elsewhere (the right hand column), whether in selling more credit protection or in making other investments. If Party B insures the residual credit risk ($90 or $100 minus the collateral amount) with Party C, Party C must post $9 in collateral, but still has $91 in capital it can invest elsewhere. Party C could then insure its residual credit risk with Party D who insures with Party E. The chain of seven credit derivatives continues to Party H. The table below shows that the total credit risk transferred by these seven derivatives is $521.70 (and the total capital remaining available to the credit protection sellers is $647.83).

<table>
<thead>
<tr>
<th>Credit derivative (Protection seller on right)</th>
<th>Credit Risk Transferred</th>
<th>Collateral Posted by Credit Protection Seller</th>
<th>Residual Credit Risk (not covered by collateral)</th>
<th>Remaining Capital Available to Seller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party A/Party B</td>
<td>$100</td>
<td>$10</td>
<td>$90</td>
<td>$90</td>
</tr>
<tr>
<td>Party B/Party C</td>
<td>$90</td>
<td>$9</td>
<td>$81</td>
<td>$91</td>
</tr>
<tr>
<td>Party C/Party D</td>
<td>$81</td>
<td>$8.10</td>
<td>$72.90</td>
<td>$91.90</td>
</tr>
<tr>
<td>Party D/Party E</td>
<td>$72.90</td>
<td>$7.29</td>
<td>$65.61</td>
<td>$92.71</td>
</tr>
<tr>
<td>Party E/Party F</td>
<td>$65.61</td>
<td>$6.56</td>
<td>$59.05</td>
<td>$93.44</td>
</tr>
<tr>
<td>Party F/Party G</td>
<td>$59.05</td>
<td>$5.91</td>
<td>$53.14</td>
<td>$94.09</td>
</tr>
<tr>
<td>Party G/Party H</td>
<td>$53.14</td>
<td>$5.31</td>
<td>$47.83</td>
<td>$94.69</td>
</tr>
<tr>
<td>Total</td>
<td>$521.70</td>
<td>$52.17</td>
<td>$647.83</td>
<td>$647.83</td>
</tr>
</tbody>
</table>

Now assume that all credit protection buyers drop their collateral requirements to 5% of the maximum credit exposure. When Party A insures $100 in bonds, Party B must post only $5 in collateral and has $95 in capital remaining. The table below shows how this lower collateral requirement means that the same seven derivatives now transfer $603.14 in credit risk (and the seven credit protection sellers now have approximately $669.83 in capital to invest elsewhere).
Credit Derivatives, Leverage, and Financial Regulation’s Missing Macroeconomic Dimension

credit derivatives and increasing the capital available for credit protection sellers to underwrite new derivatives, lower collateral can turbo-charge credit markets. As noted above, credit derivatives allow lenders (including investors in bonds or asset-backed securities) to become credit protection buyers, off-load more risk, and then make more loans (or purchase more securities). Errors in the pricing or collateralization of credit derivatives that allow credit protection sellers to become excessively leveraged can thus lead to excessive increases in liquidity. Credit protection sellers sell too many

<table>
<thead>
<tr>
<th>Credit derivative Remaining</th>
<th>Credit Risk Transferred</th>
<th>Collateral Posted by Seller</th>
<th>Residual Credit Risk</th>
<th>Remaining Capital Available to Seller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party A/Party B</td>
<td>$100</td>
<td>$5</td>
<td>$95</td>
<td>$95</td>
</tr>
<tr>
<td>Party B/Party C</td>
<td>$95</td>
<td>$4.75</td>
<td>$90.25</td>
<td>$95.25</td>
</tr>
<tr>
<td>Party C/Party D</td>
<td>$90.25</td>
<td>$4.51</td>
<td>$85.74</td>
<td>$95.49</td>
</tr>
<tr>
<td>Party D/Party E</td>
<td>$85.75</td>
<td>$4.29</td>
<td>$81.46</td>
<td>$95.71</td>
</tr>
<tr>
<td>Party E/Party F</td>
<td>$81.46</td>
<td>$4.07</td>
<td>$77.39</td>
<td>$95.93</td>
</tr>
<tr>
<td>Party F/Party G</td>
<td>$77.39</td>
<td>$3.87</td>
<td>$73.52</td>
<td>$96.13</td>
</tr>
<tr>
<td>Party G/Party H</td>
<td>$73.52</td>
<td>$3.68</td>
<td>$69.84</td>
<td>$96.32</td>
</tr>
<tr>
<td>Total</td>
<td>$603.14</td>
<td>$30.17</td>
<td>$669.83</td>
<td>$669.83</td>
</tr>
</tbody>
</table>

A drop in collateral requirements from 10% to 5% results in an increase in credit risk transferred of over 15%. The effects of lower collateral would increase geometrically with longer chains of credit derivatives.

Finally, consider if collateral requirements are changed to 50%. The following table shows that the same chain of credit derivatives now transfers only $198.43 in credit risk.

<table>
<thead>
<tr>
<th>Credit derivative Remaining</th>
<th>Credit Risk Transferred</th>
<th>Collateral Posted by Seller</th>
<th>Residual Credit Risk</th>
<th>Remaining Capital Available to Seller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party A/Party B</td>
<td>$100</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
</tr>
<tr>
<td>Party B/Party C</td>
<td>$50</td>
<td>$25</td>
<td>$25</td>
<td>$75</td>
</tr>
<tr>
<td>Party C/Party D</td>
<td>$25</td>
<td>$12.50</td>
<td>$12.50</td>
<td>$87.5</td>
</tr>
<tr>
<td>Party D/Party E</td>
<td>$12.5</td>
<td>$6.25</td>
<td>$6.25</td>
<td>$93.75</td>
</tr>
<tr>
<td>Party E/Party F</td>
<td>$6.25</td>
<td>$3.13</td>
<td>$3.12</td>
<td>$96.87</td>
</tr>
<tr>
<td>Party F/Party G</td>
<td>$3.12</td>
<td>$1.56</td>
<td>$1.56</td>
<td>$98.44</td>
</tr>
<tr>
<td>Party G/Party H</td>
<td>$1.56</td>
<td>$0.78</td>
<td>$0.78</td>
<td>$99.22</td>
</tr>
<tr>
<td>Total</td>
<td>$198.43</td>
<td>$99.22</td>
<td>$600.78</td>
<td>$600.78</td>
</tr>
</tbody>
</table>

103 In describing the monetary effects of financial institution leverage in general (but not leverage via credit derivatives), Margaret Blair coins the term “credit multiplier.” Blair, supra note 18, at 266.

104 See supra notes 81-82 (empirical evidence that banks use credit risk transfers to take on new credit risk).

Note that repo lenders and credit protection buyers have different mechanisms to control the leverage of their respective counterparties. Repo lenders set the haircut once, when the repurchase agreement is entered into. Nevertheless, the short term of many repurchase agreements allows lenders to reset the haircut quickly in subsequent transactions to compensate for changing credit risk or market conditions. The longer term of many CDSs explains why collateral requirements can change during the term of the contract. Cf. DIMITRIS N. CHORAFAS, INTRODUCTION TO DERIVATIVE FINANCIAL INSTRUMENTS: OPTIONS, FUTURES, FORWARDS, SWAPS, AND HEDGING 275-6 (2008) (describing dynamic nature of margin requirements on futures and options markets).
derivatives, allowing financial institutions to off-load too much risk, and extend too much new credit.

Applying the logic of fractional reserve banking to other channels of credit and leverage is not just a theoretical exercise. It is critical for understanding the money supply and monetary policy in the modern economy. As noted above, lending from the shadow banking system exploded over the last three decades, with the shadow banking system rivaling the traditional depository banking system in size by the eve of the global financial crisis. The modern financial system is no longer dominated by credit from deposit-taking banks. Securitization and credit derivatives represent important components of this shadow system.

B. The Measurement of Liquidity

So far, this Article has discussed the potential macroeconomic effects of credit derivative in increasing liquidity or the effective supply of money in financial markets. Unfortunately, this increase in liquidity due to credit derivative is difficult to measure with any precision given the information that is publicly available. A number of bodies do collect information on credit derivatives. But this information does not cover the data necessary to calculate the leverage and liquidity created by credit derivatives, such as collateral requirements and changes in collateral requirements, let alone whether credit derivatives are underpriced.

Furthermore, the contribution of credit derivatives to liquidity may be less straightforward than bank lending for at least four reasons. First, credit derivatives, as noted above, are contingent liabilities. Economists have noted that the contingent nature of these contracts can cause their value to jump upon

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106 The Bank for International Settlements and the International Swap Dealer Association track aggregate notional amounts and market values of credit derivatives. See, e.g., BANK FOR INT’L SETTLEMENTS, QUARTERLY REVIEW A131 (June 2011), available at http://www.bis.org/statistics/otcder/dt1920a.pdf; INT’L SWAP DEALERS ASSOC., MARKET SURVEY (2010), available at http://www.isda.org/statistics/pdf/ISDA-Market-Survey-historical-data.pdf. An IMF study notes that public securities disclosure by major derivatives dealers has improved, but still does not give markets or authorities vital information on credit derivative counterparty risk (let alone liquidity created by credit derivatives). See John Kiff et al., Credit Derivatives: Systemic Risks and Policy Options 25-28 (IMF Working Paper No. 09-254), available at http://www.imf.org/external/pubs/fi/wp/2009/wp09254.pdf. Information clearinghouses on derivatives trading, such as the DTCC Trade Information Warehouse, do track information on many credit derivatives trades. Id. at 28. But it is unclear if this information includes information on collateral and other data necessary to calculate leverage and liquidity in credit derivative markets. Moreover, data on many customized trades, such as those involved in the downfall of AIG are likely not captured by this warehouse. Id. at 28-29. Moreover, this IMF study looks at credit derivatives through the prism of counterparty risk, and does not recommend that derivatives disclosure and information gathering track information relevant to leverage and liquidity.
default. Uncertainty as to future changes in the underlying credit risk make the exposure and economic leverage of the credit protection seller harder to calculate. Credit protection buyers might react to jumps in the credit risk and value of these contracts by changing the collateral required of sellers. Sudden changes in collateral (and thus leverage) mean that the liquidity associated with these credit derivatives would contract (or expand) in a similarly “jumpy” manner.

The jumpy nature of credit derivative values points to a second, more general problem with calculating the liquidity created by credit derivatives. As noted above, the effective leverage of credit derivatives can increase if the underlying credit risk is significantly underpriced. Yet the pricing of credit derivatives is notoriously difficult. Counterparties often use historical data to price credit risk, but the failure to look back far enough in time might cause credit risk to be underestimated. Other pricing approaches borrow from advanced finance theory, such as the Black-Scholes model. But the Black Scholes model relies on numerous assumptions, which at times do not hold in real financial markets. For example, one of those assumptions, that market prices change in continuous time, can be violated during market disruptions. Indeed, Russia’s default on its sovereign debt caused the derivatives pricing models of the Long-Term Capital Management hedge fund to fail spectacularly, triggering a crisis for both that fund and financial markets.

In addition, pricing credit derivatives requires calculating the credit risk of reference assets, such as asset-backed securities, which requires pricing the credit risk of the assets backing those securities. Pricing credit risk as it flows through a long chain of multiple securitizations and credit derivatives requires parties to either trace information back to the ultimate underlying assets (an enormously difficult task) or to rely on the risk calculations of investors or rating agencies earlier in the chain (who may have perverse incentives or have made mistakes). Economists have demonstrated that even small errors in calculating the credit risk of assets are magnified with each subsequent layer of

107 Stulz, supra note 2, at 82.
108 See id.
110 Id. at 97; Gerding, supra note 44, at 141.
111 Meissner, supra note 109, at 97.
113 Id. at 140-47.
114 Coval et al., supra note 43.
115 Gerding, supra note 44, at 161-62.
securitization and derivative hedging of those assets. One particularly problematic error is underestimating correlations among the default risk of various assets or firms. Any of these errors could lead to the underpricing of credit protection in credit derivatives and thus increases in leverage. To estimate this leverage may thus require calculating the extent of systematic underpricing in the market.

Third, the liquidity created by credit derivatives depends on the extent to which lenders replace the risk they hedge with new loans and fresh credit risk; in other words, to what extent does the ability to off-load credit risk through derivatives cause lenders to extend new credit? Fourth, liquidity depends on the extent to which credit protection sellers hedge credit risk; in other words, how long is the chain of credit derivatives? Measuring liquidity thus requires understanding the leverage of each of the parties in the chain.

Even though these effects on liquidity may be difficult to calculate, given the potential for securitization, credit derivatives, and other market-based financing channels to increase liquidity in the economy, it would behoove central banks to track carefully how these channels affect the supply of money over time. Otherwise, monetary policymakers will lack an accurate gauge of the very thing they are trying to affect. However, as Margaret Blair notes, in the years before the 2008 financial crisis the Federal Reserve moved in the opposite direction. Instead of seeking broader metrics of the money supply, in 2006 the Federal Reserve stopped tracking M3, a broader measure of the money supply in the United States that measures some—but not all—of the liquidity injected by the shadow banking system.

116 Coval et al., supra note 43.
117 Id.
118 Blair, supra note 18, at 271-73. The following are the principal components of M1, M2, and M3 according to the Federal Reserve. M1 generally tracks currency in circulation (i.e. currency not held by Federal Reserve banks or in vaults of depository banks), traveler’s checks, demand deposits, and other checkable deposits. M2 generally tracks all of the items in M1 plus savings deposits, certain time deposits less than $100,000, and balances in retail money market deposit accounts. M3 generally covers all of M2 plus large time deposits, balances in institutional money market funds, certain repurchase agreements, Eurodollars, and certain other liquid assets. BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM, THE FEDERAL RESERVE SYSTEM: PURPOSES AND FUNCTIONS 22 (9th ed. 2005).

To capture the contribution of the shadow banking sector to overall liquidity in the economy, Adrian and Shin propose that the Federal Reserve track changes in the aggregate size of balance sheets of market intermediaries such as broker dealers/investment banks. See Tobias Adrian & Hyun Song Shin, Liquidity, Monetary Policy, and Financial Cycles, 14 FED. RES. BANK N.Y., CURRENT ISSUES ECON. & FIN. 1, 5, 7 (2008), available at http://www.newyorkfed.org/research/current_issues/ci14-1/ci14-1.html; Tobias Adrian & Hyun Song Shin, Liquidity and Leverage, 19 J. FIN. INTERMEDIATION 418 (2010).

This is easier said than done. First, it may be easy to measure the balance sheet of large financial institutions, such as investment banks, but harder to measure the assets of special purpose vehicles that issue asset-backed securities. Moreover, many financial institutions exploit securitizations, repos, and other elements of the shadow banking sector to move assets off-balance sheet. The most notorious example is Lehman Brother’s Repo 105 transaction. See ANTON R. VALUKAS, LEHMAN BROTHERS HOLDINGS INC. CHAPTER 11 PROCEEDINGS EXAMINER’S REPORT, VOL. 3, § III.A.4, REPO 105(2010), available at http://lehmanreport.jenner.com/(analyzing how Lehman Brother used a complex repurchase agreement to hide leverage from regulators and the marketplace).
Credit Derivatives, Leverage, and Financial Regulation’s Missing Macroeconomic Dimension

This failure to track broad gauges of the money supply may have had calamitous consequences before and during the global financial crisis. Some economists estimate that, soon after the Federal Reserve stopped tracking M3, that measure of the money supply dramatically increased and sharply diverged from narrower measures of the money supply.\(^{119}\) Central bankers may therefore have missed the inflationary consequences of increased liquidity in the economy. In effect, it is as if the Federal Reserve decided to deactivate one of an airplane’s instruments just as that instrument would have warned that the craft was flying into a storm.\(^{120}\)

C. Leverage Can Fuel Asset Prices and Asset Price Bubbles

That storm was a binge of borrowing and an asset-price bubble in housing. Loose monetary policy or easy credit in an economy can fuel inflation in asset markets and even generate asset price bubbles.\(^{121}\) Conversely, tighter credit can burst bubbles and cause prices in asset markets to plummet.\(^{122}\) Even macroeconomists, such as Ben Bernanke—who have argued that monetary policy should not be used to combat inflation in specific asset markets or to prick asset price bubbles—do not dispute that monetary policy can have this effect.\(^{123}\) Taking a step back from the debate on whether monetary policy should address asset price bubbles (a subject to which Part IV.c below returns), it is clear that simply tracking changes in the liquidity in particular asset markets is critical for policymakers. A failure to measure liquidity in particular

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119. Blair, supra note 18, at 271-73.
120. Tracking M3 would also have given central bankers vital information about the depths of the financial crisis. Economists estimate that M3 entered free fall in 2008 when the crisis hit full bore. Id.
122. Bubbles are notoriously hard economic phenomena to define and identify. Gerding, Laws against Bubbles, supra note 31, at 988-91. Many economists define a bubble as when market prices of an asset class rise above the fundamental value of the assets, i.e. the expected present value of future cash streams of the assets. Id. at 988. That begs the difficult questions (among many) of what would be a reasonable estimate of those future cash streams and what would be an appropriate discount rate. Id. at 988-90.
123. Research in experimental asset markets indicates that allowing investors to borrow money to purchase assets can exacerbate asset price bubbles. Id. at 1030 (citing Ronald R. King et al., The Robustness of Bubbles and Crashes in Experimental Stock Markets, in NONLINEAR DYNAMICS AND EVOLUTIONARY ECON. 183, 188-89 (Richard H. Day & Ping Chen eds., 1993)).
markets (for example, real estate or stocks) can blind central banks and financial regulators to inflationary pressures in those markets.  

D. Feedback Loops: Bubbles Cover Mistakes in Pricing and Assessing Leverage

Booming asset prices and at worse bubbles can create vicious economic feedback loops. For example, a sustained boom in asset prices can mask significant errors in pricing risk in that market. This can be understood by returning to credit derivatives. A boom in an asset class such as residential housing would lower the rate of defaults on loans (mortgages) to investors in that class. As long as credit remains cheap and asset prices rise, investors can either flip the assets or refinance their loans. Lower defaults on these loans would translate into lower defaults on asset-backed securities backed by those loans, as well as lower payouts on credit derivatives that hedge the risk of those asset-backed securities.

This may cause the credit protection seller in credit derivatives to misprice risk for at least three reasons. First, the credit protection sellers generally use models and historical data to price the loans. If the data does not reach back far enough in time to before the price boom, then the prices for the credit derivatives will overly discount the risk of a credit event occurring. Second, agency costs and short-termism among the employees at credit protection sellers may lead to inappropriate pricing of long-term risk; in other words, if the incentives of employees at financial firms skew towards short-term behavior, then the employees may be unlikely to take more conservative, long-term assessments of risk and ride a boom for all its worth. Third, behavioral

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124 See Adrian & Shin, Liquidity, Monetary Policy, and Financial Cycles, supra note 119.
125 Cf. Claudio Borio and Haibin Zhu, Capital Regulation, Risk-taking and Monetary Policy: a Missing Link in the Transmission Mechanism (Bank for Int'l Settlements, Working Paper No. 268, 2008). Borio and Zhu posit that changes in monetary policy may affect financial institution lending and investments through a "risk taking" channel. They argue that changes in monetary policy may alter the perceptions of risk by financial institutions or their tolerance for risk. Id. at 9.
126 Rising prices can mask the flaws in more exotic loans. For example, subprime mortgages have been described as having a binary quality, in which borrowers could afford these mortgages only so long as asset prices rose, credit remained cheap, and borrowers could exit mortgages by flipping the property or refinancing. Stephen G. Ryan, Accounting in and for the Subprime Crisis, 83 ACCT. REV. 1605 (2008).
127 See Gerding, Code, Crash, and Open Source, supra note 44, at 170-71. Economists have seen this same flaw in regulations governing loan loss provisions. If these regulations set loan loss reserves based on loan losses in the previous year or quarter, they may have procyclical effects. As prices rise during a boom period in the cycle, loan losses drop and regulations require less reserves. This frees up banks to make additional loans, which can spur further rises in prices. This feedback loop reverses when prices stagnate or drop. Lower prices can translate into higher loan default rates, which trigger higher reserve requirements. This, in turn, chokes off lending and can further depress asset prices. This feedback loop has led economists to call for dynamic loan loss provisioning regulations to exert a countercyclical effect. Jaime Caruana, Banking Provisions and Asset Price Bubbles, in ASSET PRICE BUBBLES, supra note 121, at 537.
128 Cf. Patrick Bolton et al., Executive Compensation and Short-Termist Behaviour in Speculative
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biases, such as the availability bias, may cause even financially sophisticated professionals to give excessive weight to recent and salient data—price booms—and overly discount older data—price crashes.\(^\text{129}\)

\(E. \text{The Leverage Cycle}\)

Miscalculating risk in credit derivatives can happen at two junctures. First, credit protection sellers can misprice the premiums they charge for credit protection. Second, credit protection buyers can demand too little collateral from the sellers. Market-wide errors in pricing risk can create a vicious procyclical feedback loop as cheaper loans, credit derivatives, and lower collateral requirements push asset prices higher, which can in turn loosen credit and lower collateral requirements even further. Of course, this feedback loop can clang sharply into reverse should asset prices fall and higher default rates cause lenders to tighten credit. Meanwhile, credit protection sellers decrease the sale of credit protection and credit protection buyers raise collateral requirements. All of which stanches the flow of credit, which depresses asset prices further and increases default rates.

This feedback loop meshes with the model of leverage cycles in the economy developed by John Geanakoplos.\(^\text{130}\) Geanakoplos observed that equilibrium in credit markets depends not only on interest rates, but on the margin (or the collateral lenders demand for loans) as well.\(^\text{131}\) Again, the level of margin or collateral for a loan dictates the leverage of the borrower. Geanakoplos theorized that leverage in the economy experiences cycles.\(^\text{132}\) During boom times, lenders demand less collateral and leverage increases.\(^\text{133}\) Increased lending fuels the economy and drives margins lower and leverage higher. When the economy sours, lenders demand more collateral. Reduced leverage and lending throttles back the economy.\(^\text{134}\)

Professor Geanakoplos’s theory receives empirical support from the research of Adrian and Shin, who present evidence that major financial

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\(^{131}\) Geanakoplos, supra note131.

\(^{132}\) Id.

\(^{133}\) Id. Note that the value of non-cash assets held as collateral may also increase during boom times. If the dollar value of collateral stays the same, and assets posted as collateral rise in value, the lender may withdraw assets from collateral and deploy them for other purposes.

\(^{134}\) Id.
institutions dramatically increased their leverage in the boom years in the United States, and then dramatically decreased leverage after crises struck in 1987, 1998, and 2007. They also show that the repo market, which these financial institutions rely on for short-term financing, grew significantly in the boom years leading to the Panic of 2008, peaked in March 2008, and then crashed.

As noted above, the market for credit derivatives exploded in the same period. Bank for International Settlements data reveal a sharp contraction in the size of the credit derivative market once the crisis struck in June 2008, with total notional amounts of CDSs falling over U.S.$27 trillion in the next two years. This suggests that the market for credit derivatives may also behave in a procyclical manner. That is, credit derivative volume may mushroom in boom times and contract during busts. Further research may uncover the extent to which the use of credit derivatives contributes to this boom/bust cycle. Research may also shed light on the extent to which collateral requirements in credit derivatives behave procyclically, i.e., loosening during boom times then tightening as crises strike and intensify.

F. Collective Action

The macroeconomic consequences of credit derivatives (and of the shadow banking sector generally) differ from the counterparty risk problem described in Part I in an important respect. The parties to credit derivatives have less ability and incentive to factor macroeconomic consequences into their decisions to price contracts and set collateral requirements than they do with respect to counterparty risk. Indeed, a party to a derivative contract has (however imperfect) incentives and mechanisms to mitigate its exposure to a counterparty’s default. By contrast, the contribution of one credit derivative to aggregate monetary effects is much harder to see. Counterparties may miss how macroeconomic effects mask mispricing of credit risk. Moreover, even if

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137 *Supra* notes 69-70, and accompanying text.
138 *See* BANK FOR INT’L SETTLEMENTS, QUARTERLY REPORT: STATISTICAL ANNEX A121 (Dec. 2010).
139 Credit derivatives are not the only form of derivative that demonstrates the complex linkages between macroeconomic policy and risk in financial markets. Markets in other OTC derivatives have suffered severe and unanticipated losses due to changes in central bank interest rate policies. For example, the Federal Reserve decision in 1994 to raise interest rates caused massive losses for parties in interest rate swaps. Lawrence Malkin, *Procter & Gamble’s Tale of Woe*, N.Y. TIMES, Apr. 14, 1994. Other macroeconomic policy decisions have sparked financial crises via the transmission line of OTC derivatives. The failure of Long-Term Capital Management (LTCM) in the wake of Russia default on its sovereign bonds provides a salient example. RICHARD BOOKSTABER, A DEMON OF OUR OWN DESIGN: MARKETS, HEDGE FUNDS, AND THE PERILS OF FINANCIAL INNOVATION 97-124 (2007) (describing demise of LTCM). A discussion of the linkages between macroeconomic policies and risk in OTC derivatives markets more broadly is beyond the scope of this article. However, the foregoing examples
counterparties are aware of the macroeconomic effects of credit derivatives, the logic of collective action dulls incentives to counter these affects in individual contracts. Financial institutions and managers that swim against the tide and curb investment in credit derivatives or insist on tighter collateral during boom times may be punished by angry investors. The logic of short-termism and herd behavior can mean that an individual credit derivative counterparty can do little to counteract the macroeconomic effects of credit derivatives; when the music keeps playing, you keep dancing.

V. IMPLICATIONS

Less ability and incentive for individual firms to counter cyclical macroeconomic effects opens a greater potential role for government action. The macroeconomic effects of credit derivatives and other financial instruments that create leverage argue for adding a macroeconomic dimension to the regulation of these contracts. Regulators or central banks must consider not only counterparty risk, but also macroeconomic factors when monitoring and regulating the leverage of credit derivatives.

This final Part explores some of the policy implications of credit derivatives’ macroeconomic dimension. Of course, many different kinds of financial instruments and regulations can alter the leverage of financial institutions and the liquidity this leverage creates. Accordingly, this Part uses credit derivatives as a vehicle to explore broader themes. In particular, it analyzes the linkage between prudential regulation of financial institutions and other financial regulations, on the one hand, and monetary policy, on the other.

A. The Need for Coordination

This brief Article points to a need to coordinate macroeconomic/monetary policy with financial regulation. An increase in liquidity from credit derivatives or the shadow banking sector should inform monetary policymakers as they

\[\text{Cf. Markus K. Brunnermeier & Stefan Nagel, }\textit{Hedge Funds and the Technology Bubble,}\textit{ 59 J. FIN. 2013, 2030-32 (2004) (providing an example of a hedge fund that was forced to liquidate after refusing to invest in technology stocks during the 1990s tech stock bubble).}\]

\[\text{See Gerding, }\textit{Laws Against Bubbles,}\textit{ supra note 31, at 996-99 (describing economics of herd behavior during bubbles and behavioral finance accounts of bubble formation). The music metaphor is a paraphrase of a famous quote from Citigroup CEO Charles Prince during the height of the recent bubble, in which he explained his firm’s continued bullish investments with the following statement: “When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you’ve got to get up and dance. We’re still dancing.” See Brunnermeier, }\textit{supra note 55, at 82 (providing quote).}\]
seek to manipulate market interest rates. Similarly, changes in macroeconomic conditions can impact the effectiveness of prudential bank regulations. The discussion above of how asset price booms can mask mispricing of risk provides one such example, and scholars are increasingly finding others. For instance, economists have found that loan loss reserve regulations have functioned in a procyclical manner. More recently, the burgeoning literature on macroprudential regulation has included calls for further integrating macroeconomic policy and financial regulation.

These calls for integration have historic precedent, as previous financial crises have led to similar calls for integrating macroeconomic policy and traditional financial regulation. For example, in the wake of financial crises in Sweden, Norway, and Finland in the early 1990s, scholars made this same call for integration. These "scholars were driven by a concern that the cocktail of deregulation of financial institutions and monetary growth could create dangerous feedback loops. Australian scholars have reached the same conclusion on integration after studying the history of financial crises in their nation.

The discussion below argues that regulations concerning credit derivatives—or other financial regulations that govern financial institution leverage—can be used as macroeconomic or monetary tools. But macroeconomic considerations alone should not dictate the regulation of these instruments. Macroeconomic goals need to be balanced with traditional microeconomic objectives, such as promoting the safety and soundness of financial institutions. Often, these goals will converge; when this occurs, regulatory actions taken to mitigate the risk to individual financial institutions

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142. See Caruana, supra note 128, at 537. Loan loss provisions can have procyclical effects in the following manner. As the economy booms, fewer loans default. Traditional loan loss rules that only look at defaults during a limited previous time period then allow banks to lower reserves. This frees up additional lending, which further stimulates the economy. This feedback loop can lurch into reverse if markets crash and loan defaults spike. Those same loan loss rules require banks to increase reserves and cut back lending, which can further depress markets and increase loan defaults.


would also promote long term monetary or macroeconomic stability. This is low-hanging fruit. Other times, regulatory actions that safeguard individual financial institutions may have uncertain or even counterproductive macroeconomic effects. This potential for conflict between micro- and macro-goals is one of the core areas that the literature on macroprudential regulation explores.  

A growing literature has advocated instituting countercyclical regulations to increase bank reserves during boom times and relax them in downturns. Making these regulations more automatic would insulate regulators from political pressure to let banks continue to drink from the punchbowl even after the party has gotten out of hand. However, these regulations demand high quality models to determine where the economy is in the cycle and to measure the effects of the regulations. Moreover, macroeconomic objectives may not always align with promoting the safety and soundness of individual financial institutions. Some discretion is necessary to allow regulators to take regulations off autopilot to balance competing policy objectives, adjust for economic circumstance not reflected in the models, and adapt regulations to new contexts.

B. Dodd-Frank and the Missing Macroeconomic Dimension of Credit Derivative Regulation.

Of more immediate concern inside the Beltway, the macroeconomic effects of credit derivatives argue for at once a more nuanced and a broader understanding of the provisions of the Dodd-Frank Act on OTC derivatives. The Dodd-Frank Act includes two important provisions on OTC derivatives. First, the Act generally requires that OTC derivatives be traded on exchanges and subject to central clearing.

Dodd-Frank § 721(a)(21) (to be codified in 7 U.S.C. § 1a(47)(B)). Second, the clearing requirement in Section 723(a) has a circularity problem. Swaps are required to be cleared on a registered derivatives clearing organization "or a derivatives clearing organization that is exempt from registration. If the swap is required to be cleared." Dodd-Frank § 721(a)(3) (to be codified at 7 U.S.C. § 2(h)(1)(A)). Third, the statute gives regulators the ability to grant broad exemptions for clearing requirements. E.g., Dodd-Frank § 721(a)(3) (to be codified at 7 U.S.C. § 2(h)(2)). Press accounts indicate that regulators are already looking to use their statutory authority to exempt broad classes of financial instruments from exchange trading and clearing requirements. See Robert Kuttner, Blowing a Hole in Dodd-Frank, AM. PROSPECT, Mar. 18, 2011 (describing controversy over Treasury Secretary’s decision to exempt foreign currency derivatives).
primarily on microeconomic grounds. Scholars and policymakers have advocated moving derivatives to exchange trading to encourage continuous and transparent pricing of risk. Advocates tout central clearing as a means to mitigate counterparty risk. Central clearing would insert a clearing entity between derivative counterparties. By becoming counterparty to both sides of derivative trades, the clearing entity would centralize counterparty risk, which it would then mitigate by requiring position limits and collateral requirements of all counterparties. Second, the Act authorizes Federal regulators to set collateral requirements for those derivatives exempted from the exchange trading and central clearing mandate. Dodd-Frank explicitly frames the authority for regulators to set collateral requirements for non-cleared derivatives as an anti-evasion device for the central clearing requirement.

These two components of Dodd-Frank may be at once too broad and too narrow. They may paint with too broad a brush in that they apply to all OTC derivatives. Credit derivatives merit different treatment by virtue of their unique capacity to inject liquidity into credit markets. At the same time, in writing regulations to implement these statutory provisions, regulators may see the functions and effects of these rules in solely microeconomic terms and miss the larger macroeconomic dimension. This Article demonstrates that increasing collateral requirements for credit derivatives could affect the supply of liquidity to the asset markets associated with those derivatives.

C. The Missing Macroeconomic Dimension of Leverage Regulations Generally

The macroeconomic dimension of collateral requirements for derivatives also highlights the macroeconomic potential of a host of other regulations that require financial institutions to hold greater capital in reserve or restrict their leverage. These financial regulations include capital requirements, direct...
caps on the leverage of a financial institution, \(^{157}\) loan-to-value requirements, \(^{158}\) bank taxes based on the size of balance sheets, \(^{159}\) and even credit retention requirements in a securitization\(^{160}\).

This last category merits special consideration. After the Panic of 2008, policymakers became concerned that when the lenders that originate mortgages or other loans sell these assets to an investment vehicle (the first stage in Diagram C above), their incentive to check the creditworthiness of borrowers dulls. \(^{161}\) This concern generated numerous proposals, including a provision ultimately found in the Dodd-Frank Act that requires regulators to consider new rules requiring originating lenders to retain a portion of loans sold in a securitization. \(^{162}\) But, as with credit derivatives and counterparty risk, credit retention comprises only the microeconomic half of the story. Requiring that lenders hold onto part of their loans restricts the capital they can deploy for new loans and thus throttles back the amount of additional credit that can flow back to consumers and businesses. In fact, credit retention is one of the few places in which the Dodd-Frank Act explicitly recognizes the macroeconomic capacity of financial regulations. \(^{163}\) In sum, a host of prudential regulations must now be thought of not only in microeconomic terms, but also in terms of their monetary or macroeconomic impact.

\section*{D. An Expanded Toolbox for Monetary Policy; Fighting Bubbles?}

The potential macroeconomic impact of these regulations, including collateral regulations for credit derivatives, leads naturally to questions on whether these regulations could and should be used as instruments of monetary regulators to establish capital requirements for supervised banks). But capital requirements also feature regulation of other types of financial institutions. For example, the SEC imposes capital requirements on registered broker-dealers. Net Capital Requirements for Brokers or Dealers, 17 C.F.R. § 240.15c3-1 (2009).

\(^{157}\) Id.

\(^{158}\) Id.

\(^{159}\) Id.

\(^{160}\) Dodd-Frank Act § 941.

\(^{161}\) Supra note 160.

\(^{162}\) Supra note 160.

\(^{163}\) Section 946 of the Act requires the new Financial Services Oversight Council to conduct a study on the macroeconomic effects of credit retention regulations for securitizations, including whether such requirements would dampen asset price bubbles.Dodd-Frank Act § 946. Unfortunately, the resultant study missed the monetary potential of credit retention requirements and focused instead on how these rules could address the lemons problem in securitization. FINANCIAL STABILITY OVERSIGHT COUNCIL, MACROECONOMIC EFFECTS OF RISK RETENTION REQUIREMENTS (2011), available at http://www.treasury.gov/initiatives/wst/Documents/Section%20946%20Risk%20Retention%20Study%20%20%20%20FINAL.pdf.
policy. Might regulations concerning the collateral for credit derivatives—
together with other regulations governing financial institution leverage such as
capital requirements and leverage caps—offer new tools in the macroeconomic
toolbox? New tools might tip the scales in an old debate among
macroeconomists: could these tools allow central banks and economic
collectors to target inflation in particular asset markets more surgically?
Plainly stated, could collateral regulations help combat asset price bubbles?

The last generation of macroeconomists waged a fierce debate over whether
monetary policy should be used to combat inflation or potential bubbles in
particular asset markets. One camp, led by former Princeton economist and
now Federal Reserve Chairman Ben Bernanke, argued that central banks could
not identify asset price bubbles ex ante with confidence.164 However, in the
wake of the Panic of 2008, central bankers in other countries have become
more comfortable with the ability and necessity of their institutions to
use judgment to combat bubbles.165

Yet even increased comfort with the use of judgment does not address
another concern with using monetary policy to combat bubbles. When central
banks use their traditional tools—(1) changing the interest rates for their loans
to banks, and (2) open market operations in which they purchase or sell
bonds—the banks change interest rates throughout the entire economy. Across-
the-board changes to interest rates can have spillover effects for other areas of
the economy beyond the particular asset market that is overheating.166 For
example, raising interest rates to dampen prices in housing markets would
impact other asset classes, such as commercial real estate or stock markets, as
well as affect employment, currency exchange rates, foreign trade, and a raft of
other economic sectors.167 Ben Bernanke captured this concern with a lurid
comparison of using monetary policy to combat asset price bubbles to
conducting “brain surgery with a sledgehammer.”168

164 Bernanke & Gertler, supra note 124.
165 Mark J. Carney, Commentary: Using Monetary Policy to Stabilize Economic Activity,
http://www.kansascityfed.org/publicat/sympos/2009/papers/carney.08.22.09.pdf; Andrew Mountford,
Leaning into the Wind: A Structural VAR Investigation of UK Monetary Policy, 67 OXFORD
BULL. ECON. & STAT. 597 (2005). These central bankers have aligned with a view of one
camp of macroeconomists that monetary policy can and should be used to dampen inflation in
particular asset markets. See, e.g., STEPHEN CECCHETTI ET AL., ASSET PRICES AND CENTRAL BANK
POLICY (2001). At least until the current global financial crisis, the dominant view among
macroeconomists is that monetary policy should not address potential bubbles. See Benjamin M.
Friedman, Comments on Implications of Bubbles for Monetary Policy, in ASSET PRICE BUBBLES:
THE IMPLICATIONS FOR MONETARY, REGULATORY, AND INTERNATIONAL POLICIES, supra note 121,
at 459, 460.
166 See, e.g., Frank H. Westerhoff and Cristian Wieland, Spillover Dynamics of Central Bank
167 GERDING, BUBBLES, FINANCIAL REGULATION, AND LAW, supra note 150.
168 Governor Ben S. Bernanke, Remarks at the New York Chapter of the National Association for
Expanding the monetary toolbox, however, could provide macroeconomic policymakers with a set of scalpels. Regulators could narrowly tailor rules such as collateral requirements for credit derivatives or capital requirements for banks for specific classes of assets. For example, regulators could require higher collateral requirements for a credit derivative that hedges credit risk from mortgages. Regulations could require higher bank capital for loans to specific economic sectors. Regulators could then calibrate these asset-class-specific regulations when particular asset markets appear to overheat or collapse. To continue the airplane metaphor introduced above, these tools would provide pilots with finer controls of trim.

This use of prudential regulation for monetary policy has precedent. Reserve requirements for banks used to be one of the tools for effecting monetary policy before falling largely into disuse in the twentieth century. Federal margin rules provide another example. These rules, introduced in the New Deal, restrict the ability of banks and broker dealers to lend money to investors to purchase stock. These regulations stemmed from concerns in the wake of the 1929 Crash that credit had fueled excessive speculation. In response, the U.S. Securities Exchange Act of 1934 gave the Federal Reserve the responsibility to establish margin regulations and the SEC the responsibility to enforce them. The Federal Reserve has passed separate regulations restricting the extension of credit by broker-dealers, banks, and all other types of lenders. The fact that Congress gave the Federal Reserve responsibility for setting the level of margin regulations suggests that policymakers realized that a broader policy kit was necessary for addressing overheating markets and that monetary policymaking might encompass other tools.

More recently, Chinese policymakers have deployed capital requirements and blunter restrictions on bank lending to curb possible asset price bubbles in that country’s stock and real estate markets. Some 2011
accounts credit the Chicago Mercantile Exchange’s decision to raise margin requirements on silver futures with popping a global commodities bubble.\footnote{177}{William Neuman & Graham Bowley, Response to Volatility in Silver Takes Hold, N.Y. TIMES, May 8, 2011, at B1. However, officials of that exchange deny using margin requirements as a tool to affect prices on the exchange.\footnote{178}{Evasion of margin regulations is truly nothing new under the sun. See Martin Lipton, Some Recent Innovations to Evade the Margin Regulations, 46 N.Y.U. L. REV. 1 (1971). \footnote{179}{Robert F. Weber, New Governance, Financial Regulation, and Challenges to Legitimacy: The Example of the Internal Models Approach to Capital Adequacy Regulation, 62 ADMIN. L. REV. 783, 793 (2010) (describing how and why firms engage in arbitrage of regulatory capital requirements). \footnote{180}{For a typology of forms of regulatory arbitrage, see Victor Fleischer, Regulatory Arbitrage, 89 TEXAS L. REV. 227 (2010).} The narrowness of these “new” monetary tools comes at the cost of effectiveness. Because “traditional” or “sledgehammer” tools of monetary policy, such as central bank lending and open market operations, can raise interest rates across-the-board, they are hard to evade. Narrower monetary regulations, on the other hand, such as collateral regulations for credit derivatives and capital requirements, can be sidestepped by market participants. For example, higher collateral requirements for derivatives in the United States might cause financial institutions to seek counterparties abroad or move derivatives operations offshore. Restrictions on broker-dealers or banks lending to investors encourage those investors (with the help of lawyers) to seek credit from other sources.\footnote{178} Investors and financial firms can exploit the incompleteness of regulations and develop workarounds, as witnessed by the continuing gamesmanship of capital requirements.\footnote{179} Moreover, restrictions on loans or investments in a particular asset class may simply drive investors to close, but less regulated economic substitutes. In sum, regulatory arbitrage in all its varieties may limit the effectiveness of financial regulations as tools of monetary policy.\footnote{180}
E. The Macroeconomist's Blind Spot: Arbitrage, Deregulation, and other Regulatory Change

Nevertheless, the potential for arbitrage of regulations leads to the conclusion that central banks and macroeconomic policymakers must closely track changes in the effectiveness of these regulations. If regulatory arbitrage, deregulation, or deteriorating legal compliance allow financial institutions to take on more leverage, then liquidity or the effective money supply may increase regardless of whether or not leverage regulations are used as monetary tools. Yet regulatory change—whether from regulatory arbitrage, deregulation, or deteriorating compliance—remains a blindspot for macroeconomic policy makers. As noted above, the Federal Reserve decided to narrow its tracking of the money supply at the same time that alternative lending and liquidity-creating channels began to turbo-charge the economy. Central banks largely missed the macroeconomic significance of the mushrooming shadow banking system.181

The shadow banking system is largely a creature of regulatory arbitrage. The development of shadow banking over the last three decades is in fact regulatory arbitrage writ large. Financial institutions developed new financial instruments, such as asset-backed securities and credit derivatives, to connect borrowers to capital markets because of the heavy regulatory costs borne by the traditional banking sector.182 As a case in point, money market funds, a proto-shadow banking institution, first flourished because they could offer investors higher interest rates than federally regulated bank deposits under Regulation Q.183 CDSs themselves were carefully crafted to avoid regulation as bond insurance.184 In turn, competition from the booming credit derivatives market encouraged regulated monoline bond insurers to take further risks in their underwriting.185

Furthermore, shadow banking institutions flourished in an environment of deregulation.186 Professor Arthur Wilmarth describes how the repeal of the Glass Steagall Act's division between commercial and investment banking (together with the loosening of other financial regulations) stimulated the growth of securitization, OTC derivatives, and other elements of shadow

181 See supra notes 118-120 and accompanying text.
183 ERIK F. GERDING, BUBBLES, FINANCIAL REGULATION, AND LAW, supra note 149150; Cf. Birdthistle, supra note 62, at 1174.
184 Cf supra note 35 and accompanying text.
185 ERIK F. GERDING, BUBBLES, FINANCIAL REGULATION, AND LAW, supra note 150149.
186 For a more elaborate explanation of how deregulation fueled the growth of shadow banking, see Gerding, The Shadow Banking System, supra note 33.
Other, subtler forms of deregulation also contributed to the growth of credit derivatives and shadow banking. Deregulation encompasses not only the repeal of statutes and regulations, but also new statutes that preempted regulatory action. Consider how the Commodities Futures Modernization Act of 2000 precluded regulation of OTC derivatives by states, the SEC, and the Commodity Futures Trading Commission. Deregulation can take even softer forms when courts and agencies change interpretations of existing regulations or regulators resist applying or enforcing existing rules to new contexts.

Regardless of the form that legal change takes—whether regulatory arbitrage or any of the forms of deregulation—regulators must be aware of this change in order to understand its monetary and macroeconomic consequences. Macroeconomists and central bankers have much to learn from prudential regulators and legal scholars about when and how legal change is occurring. For instance, legal experts might alert macroeconomists to subtler forms of deregulation, such as changing interpretations of derivative regulations. Conversely, macroeconomists might explain to lawyers and regulators the potential macroeconomic consequences of such changes.

F. Gathering Information

Even with no regulatory arbitrage or deregulation, it is important for regulators and monetary policymakers to understand and measure the monetary impacts of credit derivatives (and other elements of the shadow banking system) as of today. As noted above, it is hard to calculate the monetary effects of credit derivatives with the currently available public information. The need to develop better measures of liquidity reveals yet another collateral benefit of Dodd-Frank’s credit derivative regulations. Moving credit derivatives to exchanges and setting collateral requirements for other credit derivatives would allow central bankers to gather vital data on credit derivatives, the asset markets they affect, and the leverage they create. Indeed, knowing is half the battle.

The need for more information on credit derivatives and leverage makes
some of the more obscure and less sexy provisions of the Dodd-Frank Act particularly vital. Various sections in Title VII of the statute give the Commodity Futures Trading Commission ("CFTC") the authority to pass new regulations to gather information from swap counterparties and clearing organizations.\(^{193}\) The CFTC should use this authority to create systems to gather vital information on the macroeconomic impact of credit derivatives. These systems could track not only the volume of credit derivatives generally. They could also gauge the pricing of those derivatives and, most importantly, changes in the overall collateral that counterparties require under credit derivatives (above and beyond any collateral required by regulators pursuant to Dodd-Frank). Indications of whether leverage requirements are tightening or loosening in the aggregate can provide a sense of changes in overall market liquidity. If regulators could gather more finely grained information on credit derivatives that relate to particular asset classes, they could then track changes in leverage and liquidity in particular asset markets, not just on an aggregate level.

Information, however, is of little use unless it reaches the right policymaker. The CFTC, a prudential regulator that oversees particular markets, has little authority or incentive to consider monetary factors in its decisions.\(^{194}\) Dodd-Frank creates a number of other institutions that may facilitate the transfer of information among regulators and central bankers. Most notably, the new Financial Stability Oversight Council ("FSOC") creates a forum for regulators, including the Federal Reserve.\(^{195}\) The new Office of Financial Research is tasked with gathering information from financial institutions for use by the FSOC.\(^{196}\)

The rub is that the staff of these bodies needs to understand the macroeconomic dimensions of the data they collect from financial institutions and regulators, whether with respect to credit derivatives or other financial instruments. In order for this to happen, mindsets need to change. Data on margin and leverage are relevant not only to concerns about counterparty risk and prudential regulation.

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\(^{193}\) See, e.g., Dodd-Frank Act § 727 (requiring public reporting of certain swap transaction data); §728 (authorizing CFTC to pass regulations to govern swap data repositories); §729 (authorizing CFTC to pass regulations to add additional reporting and recordkeeping requirements for uncleared swaps); §730 (authorizing CFTC to pass rules requiring additional reports from large swap traders).

\(^{194}\) Compare 7 U.S.C § 5 (listing purposes of the Commodity Exchange Act and the CFTC).

\(^{195}\) Dodd-Frank Act §§ 111-112 (establishing FSOC and its authority).

\(^{196}\) Dodd-Frank Act §§ 151-154.
G. Institutional Design

More effective information flow and better decisions require a thorough rethinking of the architecture and institutional design of financial regulation. This leaves the messy questions of how to integrate macroeconomic policy and financial regulation. Academics still lack a coherent set of theories on institutional design to guide how financial regulatory authority should be divided among various regulators. Academics face the further challenge of studying how prudential regulation and macroeconomic regulation should be coordinated among regulators and central banks. Much scholarly work remains.

H. The Academic Gap: Towards ‘Law and Macroeconomics’

Part of the challenge is changing the mindset and capacities of the individuals working at central banks and regulatory agencies. Institutional design requires intellectual capital. If macroeconomic policy is to be better integrated with prudential regulation, then academics must build bridges to span the yawning gulf between macro- and microeconomics. This gulf creates a spot in which the macroeconomic consequences of microeconomic phenomena can escape attention and crises can incubate. In the legal academy, there is a nascent movement to integrate macroeconomics into the study of law.

On the bright side, the field is open and the list of items on the research agenda long. A number of legal scholars have begun to sketch out macroprudential problems for financial regulation; that is, when regulations that focus on the safety and soundness of individual financial institutions can perversely undermine the stability of the financial system. This Article meshes with that scholarship, but it also argues that there are other linkages by which financial regulations can have aggregated effects on the economy—

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197. See RICHARD A. POSNER, A FAILURE OF CAPITALISM: THE CRISIS OF '08 AND THE DESCENT INTO DEPRESSION 231-32 (2009) (arguing that the crisis provided a “wake-up call to the economics profession” and underscored the need to integrate macroeconomics with work in finance theory on the operation of financial markets).

198. See supra notes 29-31 and accompanying text. Other legal scholars have looked at other connections between law and the macroeconomy, such as how the development of legal institutions can promote economic growth. E.g., Adam Feibelman, Consumer Bankruptcy as Development Policy, 39 SETON HALL L. REV. 63 (2009). Still other scholars have focused on regulatory change as a means to stimulate innovation and thus macroeconomic growth. See, e.g., John E. Tyler and Peter H. Schuck, U.S. Policy Regarding Highly Skilled Immigrants: Change Whose Time Has Come, in THE KAUFFMAN TASK FORCE ON LAW, INNOVATION, AND GROWTH, RULES FOR GROWTH: PROMOTING INNOVATION AND GROWTH THROUGH LEGAL REFORM 83 (2011) available at http://www.kauffman.org/uploadedfiles/Rules-for-Growth.pdf.

Credit Derivatives, Leverage, and Financial Regulation's Missing Macroeconomic Dimension

namely, by affecting the money supply.

Understanding these effects requires legal scholars to consider issues outside of their comfort zone and enter the domain of macroeconomics.

In that domain, models and empirical data can help map out the monetary or other macroeconomic impacts of regulatory change. Given the opacity of OTC derivatives, we have imperfect data about how privately negotiated collateral requirements for these instruments changed before and during the current financial crisis. We lack a firm understanding of the monetary impact that future collateral requirements for credit derivatives, reserve requirements for banks, or other leverage regulations may have.

If macroeconomics can inform legal scholarship, legal scholars in turn have much to contribute to macroeconomics. Leverage regulations are not automatic, self-executing computer programs. These regulations require interpretation by regulators and the private sector. They are subject to non-compliance, evasion, regulatory arbitrage, and even roll-back. Legal change is continuous. As noted above, understanding legal change—whether from regulatory arbitrage, deregulation, or changing levels of compliance—is also critical to understanding changes in leverage and macroeconomic impacts.

There is much work to do. This Article has had a more modest objective with respect to the study of financial regulation and macroeconomics: only connect.  

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