

2017

## Investor-Driven Financial Innovation

Kathryn Judge

*Columbia Law School*, [kjudge@law.columbia.edu](mailto:kjudge@law.columbia.edu)

Follow this and additional works at: [https://scholarship.law.columbia.edu/faculty\\_scholarship](https://scholarship.law.columbia.edu/faculty_scholarship)



Part of the [Banking and Finance Law Commons](#), [Business Organizations Law Commons](#), and the [Law and Economics Commons](#)

---

### Recommended Citation

Kathryn Judge, *Investor-Driven Financial Innovation*, 8 HARV. BUS. L. REV. 291 (2017).

Available at: [https://scholarship.law.columbia.edu/faculty\\_scholarship/2064](https://scholarship.law.columbia.edu/faculty_scholarship/2064)

This Article is brought to you for free and open access by the Faculty Publications at Scholarship Archive. It has been accepted for inclusion in Faculty Scholarship by an authorized administrator of Scholarship Archive. For more information, please contact [scholarshiparchive@law.columbia.edu](mailto:scholarshiparchive@law.columbia.edu).

# INVESTOR-DRIVEN FINANCIAL INNOVATION

KATHRYN JUDGE\*

*Financial regulations often encourage or require market participants to hold particular types of financial assets. One unintended consequence of this form of regulation is that it can spur innovation to increase the effective supply of favored assets. This Article examines when and how changes in the law prompt the spread of “investor-driven financial innovations.” Weaving together theory, recent empirical findings, and illustrations, this Article provides an overview of why investors prefer certain types of financial assets to others, how markets respond, and how the spread of investor-driven innovations can transform the structure of the financial system. This examination suggests that investor-driven innovations can enhance efficiency and provide other benefits, but they can also increase complexity, interconnectedness, and rigidity in ways that render the financial system as a whole more fragile. This Article thus draws attention to a core mechanism through which legal changes affect the structure and resilience of the financial system.*

*This Article provides a framework for identifying the regulatory changes most likely to trigger investor-driven innovation, a critical first step toward improving rulemaking to reduce the likelihood of unintended consequences. The framework focuses attention on the need to develop an appropriate baseline when assessing the impact of an intervention and the need to cover the costs of innovation. This frame reveals that the regulations often blamed for contributing to bad forms of innovation are probably less transformative than commonly believed. Meanwhile, interventions outside the current debate could have important systemic effects.*

*The main policy implication is that, when the framework warrants, regulators should assess how a proposed rule change is likely to impact investor preferences, the types of innovations that might arise or spread in response, and how the intervention might otherwise affect the financial system structure. Focusing attention on a specific mechanism through which legal changes can inadvertently alter the structure of the financial system can help regulators develop the data, models, and mindset they need to assess the systemic ramifications of their actions.*

## TABLE OF CONTENTS

I.	THE BASICS . . . . .	296
	A. <i>Two Stories</i> . . . . .	296
	B. <i>The Framework</i> . . . . .	300
	C. <i>Situating the Contribution</i> . . . . .	302
II.	CONSTRAINED CAPITAL . . . . .	307
	A. <i>Money and Other Safe Assets</i> . . . . .	307
	B. <i>Use of Proxies to Facilitate Monitoring</i> . . . . .	313

---

\* Professor of Law, Columbia University. The author would like to thank Anthony Casey, John Armour, Jeff Gordon, Gillian Hadfield, David Skeel, Daniel Schwarcz, Claire Hill, and participants at the Oxford Capital Markets Union Conference, the Wharton Conference on Financial Regulation, the USC Law & Economics Workshop, the University of Minnesota Law & Economics Workshop, the Columbia Law Faculty Workshop, the Annual Law & Economics Conference hosted by Yale Law School, and the Business Law Conference at the University of Colorado for helpful comments and suggestions.

III.	INVESTOR PREFERENCES AND FINANCIAL INNOVATION . . . . .	320
	A. <i>Investor-Driven Financial Innovation</i> . . . . .	320
	1. The Building Blocks . . . . .	320
	a. <i>Securitization</i> . . . . .	320
	b. <i>Derivatives</i> . . . . .	322
	2. Some Examples . . . . .	323
	a. <i>MBS</i> . . . . .	323
	b. <i>CDOs</i> . . . . .	324
	c. <i>Asset-backed Commercial Paper</i> . . . . .	325
	d. <i>Exchange-traded Funds</i> . . . . .	326
	B. <i>The Consequences</i> . . . . .	328
	1. Some Benefits . . . . .	328
	2. The Changing Risks . . . . .	330
	a. <i>Identifiable Risks Borne by the Parties</i> <i>Involved</i> . . . . .	330
	b. <i>Context-dependent Risks</i> . . . . .	330
	c. <i>Systemic Risk</i> . . . . .	331
IV.	REGULATION, PREFERENCES, AND INNOVATION . . . . .	334
	A. <i>The Role of Regulation</i> . . . . .	335
	1. Substitute for Private Monitoring . . . . .	335
	2. Other Policy Aims . . . . .	336
	3. Indirect Effects . . . . .	338
	B. <i>The Importance of Price</i> . . . . .	341
V.	IMPLICATIONS FOR POLICYMAKING . . . . .	342
	A. <i>Investor Demand and Innovation Analysis</i> . . . . .	343
	B. <i>Two Starting Points</i> . . . . .	344
	C. <i>Regulatory Architecture</i> . . . . .	345
	D. <i>Bigger Picture</i> . . . . .	346
VI.	CONCLUSION . . . . .	348

## INTRODUCTION

Today's financial markets would be unrecognizable to those even at the forefront of finance a few decades ago. Starting with the leveraged buyout boom of the 1980s, banks and other financial institutions have created an almost endless array of new financial instruments.<sup>1</sup> The current excitement around "fintech" is merely the most recent iteration of an ongoing process of innovation that has fundamentally transformed the structure of the financial system. Despite the recognized importance of financial innovation, the forces driving innovation and the consequences of that innovation remain incompletely understood and under-theorized.<sup>2</sup> This Article helps to fill this gap.

<sup>1</sup> See *infra* Parts I–II.

<sup>2</sup> See *infra* Part I.C.

This Article examines the ways that innovations arise and spread to accommodate investor preferences. Much of modern corporate finance rests on the assumption that investors care only about maximizing their risk-adjusted returns.<sup>3</sup> Even if some investors prefer certain types of financial assets, those preferences are assumed to disappear in the aggregate as other investors rebalance their portfolios accordingly. This assumption has enabled economists to craft and refine a cohesive framework for pricing a wide array of financial assets. At the same time, in emphasizing substitutability across financial asset types and investors' interests in maximizing returns at the portfolio level, this frame cannot illuminate—and instead has tended to obscure—the related questions of what types of financial assets get produced and why. Taking investor preferences seriously helps to answer these questions and can explain a meaningful swathe of financial innovation.

Once investors value financial instrument characteristics other than risk-adjusted returns, innovative methods that increase the effective supply of the desired instruments become viable. These innovations can entail repackaging cash flows from existing financial instruments, using derivatives to create new instruments with the desired characteristics, or combining these and other innovative techniques.<sup>4</sup> By finding new ways to connect capital on the one hand, and value-creating projects on the other, financial innovations driven by investor demand can promote price efficiency and lower financing costs. Other ramifications, however, are less benign. Investor-driven innovation often entails the creation of complex new structures, new interconnections, and new types of instruments. These developments increase rigidity, create new mechanisms for contagion, and lead to new information gaps.<sup>5</sup> Investor-driven financial innovations can thus contribute to systemic fragility and, at times, may even inhibit efficiency.<sup>6</sup>

Of particular importance are the ways that legal interventions can dampen and accentuate these dynamics. Whenever a law requires or incentivizes institutions to hold particular types of financial assets, the law can

---

<sup>3</sup> See, e.g., Assar Lindbeck, Professor of the Royal Swedish Academy of Sciences, Award Ceremony Speech, The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1990 (Dec. 10, 1990), (transcript available on the official website of the Nobel Prize) (explaining that the capital asset pricing model, which “has become the backbone of modern price theory of financial markets,” “shows that the optimum risk portfolio of a financial investor depends only on the portfolio manager’s prediction about the prospects of different assets, not on his own risk preferences”); Stephen A. Ross & Lawrence E. Blume, *finance*, in THE NEW PALGRAVE DICTIONARY OF ECON. (Steven N. Durlauf et al. eds., 2d ed., 2008) (stating that “one of the central intuitions of finance” is “that close substitutes have the same price” and providing an overview of the main theoretical models, each of which assume that individual investor preferences do not affect the pricing of financial assets).

<sup>4</sup> See *infra* Part II.

<sup>5</sup> See *infra* Part III.B.2.

<sup>6</sup> See *infra* Part III.B.2. This Article is solely about the ways that constrained capital contributes to systemic risk via innovation. Constrained capital can also increase systemic risk through other mechanisms. See *infra* Part III.B.2.

increase demand and drive innovation.<sup>7</sup> Although this is not a new insight, policymakers and others involved in the ongoing debates about financial regulation routinely ignore these dynamics.<sup>8</sup> This Article brings into focus the systemic costs of this failure to grapple with the ways the law can drive innovation. It also provides concrete guidance for how to improve the rulemaking process to address these dynamics.

This Article's first contribution is descriptive. This Article provides one of the first comprehensive accounts of "investor-driven financial innovation"—what it is, when it arises, and why it matters. This account brings together empirical evidence demonstrating that investor demand affects financial asset pricing and production with an institutional account of the reasons for demand discontinuities, how these discontinuities have led to particular financial innovations, and some consequences of those innovations. In weaving together findings from different fields of study, this analysis is more than just the sum of its parts. It instead paints a new and more striking picture of the importance of constrained capital in driving innovation than could be gleaned from any of the source materials. In so doing, it helps to answer the fundamental questions that persist regarding the reasons for financial innovation.<sup>9</sup>

This Article's second contribution is to identify the legal interventions most likely to trigger innovation. That financial market participants will seek to minimize the cost of regulatory compliance, creating the possibility of unintended consequences, is well known. The focus here is on a specific mechanism: When will a law so alter investor preferences as to encourage innovation? In providing a framework to answer this question, the analysis here goes within and beyond generalized notions of regulatory arbitrage to

---

<sup>7</sup> Also important but beyond the scope of this Article are the ways the government can crowd out private innovation by increasing the supply of favored assets. See *infra* Part V.B.

<sup>8</sup> A number of experts have recognized that particular regulations, like the risk-based prudential requirements imposed on banks, may have contributed to the spread of financial innovations at the heart of the Crisis. See, e.g., Stijn Claessens, Lev Ratnovski & Manmohan Singh, IMF Staff Discussion Note, *Shadow Banking: Economics and Policy* 12–13 (Dec. 2012) (identifying banks, especially in Europe, as a major source of demand for securitized assets pre-Crisis, and explaining how banks could use these assets to reduce regulatory burdens); Erik Gerding & Anna Gelper, *Inside Safe Assets*, 33 YALE J. ON REG. 363, 398 (2016) (explaining how regulatory requirements that mandate or incentivize regulated entities to hold particular types of assets "tell potential buyers that an asset is safe, or at least safe enough for their purposes," and "can deter market-based information discovery, promote information insensitivity, and boost the liquidity of labeled assets"); Ben S. Bernanke et al., Int'l Fin. Discussion Papers, *International Capital Flows and the Returns to Safe Assets in the United States, 2003-2007* 9–11 (Paper No. 1014, 2011) (showing that European institutions dramatically increased their holdings of AAA and other investment-grade MBS in the years before the Crisis and identifying regulatory considerations as among the factors likely contributing to that change). Nonetheless, the post-Crisis reforms have increased the range of institutions subject to such regulations and have heightened the demands imposed on banks and other regulated entities. See *infra* Part IV.A.

<sup>9</sup> See *infra* Part I.C.

provide a structured way for regulators to consider the impact of a rule change on market structure.

For an intervention to trigger innovation: (1) the intervention must increase aggregate demand for a particular type of financial instrument, taking into account what private demand would be in the absence of the intervention; and (2) that heightened demand must have a price impact sufficient to cover the costs of innovation. Although these conditions are readily inferred from fundamental principles, they provide a critical and otherwise missing framework for identifying the legal interventions most likely to induce innovation. The first condition shows that the actual impact of a legal intervention can only be assessed after developing an appropriate baseline that takes private demand into account, while the second condition enables filtering across domains.

Applying this conceptual frame reveals that many rules that explicitly mandate that regulated entities hold particular types of assets are far less transformative than they might appear given the amount of capital affected.<sup>10</sup> The capital requirements imposed on banks and insurance companies, for example, are not different in kind than the type of restrictions private claimants would impose in the absence of regulation, reducing the net effect of the intervention. By contrast, regulations that impose no direct requirements on institutions to hold particular types of assets are often more transformative than is commonly assumed. For example, restricting the capacity of the Federal Reserve to serve as a lender of last resort or making it costlier for banks to provide lines of credit may have the effect of increasing the demand for “safe assets” that can enable firms to self insure against the need for liquidity in the future. Although some of the inputs are dynamic and not easily measured, this conceptual framework enables systematic analysis of the dynamics that thus far have eluded critical scrutiny.

Putting these pieces together, this Article shows how to improve the rulemaking process to address the impact of constrained capital on the structure and resilience of the financial system. First, in showing how investor preferences can drive innovation, this Article focuses attention on an identifiable mechanism through which changes in the law impact the development and spread of innovative instruments. Second, in providing a framework for recognizing those interventions most likely to spur innovation via the identified mechanism, this Article provides regulators a means for identifying when they should reconsider the prudence of a given action in light of its systemic consequences. The core claim is that when undertaking interventions likely to have a meaningful impact on aggregate investor preferences, regulators should be compelled to estimate the magnitude of the proposed impact and provide a written analysis of how the system may evolve in response to the intervention. As a starting point, these analyses should be required whenever regulators propose rules that directly require or incentivize

---

<sup>10</sup> See *infra* Part II.B.

regulated entities to hold specific types of financial assets, or when they seek to change existing rules in ways that could impact the supply or demand of so-called safe assets—an asset class particularly likely to spur systemically important innovation.

Compelling regulators to consider how an intervention will affect the aggregate demand for a given class of financial instruments could serve as a critical first step in modifying the rulemaking process to better address the systemic ramifications of particular interventions. This proposal thus complements recent work on the shortcomings of cost-benefit analyses in financial regulation and the importance of a macroprudential approach when regulating financial markets.<sup>11</sup> Although regulators are likely to confront significant data and modeling charges when first undertaking the proposed analyses, the very process of identifying and seeking to address such deficiencies should enable regulators to develop a more sophisticated understanding of the intended and unintended consequences of their actions. In time, these processes could also spur a mapping of the financial system, enabling regulators to identify better ways to consider new approaches to enhancing the resilience of the system.

This Article proceeds in five parts. Part I presents the paper's claim and uses a couple of examples to bring the dynamics at issue to life. It also situates this Article in relation to the various bodies of literature on which it draws and to which it contributes. Part II examines two of the leading forces contributing to constrained capital in today's financial system. Part III examines the types of financial innovations that arise and spread in response to investor preferences, in addition to providing an overview of the benefits and risks that accompany the proliferation of those financial innovations. Part IV provides the framework for understanding the interactions among the law, investor preferences, and innovation. Part V addresses bigger picture implications.

## I. THE BASICS

### A. *Two Stories*

In the 1950s, as the director of the Corporate Bond Research Project sponsored by the National Bureau of Economic Research, Braddock Hickman undertook a large-scale study of the bond market and the factors influencing the returns investors earned on corporate bonds. In a report on his findings, Hickman observed that “[t]he most popular measures of prospective bond quality are the ratings assigned by the . . . investment agencies”—Moody's, Fitch, and Standard & Poor's.<sup>12</sup> He found that ratings were rela-

---

<sup>11</sup> See *infra* Part V.

<sup>12</sup> W. BRADDOCK HICKMAN, CORPORATE BOND QUALITY AND INVESTOR EXPERIENCE 4 (1958).

tively accurate proxies of risk, in the sense that loss rates went up as ratings declined. But, he also found that “[o]n the average and over long periods, the . . . yields realized on high-grade bonds were below those on low-grade bonds, with the result that investors, in the aggregate, obtained better returns on the low grades.”<sup>13</sup>

Hickman also evaluated the way legal interventions beyond those tied to ratings affected investor demand and returns. At the time, mutual savings banks in many states were only allowed to hold bonds that appeared on lists promulgated by the relevant state authority. Hickman found that demand for bonds on these lists was sufficient to “push[ ] up the prices of legal bonds and push[ ] down their promised yields.”<sup>14</sup> He concluded “that legal bonds taken individually were safer than nonlegal bonds[,] but that in the aggregate the promised and realized returns on legals were *markedly* lower.”<sup>15</sup> Although his methodology was rudimentary by today’s standards, his findings were sufficient to suggest that investor preferences can lead to pricing inefficiencies and that regulations can accentuate those inefficiencies.<sup>16</sup>

Less than a decade later, a young undergraduate at U.C. Berkeley by the name of Michael Milken came across Hickman’s report. In that report, Milken found empirical support for his longstanding hunch that one could make outsized returns in the market without assuming excessive risk if one knew where to look.<sup>17</sup> Armed with his instincts and Hickman’s findings, Milken took to Wall Street. In the early 1970s, as a trader for investment bank Drexel Burnham Lambert, Milken convinced clients that buying high-yield bonds would allow them to earn higher average returns than they could earn holding investment-grade alternatives, even taking into account the higher risk of default.<sup>18</sup> He gained both credibility and clientele when high-yield bonds proved remarkably resilient even as equities crashed a few years later.<sup>19</sup>

---

<sup>13</sup> *Id.* at 14. Subsequent research has found that “during periods of stability in the economy and financial markets, the volatility of HY bond returns has been very similar to that of investment-grade bonds” but that “during periods of political or economic uncertainty, the volatility of HY bonds . . . approach[es] the volatility of common stocks.” Frank K. Reilly et al., *Historic Changes in the High Yield Bond Market*, 21 J. APPLIED CORP. FIN. 65, 76 (2009).

<sup>14</sup> HICKMAN, *supra* note 12, at 214.

<sup>15</sup> *Id.* (emphasis added).

<sup>16</sup> As techniques have improved, including the use of standard-asset pricing models and other devices to develop baselines for the appropriate return on an instrument, recent research has reaffirmed these early findings. See, e.g., Victoria Ivashina & Zheng Sun, *Institutional Demand Pressure and the Cost of Corporate Loans*, 99 J. FIN. ECON. 500, 502 (2011) (explaining how the paper’s “findings contribute to the vast literature documenting the effects of capital inflow,” providing an overview of that literature, and explaining that it runs contrary to what one would expect if financial markets were perfectly efficient).

<sup>17</sup> *Stars of the Junkyard*, THE ECONOMIST (Oct. 21, 2010), <http://www.economist.com/node/17306419>.

<sup>18</sup> *Id.*

<sup>19</sup> *Id.*

By the end of the decade, Milken began to leverage Drexel's dominant role in the secondary market for high-yield debt to encourage more companies to issue such debt and to have Drexel underwrite those offerings.<sup>20</sup>

The amount of high-yield debt outstanding grew rapidly, much of it underwritten by Drexel.<sup>21</sup> The market ultimately collapsed, bringing both Milken and Drexel down with it,<sup>22</sup> but high-yield debt came back. Milken's insight, built on Hickman's findings, that high-yield debt could provide attractive risk-adjusted returns endured, and such debt now constitutes approximately a quarter of the outstanding corporate debt in the United States.<sup>23</sup>

This brief story illustrates a number of key dynamics. Hickman's findings reflect how investor demand can lead to meaningful price and demand discontinuities and the way regulations can contribute to those discontinuities. Milken's initial response to those pricing discontinuities illustrates a variation on arbitrage as traditionally understood. Although Milken's clients were not taking hedged positions, and thus were not engaged in classic arbitrage, they were exploiting a statistically proven price anomaly to earn excess returns relative to the risks they were assuming. And, in the process, those investors were changing the prices of the instruments they were acquiring in a way that enhanced market efficiency.

This account also highlights the ways that discontinuities in investor demand can shape the type of financial instruments produced. Until Milken's activities spurred an interest in high-yield debt, "all new publicly issued bonds [sold in the United States during the twentieth century] were investment grade."<sup>24</sup> The little high-yield debt trading in the secondary market consisted of "fallen angels," bonds that had been investment grade when issued but were subsequently downgraded.<sup>25</sup> The strong preference investors had for investment-grade debt not only affected pricing during this period, but also effectively precluded the issuance of high-yield debt.

This story also sets the stage for a second vignette that illustrates how investor demand can lead to the development and proliferation of even more innovative financial instruments. Investor demand for investment-grade bonds, particularly those rated AAA, not only created a profit opportunity for Milken's early clients, but also contributed to the spread of securitization structures leading up to the Crisis.<sup>26</sup> Securitization enables unrated credit

---

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> See Frank K. Reilly et al., *supra* note 13, at 66–67.

<sup>24</sup> Glenn Yago, *Junk Bonds*, LIBR. ECON. & LIBERTY (2008), <http://www.econlib.org/library/Enc/JunkBonds.html> (emphasis added).

<sup>25</sup> See *id.*

<sup>26</sup> See, e.g., Bernanke et al., *supra* note 8 (verifying that "the '[global saving glut] countries' . . . did indeed evince a strong preference for the safest U.S. assets," and explaining that, "this preference most likely helped push down yields on MBS relative to other assets, as most MBS were either guaranteed by the Agencies or sold as tranches carrying AAA credit ratings," given the proportion of MBS "carrying AAA credit ratings").

products, like home loans, to be transformed into rated credit products, like mortgage-backed securities (MBS) backed by those loans.<sup>27</sup> It also allows lower rated credit instruments, like a BBB-rated MBS, to be transformed into higher rated ones, like a AAA-rated collateralized debt obligation (CDO).

No magic is required to achieve these transformations. So long as there is limited correlation among the underlying instruments, the combination of diversification and tranching—the process of creating a hierarchy among the instruments issued—makes it possible to redistribute the credit risk inherent in the underlying assets to produce some instruments that are riskier than the original assets and others that are far less so.<sup>28</sup>

In the frame proposed here, the pre-Crisis investor demand for AAA-rated assets exemplifies constrained capital. Some of this demand arose independent of legal interventions, but regulatory regimes, like the risk-based capital adequacy requirements imposed on banks, also contributed.<sup>29</sup> Such regimes enabled banks to reduce the amount of capital they had to hold by increasing their holdings of AAA-rated assets and certain sovereign debt. Some such instruments already existed, but there is a limit to the amount of debt that AAA-rated firms and creditworthy sovereigns want to issue. Once the demand exceeds that supply, securitization structures could be used to fill the void.

In the short-run, these processes appeared to create significant value and the cost of obtaining a home loan went down as a result.<sup>30</sup> Of course, that was only half of the story. The Crisis revealed that these innovations, and the ways they altered the structure of the financial markets, also gave rise to new risks. The Crisis further revealed that many securitized assets had been trading at inflated prices.<sup>31</sup> Nonetheless, the basic rationale for securitization remains sound, and securitization transactions have rebounded accordingly.<sup>32</sup> More broadly, securitization remains a transaction form that makes no sense in a world where financial assets are priced solely on characteristics such as risk and return. The finance literature has proffered some

---

<sup>27</sup> See generally STEVEN L. SCHWARZ, *STRUCTURED FINANCE: A GUIDE TO THE PRINCIPLES OF ASSET SECURITIZATION* (3d ed. 2003).

<sup>28</sup> See *infra* Part III.A.1.

<sup>29</sup> E.g., Bernanke et al., *supra* note 8; Ryan Bubb & Prasad Krishnamurthy, *Regulating Against Bubbles: How Mortgage Regulation Can Keep Main Street and Wall Street Safe—From Themselves*, 163 U. PA. L. REV. 1539 (2015).

<sup>30</sup> See *infra* Part III.B.

<sup>31</sup> See *infra* Part III.B.

<sup>32</sup> See, e.g., Nick Clements, *Led By Student Loans, Marketplace Lending Securitization Volume Soars*, FORBES (Oct. 21, 2016), <https://www.forbes.com/sites/nickclements/2016/10/21/led-by-student-loans-marketplace-lending-securitization-volume-soars/#565c69b23c23>

(“Marketplace lending securitization volume has increased 86% compared to last year, with \$5.4 billion already issued this year.”); Michael Corkery & Jessica Silver-Greenberg, *Investment Riches Built on Subprime Auto Loans to Poor*, N.Y. TIMES (Jan. 26, 2015), [https://dealbook.nytimes.com/2015/01/26/investment-riches-built-on-auto-loans-to-poor/?\\_r=0](https://dealbook.nytimes.com/2015/01/26/investment-riches-built-on-auto-loans-to-poor/?_r=0) (showing a dramatic increase in subprime auto loan securitizations after the Crisis, with total volume exceeding \$20 billion in 2014).

explanations for these transactions, and the incredible rate at which these transactions spread pre-Crisis is over-determined, with fraud and regulatory arbitrage likely exacerbating the rate of growth.<sup>33</sup> Nonetheless, a notable factor contributing to the proliferation of these transactions was that they converted financial instruments that investors were not particularly keen to hold into instruments that investors were very keen to hold.<sup>34</sup> The development of new forms of securitization and the proliferation of securitization structures thus exemplify investor-driven innovation.<sup>35</sup>

### B. *The Framework*

This Article's core theoretical contribution is to provide a frame for understanding the relationship among investor preferences, regulation, and investor-driven financial innovation. The framework has two components. First, for a regulation to spur innovation, it must increase the aggregate demand for financial instruments with particular characteristics. Second, the heightened demand that results must increase the price, and thus lower the yield, of the affected class of financial instruments. This is critical to cover the costs associated with developing and using more innovative structures. Although largely a return to fundamentals, each element of this framing yields insights regarding the consequences of the ongoing efforts to build a more stable financial system.

The first condition reveals that in order to assess the impact of a given intervention, one must also consider what investor preferences would look like in the absence of the intervention. The regulatory schemes imposed on banks and insurance companies, for example, entail meaningful restrictions on the types and mix of assets these institutions can hold. The role each regime plays in shaping investor preferences is thus widely recognized and a source of ongoing policy debate.<sup>36</sup> This Article suggests that these constraints may be less important than they first appear, at least with respect to the tendency of such regimes to drive investor-driven financial innovations. This is because the constraints are imposed, at least in part, to address the agency costs that would otherwise arise from the separation between the person making the investment decision and the person who stands to gain or lose from those decisions. As a result, these entities would almost assuredly be subject to private constraints on their investment activity even in the absence of regulation. And to the extent a legal intervention serves as a substitute for equivalent private monitoring, the regulation does not itself alter the aggregate demand for a particular class of financial instruments. These types

---

<sup>33</sup> See generally Claire A. Hill, *Securitization: A Low-Cost Sweetener for Lemons*, 74 WASH. U. L. Q. 1061 (1996); Gary Gorton & George Pennacchi, *Financial Intermediaries and Liquidity*, 45 J. FINANCE 49 (1990).

<sup>34</sup> See *infra* Part II.A.

<sup>35</sup> See *infra* Part III.A.

<sup>36</sup> See *infra* Part IV.A.

of interventions still matter, as these regimes likely do have an impact on the location and size of discontinuities in investor demand for various financial instruments, but using an appropriate baseline puts the magnitude of the issue at stake in perspective.

The framework proffered here simultaneously reveals that other regulatory interventions are far more transformative than is commonly appreciated. Efforts to reduce externalities by imposing portfolio or other asset restrictions on entities, for example, can fundamentally alter investor preferences.<sup>37</sup> Even more striking, and more overlooked, is the significant impact of interventions that encourage firms (or sovereigns) to self-insure against the need for liquidity in the future on the aggregate demand for money-like instruments and other safe assets.<sup>38</sup> Legal changes that make it more costly for banks to provide liquidity insurance, like credit lines, to nonfinancial firms, and changes that make it more difficult for banks to rely on government-backed liquidity, like rules proscribing the capacity of the Federal Reserve to serve as the lender of last resort, illustrate this dynamic. These changes may be justified by other considerations, but they nonetheless have the effect of fundamentally altering the quantity of money claims and other safe assets that nonfinancial and financial firms, respectively, must hold on their individual balance sheets to cover uncertain future funding needs.

The second condition serves as a filter for identifying which of the interventions that affect aggregate demand are most likely to trigger innovation. The key assumption, which is consistent with the literature and the examples here provided, is that innovation remains costly.<sup>39</sup> If markets are awash in long-term corporate debt, for example, then a new requirement that incentivizes life insurers to increase their holdings of long-term debt would not suffice to spur innovation.<sup>40</sup> To be sure, a regulated entity that seeks to minimize the cost of complying with the constraint may seek assets that satisfy the letter but not the spirit of the constraint by offering a higher return and nominally disguised risk. Nonetheless, when the financial system can readily absorb the increased marginal demand arising from the regulatory intervention, that intervention does not give rise to the type of innovation

---

<sup>37</sup> See *infra* Part II.

<sup>38</sup> See *infra* Part II.B.

<sup>39</sup> See *e.g.*, Josh Lerner & Peter Tufano, *The Consequences of Financial Innovation: A Counterfactual Research Agenda*, 3 ANN. REV. FIN. ECON. 41, 45 (2011) (“[Financial] innovations are not easy or cheap to develop and diffuse . . . [I]nvestment banks frequently retain many highly compensated PhDs, MBAs, and lawyers to design new products and services [and] innovators must frequently expend considerable resources developing distribution channels for their products.”). This point also comes through in the examples in Part III.A., *infra*.

<sup>40</sup> This is not to say that such a regulation may not have unintended consequences. To the extent the “natural” supply of an asset is elastic, such an intervention could increase primary issuances of assets favored by the regulatory scheme. See, *e.g.*, John R. Graham et al., *How Does Government Borrowing Affect Corporate Financing and Investment?* 3–4 (Nat’l Bureau of Econ. Research, Working Paper No. 20581, 2014).

here at issue. Regulatory arbitrage overlapping and related, but nevertheless distinct, driver of innovation and change.<sup>41</sup>

This second condition has two important implications. First, it suggests that interventions are most likely to lead to innovation when there is some limit on the volume of the desired instruments that can readily be produced through primary issuances and demand, exclusive of the intervention, is already approaching that limit. Focusing on the need for a price impact, and thus on the demand and supply of a given class of financial instruments, also brings to the fore the importance of considering the impact of an intervention over the credit cycle. During boom times, it is not uncommon for the size of the overall financial sector to grow rapidly and the demand for particular types of instruments to increase accordingly.<sup>42</sup> U.S. Treasuries, again, demonstrate the type of asset that will often not proliferate at the same rate that the system as a whole, and demand for safe assets, may be increasing. This, in turn, increases the probability that a regulation that requires or incentivizes institutions to hold such instruments will have the necessary price impact.<sup>43</sup> This is consistent with experience but not yet broadly understood or taken into consideration when contemplating interventions that could profoundly impact the demand for such instruments.

In order to illuminate the relationship between constrained capital and financial innovation, and the ways legal interventions affect this dynamic, this Article holds constant or delays consideration of a range of other variables. Among the most important variables given secondary status for most of the analysis are the myriad ways the government affects the supply of certain types of financial instruments. The question of which actors are most likely to seek out substitutes and what qualifies as a substitute in different states of the world are also important factors that are addressed only tangentially. These dynamics are too fundamental to be cabined entirely but they are not incorporated into the basic framework in order to make the analysis tractable. The importance and relevance of these considerations and the ways that more sophisticated treatment of these factors could inform further research that builds on the framework presented here are discussed in connection with assessing the implication of this Article's core claim.<sup>44</sup>

### C. *Situating the Contribution*

This Article makes two contributions. One is to provide and apply a framework for understanding when the law is likely to drive innovation via changes in investor preferences. The other is to provide a descriptive account

---

<sup>41</sup> See *infra* Part I.C.

<sup>42</sup> See *e.g.*, GARY B. GORTON, MISUNDERSTANDING FINANCIAL CRISES: WHY WE DON'T SEE THEM COMING 19 (2012).

<sup>43</sup> See *infra* Part III.B.

<sup>44</sup> See *infra* Part III.B.

of where investor preferences arise and some of the innovations that have been created and spread to satisfy those preferences. This analysis brings together heretofore disparate insights and data into a cohesive account that helps explain an array of financial market structures that are not readily explained by traditional approaches to corporate finance. This descriptive undertaking is the task of Parts II and III.

The depth of the descriptive account reflects the fact that it does more than serve as a foundation for the framework this Article proposes for understanding a particular mechanism through which the law shapes financial market structures. It also serves to highlight the centrality of investor preferences in shaping the types of financial instruments produced and the structure of the financial system, and to provide an institutional framework for understanding those preferences. The framing, which places the frictions that help to explain the existence of various institutions in the background, rather than in the foreground they typically occupy in the economics literature, is designed to be more user friendly for policymakers and legal academics. This framing also serves to push against the assumption that the structures here examined are merely the byproduct of the influence of powerful financial intermediaries.<sup>45</sup> It does not discount that such influence provides a partial explanation, but that explanation is only partial.<sup>46</sup> Understanding why investors may desire particular types of instruments, and how complex arrangements may at times be a byproduct of the effort to satisfy those demands, is critical to developing a more complete picture of how we got to where we are and the realistic options for where we can go from here.

The literature on financial innovation, both in terms of drivers and effects, is remarkably modest relative to its importance. Recent reviews of the literature on financial innovation emphasize the relative paucity of the research, despite the fact that “financial innovation is ubiquitous.”<sup>47</sup> The con-

<sup>45</sup> There is a growing literature on “financialization,” some of which allows for the nuances this Article develops, but some of which assumes that financial intermediaries are self-interested in lieu of (rather than in connection with) serving the interests of investors and society more generally. See generally FRANCES THOMSON & SAHIL DUTTA, *THE TRANSNAT’L INST., FINANCIALIZATION: A PRIMER* (2016).

<sup>46</sup> The claims here are best understood as complementary to claims that highlight the importance of financial intermediary influence in distorting, but not completely eliminating, the tendency of market forces to lead to efficient outcomes. See, e.g., Dan Awrey, *Complexity, Innovation and the Regulation of Modern Financial Markets*, 2 HARV. BUS. L. REV. 235 (2012) (arguing that the complexity of financial markets and the rate of innovation in those markets undermine the strong assumptions regarding “market fundamentalism” that motivated much of the deregulatory agenda prior to the Crisis); see also Kathryn Judge, *Intermediary Influence*, 82 U. CHI. L. REV. 573 (2016) (arguing that in developing the informational and positional advantages that enable them to be effective intermediaries, intermediaries simultaneously develop the capacity to exercise outsized influence on institutional design).

<sup>47</sup> See Lerner & Tufano, *supra* note 39, at 40; see also W. Scott Frame & Lawrence J. White, *Empirical Studies of Financial Innovation: Lots of Talk, Little Action?*, 42 J. ECON. LITERATURE 116 (2004) (“A striking feature of this literature . . . is the relative dearth of empirical studies that specifically test hypotheses or otherwise provide a quantitative analysis of financial innovation.”).

trast is even more striking when compared to the far more extensive body of research on innovation in other domains.<sup>48</sup> For example, a 2004 research review could locate only 39 empirical studies of financial innovation, of which only two focused on the origins (rather than diffusion) of innovations.<sup>49</sup> The gap between importance and scholarly attention is even wider with respect to the role of regulation in inadvertently driving innovation. A recent review of “Empirical Research on the Design and Impact of Regulation in the Banking Sector” describes the findings of over 120 studies, none of which addresses the ways bank regulation can influence the spread of innovative financial instruments.<sup>50</sup> Thus, an important function of this Article is gap filling.

This Article’s institutionally focused description of investor-driven innovation is largely in accord with the limited formal work done in this area. In particular, although framed differently, this account is consistent with work by Nicola Gennaioli, Andrei Shleifer, and Robert Vishny, showing that “investor demand for particular cash flow patterns” results in excessive issuance of new instruments and fragility when, as this account confirms, too little heed is paid to highly improbable risks.<sup>51</sup> It is also consistent with the informal claims often made with respect to the significance of recent regulatory reforms, though, again, the contribution here is to make those dynamics more concrete and to place them into a broader theoretical frame.<sup>52</sup>

Another line of work relevant here is that on the role of law in shaping the financial system, and the specific role the law plays in the domain of safe assets.<sup>53</sup> As Katharina Pistor has shown, the law plays a first-order role in determining the structure, and fragility, of the financial system.<sup>54</sup> This Article builds on that insight by drawing attention to a specific mechanism through which the law plays this constitutive role. Of particular relevance is work by Anna Gelpern and Erik Gerding that provides a typology of the ways the law affects the demand for safe assets, the supply of seemingly safe

---

<sup>48</sup> See Lerner & Tufano, *supra* note 39, at 40.

<sup>49</sup> See Frame & White, *supra* note 47, at 117.

<sup>50</sup> Sanja Jakovljevic et al., *A Review of Empirical Research on the Design and Impact of Regulation in the Banking Sector*, 7 ANN. REV. FIN. ECON. 423 (2015).

<sup>51</sup> Nicola Gennaioli et al., *Neglected Risks, Financial Innovation, and Financial Fragility* 453 (Nat’l Bureau of Econ. Research, Working Paper No. 16068, 2010).

<sup>52</sup> See, e.g., Robin Greenwood et al., *The Financial Regulatory Reform Agenda in 2017* 7 (Harv. Univ. Working Paper, 2017) (stating that “because the [new liquidity coverage ratio] may consume large quantities of high-quality liquid assets like Treasuries, it could potentially create a costly and unnecessary shortage of such assets”); see also IMF, *Global Financial Stability Report: The Quest for Lasting Stability* (Apr. 2012) (predicting a shortage of safe assets in part because of prudential and other regulations requiring institutions to hold safe assets or to have them to post as collateral in derivative transactions, and identifying liquidity and capital requirements as among the forces likely to lead to excess demand for safe assets).

<sup>53</sup> See generally Gary B. Gorton, *The History and Economics of Safe Assets 2* (Nat’l Bureau of Econ. Research Working Paper No. 22210, 2016).

<sup>54</sup> Katharina Pistor, *A Legal Theory of Finance*, 41 J. COMP. ECON. 315 (2013), <http://www.sciencedirect.com/science/article/pii/S014759671300036X>.

assets, and perceptions of so-called safe assets as safe.<sup>55</sup> This Article complements their work and that of other scholars who have shown, empirically and otherwise, the importance of recognizing the distinct role of safe assets in financial markets.<sup>56</sup> In contrast to Gelpert and Gerding, this piece focuses more narrowly on the role of law in influencing demand, while expanding the analysis to reveal the way the law can create demand by altering private preferences.

The literature on regulatory arbitrage is also relevant.<sup>57</sup> Regulatory arbitrage, a term broadly used for actions taken to minimize the cost of regulatory compliance, is closely related to the dynamics here at issue. Improving our understanding of investor-driven financial innovation will shed light on some of the when and why of regulatory arbitrage, important dynamics for developing ex ante mechanisms for addressing the inevitable fact that the financial system will evolve to minimize the cost of regulatory compliance. Not all of the dynamics here at issue, however, are forms of regulatory arbitrage. As reflected in the history of safe assets, there is a regular pattern of private assets being treated as safe during periods of economic growth, leading to an increase in the issuance of such assets.<sup>58</sup> Legal interventions may exacerbate (or dampen) this growth, but these dynamics pre-exist the regulatory state and private demand continues to be central.<sup>59</sup> That some of the most creative forms of supposedly safe assets that spread before the Crisis, like auction rate securities, could not be used to satisfy any regulatory requirement highlights the importance of understanding investor-driven innovation as something more than just a form of regulatory arbitrage.

Perhaps the best way to demonstrate the importance of this Article's contribution is to look at the confusion that pervades recent policymaking. This is illustrated in the work product produced by staff at the Securities and Exchange Commission (SEC) when the SEC was assessing how to improve the consideration of how to change the rules governing money market mutual funds. On the one hand, the SEC seemed to recognize that regulations

---

<sup>55</sup> See Gelpert & Gerding, *Inside Safe Assets*, *supra* note 8, at 376; see also Anna Gelpert & Erik F. Gerding, *Private and Public Ordering in Safe Asset Markets*, 10 *BROOK. J. CORP. FIN. & COM. L.* (2015).

<sup>56</sup> See *supra* Part I.A.

<sup>57</sup> See generally Victor Fleischer, *Regulatory Arbitrage*, 89 *TEX. L. REV.* 227 (2010); see also Merton Miller, *Financial Innovation: The Last Twenty Years and the Next* 21, *J. FIN. & QUANTITATIVE ANALYSIS* 459 (1986) (suggesting that regulatory and tax changes are the core drivers of financial innovation).

<sup>58</sup> See Gorton, *supra* note 53, at 2 ("Financial crises are often preceded by credit booms, and these booms tend to occur when there is insufficient safe government debt."); see also Gelpert & Gerding, *Inside Safe Assets*, *supra* note 8, at 376 ("In a credit boom, many public and private contracts look safe, substitute for one another, and serve as inputs in new private safe assets.").

<sup>59</sup> *E.g.*, Gorton, *supra* note 53, at 560 (observing that "[p]rivately-produced safe debt has taken the form of goldsmith notes, bills of exchange, bank notes, demand deposits, certificates of deposit, commercial paper, sale and repurchase agreements, to name a few" and providing an overview of the history of how private demand for safe assets has led to the proliferation of such instruments independent of any state intervention).

could play an important role in spurring innovation. In 2014, SEC staff prepared a memorandum on safe assets that identifies the need “to fulfill prudential requirements” as a notable source of the pre-Crisis demand for seemingly safe assets, such as the AAA-rated MBS.<sup>60</sup> The memorandum further recognizes that “monetary policies and regulatory reforms in the wake of the . . . Crisis . . . have increased the demand for safe assets, and it acknowledges recent reports that suggest the demand for such assets may well outstrip supply.”<sup>61</sup>

On the other hand, the memorandum suggests that the SEC need not worry about these dynamics when contemplating reforms that could exacerbate the shortage.<sup>62</sup> One reason is that “sustained excess demand for safe assets should increase the price of safe assets,” which “should attract new private-label safe assets to the market” and incentivize “market participants . . . to identify new sources of safe assets and ways to transform asset risk.”<sup>63</sup> In other words, the memorandum assumes that the possibility of triggering new financial innovations is a reason *not* to worry, rather than a reason *to* worry about the impact of a proposed reform.

Eventually, the SEC adopted a rule that did have the effect of significantly increasing demand for a particular type of safe asset with little consideration of how the system would supply those assets. Implementation of that rule has had the important and unintended consequence of increasing dramatically the size of the Federal Home Loan Banks, a lesser known government-sponsored enterprise.<sup>64</sup> Although this development entails interactions between private and quasi-public actors, it is an important structural change to the financial system, one that has significant ramifications for stability and taxpayer exposure, and one that occurred because of a regulatory intervention that increased the demand for a particular set of safe assets.<sup>65</sup> This is emblematic of the type of intervention that this Article argues should not proceed without meaningful consideration of the systemic ramifications, and hence is a nice example of a concrete setting where application of this Article’s policy claim may have resulted in a very different outcome.

---

<sup>60</sup> SEC. & EXCH. COMM’N, DIV. OF ECON. AND RISK ANALYSIS, DEMAND AND SUPPLY OF SAFE ASSETS IN THE ECONOMY (2014), <https://www.sec.gov/dera/staff-papers/economic-analysis/demand-supply-safe-assets-2014.pdf>.

<sup>61</sup> *Id.* The “natural” supply of safe assets consists primarily of certain sovereign debt, assets backed by a credible sovereign, like insured deposits, and the highest quality corporate debt.

<sup>62</sup> *Id.* at 4–5.

<sup>63</sup> *Id.* at 4.

<sup>64</sup> Jonathon Adams-Kane & Jakob Wilhelmus, *The Real Story Behind the Surge in FHLB Advances: Macroprudential Policy Changed How Banks Borrow* 5 (Milken Inst., Working Paper, 2017) (explaining that “the implementation of new rules for MMFs, which mandated floating NAV and gates and fees on redemptions, was the main driver of the acceleration of [Federal Home Loan Bank] advances in mid- to late 2016”).

<sup>65</sup> *Id.* at 7 (explaining that as a result of the growth of the Federal Home Loan Bank system triggered by the reforms to money market mutual funds, “[p]rivate financial intermediaries are now even more interconnected with GSEs” and “[p]otentially, taxpayers now bear more of the remaining risk in the financial system”).

Few other regulators have celebrated the possibility that their post-Crisis reforms could trigger innovation, but many have shown a similar disregard for how reforms will affect investor demand and the innovations that might arise as a result.<sup>66</sup> This Article's descriptive account provides much needed clarity with respect to these dynamics and the framework proposed provides a way out of the morass.

## II. CONSTRAINED CAPITAL

For investor-driven financial innovation to merit attention, investor preferences must be sufficiently strong and sufficiently common to play a meaningful role shaping the types of instruments the financial system creates. This Part establishes that prerequisite. The analysis here seeks to show that investor preferences informed by regulation are intertwined with those arising entirely outside the regulated space. This structure reflects the view that these two types of demand are inherently interconnected, and the ramifications of regulatory and other legal interventions can only be understood in light of how they also impact private demand. Part IV disaggregates the role of regulation and how regulation shapes demand. With respect to scope, the aim is to illustrate rather than exhaust the sources of constrained capital. Focusing on two core reasons for constrained capital is helpful for understanding where discontinuities are likely to arise and why they may be difficult to eliminate, but there is an array of other sources on constrained capital not discussed here.

### A. Money and Other Safe Assets

Financial instruments that function like money have long served distinct socially useful functions. These functions include the capacity of money-like claims to facilitate transacting and to serve as a store of value over time.<sup>67</sup> Precious metals, which were the original form of money, and the fiat currencies of modern economies, like dollar bills, are the most obvious forms of money. At the same time, other financial instruments, from the privately issued banknotes that were common prior to the Civil War to the short-term commercial paper that remains prevalent today, have long served a similar function and have been priced accordingly.<sup>68</sup>

---

<sup>66</sup> See *infra* Part IV.A.

<sup>67</sup> These functions are sometimes characterized as the “transaction motive” and “asset motive” for holding money-like claims. See generally Andrew Hill, *Functions and Characteristics of Money: A Lesson to Accompany The Federal Reserve and You* (Philadelphia Fed. Res., 2013), [https://www.philadelphiafed.org/-/media/education/teachers/resources/fed-today/Functions\\_and\\_Characteristics\\_of\\_Money\\_Lesson.pdf](https://www.philadelphiafed.org/-/media/education/teachers/resources/fed-today/Functions_and_Characteristics_of_Money_Lesson.pdf).

<sup>68</sup> See, e.g., GORTON, *supra* note 42, at 10 (explaining that “[i]n market economies, consumers rely heavily on bank-created money” and providing an array of historical examples); FRIEDRICH HAYEK, *PRICES AND PRODUCTION* 113 (2d ed. 1935) (“There can be no doubt that besides the regular types of the circulating medium, such as coin, notes and bank deposits,

The full range of financial instruments that have money-like qualities, and the relationship between the demand for money and income levels and interest rates, remain contested.<sup>69</sup> There is also disagreement about the relevance of long-term safe assets as most money-like claims are quite short term.<sup>70</sup> But these disagreements about where and how to draw boundaries are secondary to the core point: There is outsized demand for money-like financial instruments relative to what one would expect if viewing these instruments solely as investments.

One way that economists have empirically established the demand for money-like instruments is by focusing on the premium that investors are willing to pay for financial instruments that have some degree of “moneyness.” For example, Arvind Krishnamurthy and Annette Vissing-Jorgensen examine the premium investors are willing to pay for Treasury instruments, which are presumed to be essentially free of credit risk and to have virtually no liquidity risk.<sup>71</sup> They found a “monetary premium” that averaged 72 basis points between 1926 and 2008.<sup>72</sup> In subsequent work, they show that the aggregate amount of short-term debt issued by the financial sector is inversely related to the aggregate amount of government debt outstanding.<sup>73</sup> Based on this and other findings, they “argue that the amount of short-term debt in the economy, issued by the financial sector, is in large part driven by

---

which are generally recognized to be money . . . and . . . which is regulated by some central authority . . . there exist still other forms of media of exchange which occasionally or permanently do the service of money.”); Perry Mehrling et al., *Bagehot Was a Shadow Banker: Shadow Banking, Central Banking, and the Future of Global Finance* 9 (Nov. 6, 2013), <http://ssrn.com/abstract=2232016> (“Why insist on holding genuine Tbilis when quasi-Tbilis [i.e., private money,] promise the same liquidity but with a slightly higher yield?”).

<sup>69</sup> E.g., Stephen M. Goldfeld & Daniel E. Sichel, *The Demand for Money*, in 1 HANDBOOK MONETARY ECON. 299, 300 (Benjamin M. Friedman & Frank H. Hahn eds., 1990) (explaining that “the demand for money in many countries has been subjected to extensive empirical scrutiny” and while “[t]he evidence that emerged . . . prior to the mid-1970s[ ] suggested that a few variables (essentially income and interest rates . . . ) were capable of providing a plausible and stable explanation of money demand[,]” it “has been widely documented, . . . [that] matters have been considerably less satisfactory since the mid-1970s”).

<sup>70</sup> Compare Robin Greenwood, Samuel G. Hanson & Jeremy C. Stein, *A Comparative-Advantage Approach to Government Debt Maturity*, 70 J. FINANCE 1683, 1687 (2015) (showing that holders of short-term Treasuries pay a premium relative to “what one would expect based on an extrapolation of the rest of the yield curve” for other Treasury instruments); Zoltan Pozsar, *Institutional Cash Pools and the Triffin Dilemma of the U.S. Banking System*, 22 FIN. MKTS., INSTS. & INSTRUMENTS 283, 283–84 (2013) (distinguishing his work from that done by others in its focus on short-term safe assets); and Bernanke et al., *supra* note 8 (invoking as useful the concept of safe assets that include longer term instruments); Gary B. Gorton, Stefan Lewellen & Andrew Metrick, *The Safe-Asset Share*, 102 AM. ECON. REV.: PAPERS & PROCEEDINGS 101 (2012) (same). For a helpful analysis of the growth of safe assets as a concept, see Gerding & Gelpner, *supra* note 8.

<sup>71</sup> Arvind Krishnamurthy & Annette Vissing-Jorgensen, *The Aggregate Demand for Treasury Debt*, 120 J. POL. ECON. 233 (2012).

<sup>72</sup> *Id.*

<sup>73</sup> Arvind Krishnamurthy & Annette Vissing-Jorgensen, *Short-term Debt and the Financial Crisis: What We Can Learn from U.S. Treasury Supply*, J. FIN. ECON. (forthcoming).

the non-financial sector's willingness to pay a premium on liquid/safe debt."<sup>74</sup>

Others take the position that even within the market for Treasury instruments, shorter duration instruments are more money-like and can demand a premium accordingly. For example, Robin Greenwood and co-authors sought to compare the actual yields on T-bills, which had maturities from 1 to 24 weeks, with the yield one would expect for those instruments if one merely extrapolated the expected yield from a yield curve created of Treasury instruments with yields longer than three months.<sup>75</sup> They found "four-week bills have yields that are roughly 40 basis points (bps) below their fitted values; for one-week bills, the spread is about 60 bps."<sup>76</sup> In their view, "these z-spreads . . . reflect a money-like premium on short-term T-bills above and beyond the liquidity and safety premia embedded in longer term Treasury yields."<sup>77</sup>

While short-term Treasuries display an exceptional degree of money-ness, privately produced financial claims can also serve money-like functions. This is reflected in the work by Krishnamurthy and Vissing-Jorgensen, and also demonstrated by other recent empirical work. Another study, for example, shows that the premium that investors are willing to pay for commercial paper and other high-quality debt issued by large U.S. firms is inversely related to the volume of Treasuries outstanding.<sup>78</sup> And a different study by Mark Carlson and other economists provides yet further evidence of "the extent to which public short-term debt and private short-term debt" function as "substitutes," by examining the relationship between the level of issuance of public and private short-term instruments.<sup>79</sup> Carlson and his co-authors "find that several money-market instruments—such as financial and non-financial commercial paper (CP), asset-backed CP, and time deposits—exhibit a strong negative relationship with the amount of Treasury bills outstanding."<sup>80</sup> They further show that within two or three months of a shock in the supply of public short-term, safe instruments, there is a change in the rate

---

<sup>74</sup> *Id.* at \*32.

<sup>75</sup> See Greenwood et al., *supra* note 70.

<sup>76</sup> *Id.* at 1687, 1688 fig.1; see also Gregory R. Duffee, *Idiosyncratic Variation of Treasury Bill Yields*, 51 J. FINANCE 527 (1996); Refet S. Gürkaynak, Brian Sack & Jonathan H. Wright, *The US Treasury Yield Curve: 1961 to the Present*, 54 J. MONETARY ECON. 2291 (2007).

<sup>77</sup> Greenwood et al., *supra* note 70, at 1687.

<sup>78</sup> See Krishnamurthy & Vissing-Jorgensen, *supra* note 68; John R. Graham, Mark T. Leary & Michael R. Roberts, *How Does Government Borrowing Affect Corporate Financing and Investment?* 3–4 (Nat'l Bureau of Econ. Research, Working Paper No. 20581, 2014) (finding "a robust and statistically significantly negative relation between the BAA-AAA corporate bond spread and the government debt-to-GDP (and debt-to-asset) ratio," and conducting various tests that further suggest that nonfinancials play a significant, and increasingly important role, "fulfilling excess demand [for safe securities] due to variation in the supply of Treasuries").

<sup>79</sup> Mark Carlson et al., *The Demand for Short-Term, Safe Assets and Financial Stability: Some Evidence and Implications for Central Bank Policies*, 12 INT'L J. CENT. BANKING 307 (2016).

<sup>80</sup> *Id.* at 309.

of issuance of private substitutes.<sup>81</sup> These findings suggest that private short-term, safe instruments can serve as substitutes for short-term Treasuries, but the degree to which investors will pay a moneyness premium for such instruments—and hence the issuance of such instruments—depends on the supply of Treasury instruments.

That private claims serve money-like functions is also reflected in definitions of what constitutes money. For example, central banks often track multiple indicators of the aggregate amount of “money” in the system at any given time: M1, which includes only cash and coin in circulation; M2, which also includes short-term bank deposits and money market mutual funds with a maturity of less than 24 hours; and, sometimes, M3, which further includes longer-term time deposits and money market mutual funds with maturities over 24 hours.<sup>82</sup> For purposes of U.S. accounting standards, highly liquid instruments with maturities of up to three months, like commercial paper and money market funds, can generally be characterized as “cash equivalents.”<sup>83</sup> Professor Morgan Ricks argues that virtually all debt with a maturity of less than a year should be deemed money-like and should be heavily regulated accordingly.<sup>84</sup>

One challenge with drawing any bright line around money-like claims is that the types of financial claims that enjoy money-like status vary across different states of the world. During boom times, the demand for money-like assets often exceeds the supply of truly safe assets and history suggests that during such periods, private money-like instruments, from bank notes to asset-backed commercial paper, are regularly created and accepted to satiate this excess demand.<sup>85</sup> Times of crisis, by contrast, are characterized by a growing demand for cash and a refusal to accept as money-like instruments that were accorded that status just before the crisis broke out.<sup>86</sup>

Taking a different tack to assessing the demand for money-like instruments, Zoltan Pozsar documents the growth of “institutional cash pool[s]”—“large, centrally managed, short-term cash balances of global non-financial corporations and institutional investors such as asset managers, securities lenders and pension funds.”<sup>87</sup> Pozsar shows that just “between 2003 and 2008, institutional cash pools’ demand for insured deposit alternatives exceeded the outstanding amount of short-term government guaranteed

---

<sup>81</sup> *Id.*

<sup>82</sup> *E.g.*, Fin. Times Lexicon, *Definition of M0, M1, M2, M3, M4*, <http://lexicon.ft.com/Term?term=M0,-m1,-m2,-m3,-m4> (last visited Aug. 1, 2016).

<sup>83</sup> *E.g.*, MORGAN RICKS, *THE MONEY PROBLEM: RETHINKING FINANCIAL REGULATION* 37 (2016).

<sup>84</sup> *Id.* at 230-37; Kathryn Judge, *The Importance of “Money”*, 130 HARV. L. REV. 1148 (2017) (reviewing RICKS, *supra* note 83).

<sup>85</sup> *See, e.g.*, GORTON, *supra* note 42.

<sup>86</sup> *E.g.*, WALTER BAGEHOT, *LOMBARD STREET: A DESCRIPTION OF THE MONEY MARKET* (William Clowes and Sons eds., 14th ed. 1924) (1873) (stating that a financial panic is “a sudden demand for cash”); GORTON, *supra* note 41, at 6 (“Whatever the form of the bank money, financial crises are en masse demands by holders of bank debt for cash—panics.”).

<sup>87</sup> Pozsar, *supra* note 70, at 285.

instruments *not* held by foreign official investors by . . . at least \$1.5 trillion,” and potentially far more.<sup>88</sup> In his view, “the ‘shadow’ banking system rose to fill this gap.”<sup>89</sup> Pozsar’s work complements the empirical literature described thus far by showing where the demand comes from, how it has changed over time, and how this has contributed to new financial innovations.

In part because of the disagreements about how broadly money ought to be construed, but also because exceptionally safe, long-term assets can also serve noninvestment functions, a growing number of economists and others are studying the broader category of safe assets.<sup>90</sup> Again, a range of techniques have been employed to measure the demand for such assets and a range of explanations have been given for that demand. For example, the concept of safe assets plays a prominent role in the work done by Ben Bernanke and co-authors on the “global saving glut” and related efforts to understand global capital flows in the past decade and their impact on systemic stability.<sup>91</sup> Starting with an influential speech delivered in 2005, Bernanke argued that excess savings in certain developing countries and in countries with significant oil wealth were playing a fundamental role reshaping capital flows. In subsequent work, he and co-authors provide a more detailed analysis of the type of assets that these other investors demanded to argue that prior to the Crisis, there was an excess demand for safe assets and that demand helps to explain the growth of securitization and other arrangements and others have built on this thesis.<sup>92</sup>

Other economists have built upon and provided alternatives to Bernanke’s account while sharing his assessment that investor demand for safe assets played a role in laying the groundwork for the Crisis. For example, Ricardo Caballero has argued that “the root imbalance” at the core of the Crisis was that “[t]he entire world, including foreign central banks and investors, but also many U.S. financial institutions, had an insatiable demand for safe debt instruments.”<sup>93</sup> In Caballero’s assessment, “the surge of safe-assets-demand is a key factor behind the rise in leverage and macroeconomic risk concentration in financial institutions in the U.S. (as well as the U.K., Germany, and a few other developed economies), as these institutions

---

<sup>88</sup> *Id.* at 284, 290 fig. 5.

<sup>89</sup> *Id.* at 284. For an earlier discussion of this relationship, see Zoltan Pozsar, *Does the Secular Rise of Wholesale Cash Pools Necessitate Shadow Banking?* (2011) (unpublished working paper) (on file with author).

<sup>90</sup> *E.g.*, Gorton, Lewellen & Metrick, *supra* note 70; Pierre-Olivier Gourinchas & Olivier Jeanne, *Global Safe Assets* (Bank for Int’l Settlements, Working Paper No. 399, 2012).

<sup>91</sup> *See* Bernanke et al., *supra* note 8.

<sup>92</sup> Bernanke et al., *supra* note 8; Ricardo J. Caballero & Arvind Krishnamurthy, *Global Imbalances and Financial Fragility*, 99 *Am. Econ. Rev.* 584 (2009).

<sup>93</sup> Ricardo J. Caballero, *The “Other” Imbalance and the Financial Crisis 2* (Nat’l Bureau of Econ. Research, Working Paper No. 15636, 2010).

sought the profits generated from bridging the gap between this rise in demand and the expansion of its *natural supply*.”<sup>94</sup>

Given that empirical work necessarily documents what has happened before, it is worth momentarily looking ahead. Even apart from the cyclical-ity that is common, there are reasons to expect increasing demand for safe assets. Two ways that money claims provide utility apart from their risk-adjusted returns are their capacity to facilitate transactions and to serve as a store of liquidity over time.<sup>95</sup> Mervyn King, former Head of the Bank of England, believes that this latter function is increasingly important and will continue to grow in the years ahead.<sup>96</sup> In his assessment, in a world plagued by radical uncertainty, money-like claims satisfy the desire of individuals, companies, and countries to self-insure against this increasingly uncertain future.<sup>97</sup> This view also helps to explain why safe assets can sometimes serve as a substitute for short-term claims.<sup>98</sup>

Safe assets also play an additional and increasingly important function in today’s financial landscape, that is, serving as collateral.<sup>99</sup> As an initial matter, collateralized structures are a primary mechanism for converting safe (and sometimes less safe) assets into money-like claims.<sup>100</sup> But safe assets are also used as collateral in a range of other financial transactions. As the financial system becomes increasingly interconnected and market participants increasingly enter into arrangements with others that entail future, contingent payment obligations, there is growing demand for high-quality collateral to reduce the credit risk such arrangements pose and the amount of counterparty risk monitoring parties must undertake. Post-Crisis regulatory reforms are contributing to and shaping, but not alone in creating, high demand for assets that can readily serve as collateral.<sup>101</sup>

Other post-Crisis regulatory changes further contribute to the demand for safe assets. The most obvious examples are new and heightened regulatory mandates regarding who must hold safe assets and in what amounts. Large banks in the U.S. and elsewhere, for example, are facing substantially

---

<sup>94</sup> *Id.* at 3.

<sup>95</sup> See RICKS, *supra* note 83.

<sup>96</sup> MERVYN KING, THE END OF ALCHEMY: MONEY, BANKING, AND THE FUTURE OF THE GLOBAL ECONOMY 84–85 (2016).

<sup>97</sup> *Id.*

<sup>98</sup> See, e.g., Judge, *supra* note 84.

<sup>99</sup> See e.g., Gorton, Lewellen & Metrick, *supra* note 70, at 102.

<sup>100</sup> A range of different transaction structures, from asset and repurchase agreements to asset-backed commercial paper programs, can be used to enable this transformation. This dynamic both highlights the value of further research into the relationship between short-term, money-like claims and longer term safe assets and illustrates the challenge of trying to fully disentangle the two.

<sup>101</sup> See, e.g., J.P. MORGAN, REGULATORY REFORM AND COLLATERAL MANAGEMENT: THE IMPACT ON MAJOR PARTICIPANTS IN THE OTC DERIVATIVES MARKETS 6–7 (2012); BASEL COMM. ON BANKING SUPERVISION & Bd. INT’L ORG. SEC. COMM’NS, MARGIN REQUIREMENTS FOR NON-CENTRALLY CLEARED DERIVATIVES 3 (Sept. 2013), <https://www.bis.org/publ/bcb261.pdf>.

heightened liquidity requirements.<sup>102</sup> While banks have long been subject to reserve requirements designed to ensure that banks could meet short-term liquidity demands, banks are now being asked to hold “high quality, liquid assets” in quantities sufficient to cover the bank’s liquidity needs during a period of market distress,<sup>103</sup> and, separately, to enable an orderly resolution of the bank in a bankruptcy proceeding.<sup>104</sup>

The types of institutions subject to liquidity requirements are also expanding. Mutual funds, for example, which traditionally have been subject only to market-based constraints and disclosure requirements, are now required by regulation to adopt and implement liquidity-management policies.<sup>105</sup> Less obvious but no less important, other post-Crisis reforms may be contributing to nonfinancial firms’ demand for liquid assets. For example, recent changes may make it more costly for banks to issue lines of credit, reducing their incentive to do so and increasing the price they will demand to provide this service.<sup>106</sup> A nonfinancial firm that can no longer depend on a standing line of credit as a means to satisfy its future liquidity needs may well opt to hold additional liquid assets to satisfy those needs.

In sum, although there are ongoing debates on the margins, there is generally broad consensus with respect to the two points critical to the analysis here: (1) there is a sizeable amount of capital that is constrained by a preference for very safe, liquid assets; and (2) this demand creates price and demand discontinuities of sufficient magnitude to affect market activity.

### B. Use of Proxies to Facilitate Monitoring

Another factor contributing to discontinuities in the demand for particular types of assets is the extensive use of proxies for financial asset quality. Credit ratings issued by the leading rating agencies have long been, and despite some recent changes remain, the most commonly employed proxy

---

<sup>102</sup> Liquidity Risk Management Standards, 12 C.F.R. §§ 329.1-329.50 (2014); BASEL COMM. ON BANKING SUPERVISION & BD. INT’L ORG. SECS. COMM’NS, BASEL III: THE LIQUIDITY COVERAGE RATIO AND LIQUIDITY RISK MONITORING TOOLS (Jan. 2013), <https://www.bis.org/publ/bcbs238.pdf>.

<sup>103</sup> *Id.* For earlier assessments of the impact of these new regulations, see, for example, MARK HOUSE, TIM SABLICK & JOHN R. WALTER, FED. RES. BANK OF RICHMOND, UNDERSTANDING THE NEW LIQUIDITY COVERAGE RATIO REQUIREMENTS (Jan. 2016), [https://www.richmond.fed.org/-/media/richmondfedorg/publications/research/economic\\_brief/2016/pdf/eb\\_16-01.pdf](https://www.richmond.fed.org/-/media/richmondfedorg/publications/research/economic_brief/2016/pdf/eb_16-01.pdf); Ryan N. Banerjee & Hitoshi Mio, *The Impact of Liquidity Regulation on Banks* (Bank for Institutional Settlements Working Paper No. 470, 2014), <https://www.bis.org/publ/work470.pdf>.

<sup>104</sup> See, e.g., William Nelson, *Living Wills: The Biggest Liquidity Rule of Them All*, AM. BANKER (May 24, 2016, 9:30 AM), <https://www.americanbanker.com/opinion/living-wills-the-biggest-liquidity-rule-of-them-all>; Press Release, Fitch Ratings, Fitch: Liquidity Consideration Key in US Bank Resolution Plans (Apr. 15, 2016), <https://www.fitchratings.com/site/pressrelease?id=1002657>.

<sup>105</sup> Liquidity Risk Management Programs, 17 C.F.R. § 270.22e-4 (2016).

<sup>106</sup> See *infra* Part II.B.

for the credit risk of a given financial asset.<sup>107</sup> As with money-like claims, the rating given to a financial instrument can provide utility apart from the instrument's risk adjusted return. Investors can rely on proxies like credit ratings for a range of purposes, including reducing the effort they must expend acquiring information about a potential investment. But the importance of proxies often increases significantly when there is a separation between the person making the investment decision and the ultimate beneficiary of the funds being invested, as proxies are frequently employed to reduce agency costs and facilitate monitoring in such settings.

As Ronald Gilson and Jeffrey Gordon have explained, "the agency costs of agency capitalism" have become a core challenge for financial markets.<sup>108</sup> The rise of institutional investors and the way that they have displaced individuals as the dominant source of capital in the capital markets is vividly illustrated by changes in public equity markets. Gilson and Gordon document that "institutional investors, including pension funds, held only approximately 6.1% of U.S. equities" in 1950; that figure reached 28.4% in 1980; and, "[b]y 2009, institutional investors held 50.6% of all U.S. public equities, and 73% of the equity of the thousand largest U.S. corporations."<sup>109</sup> While Gordon and Gilson focus on the implications for firm governance, the trend they document also has important implications for investor preferences.

One way that intermediaries provide assurances to would-be investors is through self-imposed limits on their holdings and other activities. Mutual funds, for example, regularly make pre-commitments that limit the types of assets that they can hold and in what amounts. In one of the first academic studies documenting the capacity of investor preferences to influence financial asset pricing, Andrei Shleifer examined the effects of the rise of mutual funds committed to tracking the S&P 500 Index.<sup>110</sup> He found that an announcement that a company would be added to the S&P 500 resulted in a statistically significant capital gain of roughly 3% in that company's stock price.<sup>111</sup> Although alternative explanations have been proffered,<sup>112</sup> the find-

---

<sup>107</sup> See generally Aline Darbellay & Frank Partnoy, *Credit Rating Agencies under the Dodd-Frank Act*, 30 BANKING & FIN. SERVS. POL. REP. 1 (Dec. 2011); Frank Partnoy, *Historical Perspectives on the Financial Crisis: Ivar Kreuger, the Credit Rating Agencies, and Two Theories about the Function, and Dysfunction, of Markets*, 26 YALE J. ON REG. 431 (2009).

<sup>108</sup> See generally Ronald Gilson & Jeffrey Gordon, *The Agency Costs of Agency Capitalism*, 113 COLUM. L. REV. 863, 874 (2013).

<sup>109</sup> *Id.* at 874. See also AVINASH D. PERSAUD, PETERSON INST. FOR INT'L ECON., HOW NOT TO REGULATE INSURANCE MARKETS: THE RISKS AND DANGERS OF SOLVENCY II (2015) ("With more than \$50 trillion in assets worldwide, investment funds run by the insurance industry and pension system are one of the most systemically important elements of the global financial system.").

<sup>110</sup> Andrei Shleifer, *Do Demand Curves for Stocks Slope Down?*, 41 J. FINANCE 579, 583 (1986).

<sup>111</sup> *Id.* at 585–88.

<sup>112</sup> See, e.g., Sanjay P. Hegde & John B. McDermott, *The Liquidity Effects of Revisions to the S&P 500 Index: An Empirical Analysis*, 6 J. FIN. MKTS. 413 (2003) (providing evidence that enhanced liquidity may help to explain the price impact of inclusion in the S&P 500);

ing continues to be recognized as indicative of the influence of index funds on stock prices. More recent studies have also documented the impact of institutional investors on financial market pricing in other domains.<sup>113</sup>

Other types of mutual funds similarly have self-imposed limits on the types of assets they can hold. The Fidelity Short Term Bond Fund, for example, promises investors geographic diversity while also committing that it will “[n]ormally invest[ ] at least 80% of assets in investment-grade debt securities” and it will “[n]ormally maintain[ ] a dollar-weighted average maturity between three years or less.”<sup>114</sup> Although most such limits are self-imposed, money market mutual funds are further subject to regulatory limits with respect to the quality and duration of the assets they can hold.<sup>115</sup>

In exchange for agreeing to these restrictions, the Securities and Exchange Commission (SEC) provides money market mutual funds greater flexibility than other types of funds with respect to accounting and redemption practices, allowing most retail money market funds to maintain a steady net asset value of \$1.00.<sup>116</sup> (The value of assets invested in money market mutual funds—just shy of \$3 trillion as of March 31, 2017—is also testament to the demand for money-like claims and reflective of the ways that efforts to reduce agency costs can overlap with demand for safe assets.<sup>117</sup>)

A number of other institutional forms, like insurance companies and banks, fall outside a simple agency model, yet give rise to similar challenges. The great bulk of the capital that insurance companies hold and invest will eventually be needed to satisfy claims by policyholders. Those policyholders pay premiums today with the expectation that an insurance company will be able to pay out should the contingency against which they have insured comes to pass. Similarly, bank depositors place money in a bank today with the expectation that it will be available on demand when they need liquidity in the future. Policyholders and depositors thus require some assurance that the firm to whom they are giving money today will be able to pay their claims in the future.

Honghui Chen et al., *The Price Response to S&P 500 Index Additions and Deletions: Evidence of Asymmetry and a New Explanation*, 59 J. FINANCE 1901 (2004) (suggesting that the price impact of inclusion in S&P 500 may be attributable to investor awareness rather than index funds and supporting hypothesis with evidence that there is no permanent decline in a company's stock price when it is taken out of the Index).

<sup>113</sup> See, e.g., Paul A. Gompers & Andrew Metrick, *Institutional Investors and Equity Prices*, 116 Q. J. ECONOMICS 229 (finding that the rise of large, institutional investors contributed to an increase in the price of large-company stocks relative to small-company stocks).

<sup>114</sup> FIDELITY SHORT-TERM BOND FUND SUMMARY, FIDELITY, <https://fundresearch.fidelity.com/mutual-funds/summary/316146208>.

<sup>115</sup> See, e.g., Money Market Funds, 17 C.F.R. § 270.2a-7 (2018).

<sup>116</sup> For a discussion of the traditional rules and post-Crisis reforms underway, see SEC. & EXCH. COMM'N., ACTION ADOPTING MONEY MARKET FUND REFORM RULES (2014), <https://www.sec.gov/rules/final/2014/33-9616.pdf>; 17 C.F.R. §§ 230.419, 230.482, 270.2a-7, 270.12d3-1, 270.18f-3, 270.22e-3, 270.30b1-7, 270.31a-1, 270.30b1-8.

<sup>117</sup> SEC. & EXCH. COMM'N., DIV. OF INV. MGMT., MONEY MARKET FUND STATISTICS (Apr. 20, 2017), <https://www.sec.gov/divisions/investment/mmf-statistics/mmf-statistics-2017-3.pdf>.

In practice, individual policyholders and depositors do little to monitor insurance companies and banks. Much of this apathy is a rational response to the fact that most banks and insurance companies are subject to extensive regulation and supervision and government-provided insurance limits the downside risks to which both types of claimants are exposed.<sup>118</sup> Examining the regulatory regime governing each type of firm is thus the most direct way of understanding how efforts to restrain agency costs in these domains produces constrained capital, while bearing in mind the private arrangements that would have arisen in the absence of extensive state intervention.

As an initial matter, banks and insurance companies control a massive amount of capital. Aggregate assets in banks (not their holding companies or affiliates) totaled \$15.3 trillion at the end of 2014.<sup>119</sup> The U.S. insurance industry is also large and growing.<sup>120</sup> The net premiums taken in on just the two most significant lines of insurance—property & casualty and life, accident & health—well exceeded a trillion dollars a year in each of the last five years.<sup>121</sup> According to the Federal Insurance Office, at year-end 2015, the accident and health sector of the insurance industry held approximately \$6.3 trillion in total assets (including \$2.4 trillion in separate accounts) and the property and casualty sector held approximately \$1.8 trillion in assets.<sup>122</sup> These are significant, potentially market-distorting, amounts of capital by any measure and a number of recent studies attest to the ways that insurance company investment decisions can have measurable effects on asset prices.<sup>123</sup>

Turning to the ways this capital is constrained, both banks and insurance companies are subject to investment restrictions and risk-based capital

<sup>118</sup> See generally NAT'L ASS'N INS. COMM'RS, IMF FINANCIAL SECTOR INVESTMENT PROGRAM, SELF ASSESSMENT OF IAIS CORE PRINCIPLES (2009); ROBERT W. KLEIN, A REGULATOR'S INTRODUCTION TO THE INSURANCE INDUSTRY 146 (Nat'l Ass'n Ins. Comm'rs eds., 2d ed. 2005); MICHAEL S. BARR, HOWELL E. JACKSON & MARGARET E. TAHYAR, FINANCIAL REGULATION: LAW AND POLICY (2016); *Who is the FDIC?*, FED. DEPOSIT INS. CORP., <https://www.fdic.gov/about/learn/symbol/index.html>.

<sup>119</sup> See Steve Schaefer, *Five Biggest U.S. Banks Control Nearly Half Industry's \$15 Trillion in Assets*, FORBES (Dec. 3, 2014, 10:37 AM), <http://www.forbes.com/sites/steveschaefer/2014/12/03/five-biggest-banks-trillion-jpmorgan-citi-bankamerica/#45806a0e1d43>.

<sup>120</sup> See 2015 U.S. DEP'T OF TREAS., ANN. REP. ON INSURANCE INDUSTRY 12–13.

<sup>121</sup> NAT'L ASS'N INS. COMM'RS, FIN. REGULATORY SERVS., P&C, TITLE, LIFE/A&H, FRATERNAL, AND HEALTH INDUSTRY SNAPSHOTS FOR THE PERIOD ENDED DEC. 31, 2015 (2016), [http://www.naic.org/documents/topic\\_insurance\\_industry\\_snapshots\\_year\\_end.pdf](http://www.naic.org/documents/topic_insurance_industry_snapshots_year_end.pdf); see also 2015 U.S. DEP'T OF TREAS., *supra* note 120, at 13 fig.1 (documenting the size and growth of the insurance industry since 2005).

<sup>122</sup> See 2015 U.S. DEP'T OF TREAS., *supra* note 120, at 13.

<sup>123</sup> E.g., Andrew Ellul et al., *Is Historical Cost Accounting a Panacea? Market Stress, Incentive Distortions, and Gains Trading*, 70 J. FINANCE 2489 (2014) (finding differences in how different types of insurance firms responded to ratings declines during the financial crisis, consistent with the different regulatory regimes to which they are subject, and that the sales by insurance firms had a price impact); Craig Merrill et al., *Did Capital Requirements and Fair Value Accounting Spark Fire Sales in Distressed Mortgage-Backed Securities?* (Nat'l Bureau of Econ. Research, Working Paper No. 18270, 2012) (finding that financially constrained life insurers sold downgraded residential mortgage-backed securities during the financial crisis, contributing to the decline in the prices of those assets).

requirements. The analysis here will use insurance companies to explore the impact of investment restrictions and banks to examine capital adequacy requirements. Limits on the types of assets that insurance companies can hold, like most insurance regulations, are promulgated at the state level. Most states follow one of two approaches promulgated by the National Association of Insurance Commissioners (NAIC) so the regulations are more uniform than the dispersion of authority might suggest.<sup>124</sup> With respect to investment restrictions, the NAIC has issued two model acts, each of which takes a different approach to ensuring that firms pursue an appropriate investment strategy in light of their large, contingent financial obligations.<sup>125</sup> As Robert Klein explains, the first model act embraces a “prescriptive approach” and provides “relatively detailed and specific limitations on . . . the amounts or relative proportions of different assets insurers can hold to ensure adequate diversification and limit risk.”<sup>126</sup> Thus, most insurance companies today are subject to portfolio restrictions that meaningfully limit the ability of insurance companies to hold lower grade assets and use credit ratings to demarcate what insurance companies can hold and in what amounts.<sup>127</sup> These rules directly give rise to constrained capital.

Risk-based capital adequacy requirements operate slightly differently than asset constraints. Rather than requiring firms hold or not hold particular types of assets, capital adequacy rules typically affect incentives by requiring firms to fund themselves with more equity when holding assets deemed to be more risky. The basic rationale for capital adequacy requirements are that a bank with a thicker equity cushion is less likely to fail and less incentivized to take excessive risk than an otherwise comparable but less well-capitalized institution.

The first generation of widespread capital adequacy requirements, promulgated internationally through the Basel Accords, used coarse indicators of the riskiness of a particular asset to calibrate the amount of high-quality capital, primarily equity, that a bank must hold.<sup>128</sup> Regulators have also started to require that banks hold additional capital to address the risks that may not show up on a bank’s balance sheet, such as counterparty exposures arising from derivative transactions.<sup>129</sup> Because banks perceive capital to be costly, these regulations give banks a reason to favor assets and activi-

---

<sup>124</sup> KENNETH ABRAHAM & DANIEL SCHWARCZ, *INSURANCE LAW AND REGULATION* 122 (6th ed. 2015).

<sup>125</sup> See KLEIN, *supra* note 118, at 146.

<sup>126</sup> *Id.*

<sup>127</sup> ABRAHAM & SCHWARCZ, *supra* note 124, at 122. In response to concerns that the first model act was too rigid and failed to recognize the importance of portfolio-level analysis, the NAIC promulgated a second model act that allows insurers greater discretion if they can convince regulators that they have developed a sound, individualized plan for managing their portfolio and they will adhere to that plan. *E.g.*, NAT’L ASS’N INS. COMM’RS, *IMF FINANCIAL SECTOR INVESTMENT PROGRAM*, *supra* note 118, at 40.

<sup>128</sup> See BASEL COMM. ON BANKING SUPERVISION, *BASEL III: A GLOBAL REGULATORY FRAMEWORK FOR MORE RESILIENT BANKS AND BANKING SYSTEMS* (2017).

<sup>129</sup> See *id.* See also BARR, ET AL., *supra* note 118, at 23.

ties that have lower capital requirements, holding all else equal.<sup>130</sup> The empirical evidence available suggests that capital adequacy requirements sufficiently impact bank preferences to have material effects on asset pricing. For example, one study found that when the capital adequacy requirements for highly rated MBS were lowered in 2002, the price of commercial MBS went up relative to comparable corporate debt.<sup>131</sup>

Although credit ratings were the primary, though never exclusive, factor determining an asset's risk weighting, there have been attempts to move away from reliance on ratings. The first widespread attempt to reduce reliance on ratings was the adoption of Basel II, which was designed to encourage firms to develop their own, more sophisticated portfolio-level risk management systems and to reduce reliance on ratings.<sup>132</sup> The Crisis, however, revealed fundamental flaws in this regime as implemented. Banks' internal risk management systems proved to be less sophisticated than they had claimed, regulators failed to identify and understand the weaknesses inherent in banks' internal risk management regimes, and the thinner capital cushions the Basel II regime enabled proved insufficient to protect banks from the larger than anticipated losses they incurred.

The Crisis revealed that ratings can be poor prognosticators of risk and using ratings for regulatory purposes can create problematic incentives.<sup>133</sup> In response to these concerns, the Dodd-Frank Act prohibits reliance on credit ratings for federal regulatory purposes.<sup>134</sup> The results of this effort have been mixed. For one thing, there is little indication that ratings have declined much in their importance.<sup>135</sup> Credit ratings remain a centerpiece of private monitoring efforts and many state and foreign regulatory regimes.<sup>136</sup> Moreover, few federal regulators have found superior alternatives. Many have replaced reliance on credit ratings with metrics that may be even less effective at capturing the risk inherent in a financial instrument, including some metrics promulgated by third party service providers who are less regulated, but

---

<sup>130</sup> E.g., Malcolm Baker & Jeffrey Wurgler, *Do Strict Capital Requirements Raise the Cost of Capital? Bank Regulation and the Low Risk Anomaly* 1 (Nat'l Bureau Econ. Research, Working Paper No. 19018, 2013).

<sup>131</sup> Richard Stanton & Nancy Wallace, *CMBS Subordination, Ratings Inflation, and Regulatory-Capital Arbitrage* 3 (U. Cal. Berkeley Fisher Ctr. for Real Estate & Urban Econ., Working Paper, 2012), <http://escholarship.org/uc/item/6dj7p4dg>.

<sup>132</sup> E.g., DANIEL K. TARULLO, *BANKING ON BASEL: THE FUTURE OF INTERNATIONAL FINANCIAL REGULATION* 151 (2008) (explaining that Basel II is a "new regulatory paradigm that builds on the practice of large banks in generating their own credit risk estimates for internal risk management purposes").

<sup>133</sup> E.g., John C. Coffee Jr., *What Went Wrong? A Tragedy in Three Acts*, 6 U. ST. THOMAS L.J. 403, 416 (2009); JOHN SOROUSIAN, OFFICE OF FIN. RESEARCH BRIEF SERIES, *CREDIT RATINGS IN FINANCIAL REGULATION: WHAT'S CHANGED SINCE THE DODD-FRANK ACT?*, at 2 (Apr. 21, 2016), [https://www.financialresearch.gov/briefs/files/OFRbr\\_2016-04\\_Credit-Ratings.pdf](https://www.financialresearch.gov/briefs/files/OFRbr_2016-04_Credit-Ratings.pdf).

<sup>134</sup> Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, Pub. L. No. 111-203, § 939A, 124 Stat. 1376, 1887 (2010).

<sup>135</sup> See SOROUSIAN, *supra* note 133, at 5.

<sup>136</sup> See *id.*

not necessarily more reliable, than the credit rating agencies.<sup>137</sup> These challenges reflect the fact that proxies serve a genuinely useful purpose in facilitating monitoring and oversight despite the associated challenges.

Taking a more global perspective, there has been a shift back toward reliance on proxies. As a result of the perceived failures of relying on banks' internal models under Basel II, coarser metrics have returned to fashion.<sup>138</sup> Their use is also on the rise for insurance companies. For example, Europe has recently revised its regulatory framework for insurance companies.<sup>139</sup> The centerpiece of the new regime is heightened capital adequacy requirements, in many ways akin to those long-imposed on banks, which are designed to promote the financial health of the institutions. Like Basel II, the directive allows large firms some freedom to individualize the metrics that they use, but many key elements remain highly standardized, and implementation of the regime seems likely to alter the mix of financial assets that insurance companies will hold. According to Avinash Persaud, “[f]ollowing a series of quantitative impact assessments and simulations, investment managers of insurers generally accept that, as a result of the disproportionate impact on their after-capital-charge returns, [the new directive] will lead to a switch out of public and private equity, infrastructure bonds, property, and low-rated corporate bonds.”<sup>140</sup> Taking a step back, this move is emblematic of ways that the post-Crisis regulatory reforms seem likely to increase the amount of constrained capital in the financial system in ways that include but also go beyond increasing the demand for safe assets.

The preceding overview is just that—a brief introduction to some of the reasons that significant swathes of capital flowing into the financial system are subject to private or public constraints that are independent of the metrics used in classic asset-pricing models. There are plenty more. An increasing number of investors, for example, are altering their investment choices based on firms' environmental, social, and corporate responsibility commitments.<sup>141</sup> According to a recent report, approximately one-fifth of professionally managed assets, or \$8.72 trillion, is now invested pursuant to sustainability constraints.<sup>142</sup> The rapid rise of funds catering to investors' in-

<sup>137</sup> See *id.*

<sup>138</sup> E.g., BASEL COMM. ON BANKING SUPERVISION, THE BASEL COMMITTEE'S RESPONSE TO THE FINANCIAL CRISIS: REPORT TO THE G20 5 (2010) (“Another key element of the Basel III regulatory capital framework is the introduction of a nonrisk-based leverage ratio that will serve . . . as an additional safeguard against attempts to “game” the risk-based requirements and will help address model risk.”).

<sup>139</sup> See generally EUR. COMM'N, SOLVENCY II OVERVIEW (2015), [http://europa.eu/rapid/press-release\\_MEMO-15-3120\\_en.htm](http://europa.eu/rapid/press-release_MEMO-15-3120_en.htm).

<sup>140</sup> PERSAUD, *supra* note 109, at 3 (citing ANDRE THIBEAULT & MATHIAS WAMBEKE, VLERICK CENTRE FOR FIN. SERVS., REG. IMPACT ON BANKS' AND INSURERS' INVS. (2014)); see also Stefan Mittnik, *Solvency II Calibrations: Where Curiosity Meets Spuriousity* (Ludwig Maximilians Univ. Munich Ctr. for Quantitative Risk Analysis, Working Paper No. 04, 2011).

<sup>141</sup> US SIF FOUNDATION, REPORT ON US SUSTAINABLE, RESPONSIBLE AND IMPACT INVESTING TRENDS 5 (2016), [http://www.ussif.org/files/SIF\\_Trends\\_16\\_Executive\\_Summary\(1\).pdf](http://www.ussif.org/files/SIF_Trends_16_Executive_Summary(1).pdf).

<sup>142</sup> *Id.*

terests in integrating nonfinancial values into their investment strategies is a prime example of an investor-driven innovation, and the money in those funds is constrained capital for purposes of the analyses here.<sup>143</sup> The following analysis shows that constrained capital is sufficiently pervasive to affect financial asset pricing and production, at least some of the time.

### III. INVESTOR PREFERENCES AND FINANCIAL INNOVATION

The existence of constrained capital has a number of implications. One of the most important is that countries and firms capable of issuing the type of instruments for which there is outsized demand can raise capital more easily and at a lower cost.<sup>144</sup> These effects can be significant and typically benefit countries and firms that are large, pose modest credit risks, and issue debt in U.S. dollars or another desirable currency.<sup>145</sup> Entities like banks that can readily issue money equivalents enjoy particularly notable benefits in this regard.<sup>146</sup> The focus here is not on the allocation-related implications of constrained capital in settings when primary issuances alone more than suffice to satisfy the demand. Rather, the aim here is to determine when increased constrained capital is likely to spark innovation.

This Part identifies the building blocks of modern financial engineering, some examples of innovations that arose or spread, at least in part, in response to investor demand, and the benefits and drawbacks that arise as those innovations spread. Against this background, the final subpart addresses the second requirement this Article identifies as necessary for innovation—demand sufficient to cover the costs of innovation.

#### A. *Investor-Driven Financial Innovation*

##### 1. *The Building Blocks*

###### a. *Securitization*

The first critical tool is securitization. Securitization entails the sale of financial assets from the entity that originated those assets to a new investment vehicle specially created to house those assets. The originator selling the assets is usually required to make an array of representations and warranties regarding the quality of the assets sold and the processes employed dur-

---

<sup>143</sup> *Id.* (“Client demand is one of the major drivers for money managers that introduce products that take ESG factors into account.”).

<sup>144</sup> *E.g.*, Carlson et al., *supra* note 79; Caballero & Krishnamurthy, *supra* note 92, at 584–85 (“[O]ver the last decade, the US has experienced large and sustained capital inflows from foreigners seeking US assets to store value . . . . The external demand for US assets, from foreign central banks for example, is in particular a demand for high-grade debt.”).

<sup>145</sup> *E.g.*, Carlson et al., *supra* note 79; Caballero & Krishnamurthy, *supra* note 92.

<sup>146</sup> *E.g.*, Morgan Ricks, *Safety First: The Deceptive Allure of Full Reserve Banking*, 83 U. CHI. L. REV. 113 (2016).

ing origination, so the originator has a financial interest in the quality of the assets it originates. Nonetheless, the sale extinguishes the originator's property interest in those assets, and that interest is transferred in its entirety to the newly created vehicle. This is critical, as it enables a financing structure that depends solely on the quality of the financial instruments packaged into the securitization structure, not the creditworthiness of the entity that originated those instruments.<sup>147</sup>

The other two features that are critical to most securitization structures are diversification and tranching. Tranching entails the creation of multiple distinct classes of instruments, all of which have different sets of rights to the cash flows produced by the underlying assets.<sup>148</sup> While some securitization structures entail specialized tranches, such as interest-only or principal-only securities that have a right to payment only when there is an excess of cash flows of a particular type coming into the securitization structure, the primary function of tranches is to create a hierarchy among the different classes of securities issued. The rights of each class are set forth in a "water-fall," specific to that securitization structure, which is designed to ensure that the senior tranches receive any interest and principal owed to them before the junior tranches receive any payments while also seeking to make the terms of the junior tranches sufficiently attractive to justify the higher risk they pose. Diversification is key to enabling the senior tranches to enjoy reduced exposure to the credit risk of the underlying instruments.<sup>149</sup>

This process gives rise to a host of logistical challenges. These challenges include the ongoing monitoring of the underlying financial instruments, the collection of cash flows from those instruments, and the need to address the issues that arise when a party defaults on one of those instruments. Typically, these issues are addressed through the appointment of a servicer who is authorized to exercise many of the rights belonging to the holder of the instrument and who is given instructions with respect to how to handle standard challenges, like managing a foreclosure.<sup>150</sup> Another logistical challenge, usually resolved through the appointment of a trustee, entails distributing payments to the various holders and enforcing other rights associated with ownership of the underlying instruments, such as pursuing an originator should an asset sold to the securitization vehicle fail to conform to the representations and warranties made by the originator at the time of

---

<sup>147</sup> For a more detailed description of how securitization structures work, see, for example, Kathryn Judge, *Fragmentation Nodes: A Case Study in Financial Innovation, Complexity and Systemic Risk*, 64 STAN. L. REV. 657, 672 (2012).

<sup>148</sup> See *id.*

<sup>149</sup> E.g., Joshua D. Coval et al., *Economic Catastrophe Bonds*, 99 AM. ECON. REV. 628 (2009).

<sup>150</sup> See, e.g., Anna Gelpern & Adam J. Levitin, *Rewriting Frankenstein Contracts: Workout Prohibitions in Residential Mortgage-Backed Securities*, 82 S. CAL. L. REV. 1075 (2009). See Part III.B., *infra*, for a discussion as to why these instructions are necessarily incomplete.

sale.<sup>151</sup> While these challenges are all significant, and there are meaningful limits to the resolutions used to address each, the magnitude of these challenges and the costs associated with addressing them generally declined as securitization structures spread, as the terms became more standardized and the persons assuming roles like those of a servicer and trustee were already in the business of playing those roles for other securitization structures.

*b. Derivatives*

The second tool that facilitates investor-driven financial innovation is the derivative, a category of transactions that involve obligations that reference but are otherwise independent of instruments used to raise capital for a productive undertaking.<sup>152</sup> A simplified illustration of a credit default swap (CDS) demonstrates how these transactions work: Company A raises capital by issuing long-term debt. Parties X and Y later enter into an agreement pursuant to which Party X agrees to pay Party Y a fixed amount should Company A default on that debt. In exchange, Party Y pays Party X a recurring premium. Although it is possible that Party Y seeks protection from Party X because it is otherwise exposed to Company A, no such connection is required and often no such connection will exist. As with securitization, parties have devised ways to address the myriad logistical challenges that arise from these arrangements and, apart from regulatory considerations, the associated costs have tended to decline as swaps have become more pervasive and standardized.<sup>153</sup>

Derivatives can play an important role reallocating risks among parties in ways that map onto their respective capacity to bear those risks.<sup>154</sup> The focus here is not on the way they may be used by parties to hedge against exogenous risks, but rather on the way they are used to facilitate the reallocation of risks that arise in connection with financial market activity. For example, by allowing the banks involved in securitization and other activities to offset some of the risks to which they would otherwise be exposed, derivatives played a critical role facilitating, directly and indirectly, much of the investor-driven financial innovation that occurred prior to the Crisis.<sup>155</sup>

---

<sup>151</sup> See Judge, *supra* note 147.

<sup>152</sup> This Article uses the term “derivatives” to refer to CDS, interest rate swaps, and other obligations that reference another financial instrument or index but have no direct stake in it. See, e.g., Bruce Tuckman, *In Defense of Derivatives: From Beer to the Financial Crisis*, 781 *Cato Institute* 3 (2015) (noting that “[d]efining derivatives in a way that excludes MBSs and CDOs is not controversial in the policy context” and providing support from recent policy initiatives).

<sup>153</sup> See Frank Partnoy & David A. Skeel, Jr., *The Promise and Perils of Credit Derivatives*, 75 *UNIV. CIN. L. REV.* 1019, 1025–26 (2007) (describing the role that the International Swaps and Derivatives Association has played in facilitating these processes).

<sup>154</sup> See generally Tuckman, *supra* note 152.

<sup>155</sup> See *infra* Part III.A.2.

And, like securitization, derivatives can give rise to risks that did not previously exist, for example, by increasing interconnectedness.<sup>156</sup>

## 2. *Some Examples*

The way that securitization and other derivatives may be used to satisfy excess investor demand for particular types of financial instruments is best illustrated by example. This subpart provides highly simplified accounts of four transaction structures that arose and spread, at least in part, in response to investor preferences. The latter examples all build on the first, enabling the examples to further highlight the way the building blocks just described can be layered with each other and other innovations.<sup>157</sup> This structure also brings to light the way some forms of constrained capital can create a demand for other types of constrained capital.

### a. *MBS*

Mortgage-backed securities (MBS) are the instruments issued by securitization structures in which the underlying instruments are home loans.<sup>158</sup> The volume of MBS transactions skyrocketed in the early 2000s.<sup>159</sup> Although a number of explanations have been given for this growth,<sup>160</sup> one of the most frequently cited is excess demand for AAA-rated instruments.<sup>161</sup>

To understand why the demand for AAA-rated instruments may have been such a powerful force prior to the Crisis, a little context is required beyond the explanations given above. Recall, investor-driven financial inno-

<sup>156</sup> See *infra* Part III.B.

<sup>157</sup> See Lerner & Tufano, *supra* note 39, at 47 (explaining that systemically important financial innovations are often embedded in an innovation spiral, such as when “one successful innovation provid[es] the raw material, or building blocks, for another”); Robert Merton, *Financial Innovation and Economic Performance*, 4 J. APPLIED CORP. FIN. 4, 12–22 (1992) (describing “innovation spirals” in which innovations beget further forms of innovation).

<sup>158</sup> MBS include two subcategories: those backed by residential home loans (RMBS) and those backed by loans for commercial real estate. In line with most academic work on the topic, this Article uses MBS as shorthand for RMBS.

<sup>159</sup> See, e.g., Miguel Segoviano et al., *Securitization: Lessons Learned and the Road Ahead*, at 9, 11 fig.5 (IMF, Working Paper No. 13/255, 2013) (“Private-label residential MBS issuance in the United States increased from US\$148 billion in 1999 to US\$1.2 trillion by 2006 (Figure 5).”).

<sup>160</sup> Another rationale for securitization is that it economizes on information production. See, e.g., Peter DeMarzo, *The Pooling and Tranching of Securities: A Model of Informed Intermediation*, 18 REV. FIN. STUD. 1 (2005); Gary Gorton & George Pennacchi, *Financial Intermediaries and Liquidity Creation*, 45 J. FINANCE 49 (1990). As discussed further below, this is not necessarily an efficient outcome, as it can result in there being too few informed investors and fragility-enhancing information gaps when the good times end. See, e.g., Kathryn Judge, *Information Gaps and Shadow Banking*, 103 VA. L. REV. 411 (2017) [hereinafter *Information Gaps*]; Samuel G. Hanson & Adi Sunderam, *Are There Too Many Safe Securities? Securitization and the Incentives for Information Production*, 108 J. FIN. ECON. 565 (2013).

<sup>161</sup> See, e.g., FIN. CRISIS INQUIRY COMM’N, THE FINANCIAL CRISIS INQUIRY REPORT 119 (2011); Miguel Segoviano et al., *supra* note 159, at 30–35; Ben S. Bernanke et al., *supra* note 8, at fig.5. See also *infra* Part III.A.

vations are most likely to be cost-justified when the demand for a particular type of financial asset exceeds the naturally available supply. As Bernanke and co-authors, among others, have demonstrated, foreign sovereigns—the so-called global saving glut (GSG) countries—held a significant portion of Treasury instruments and other agency securities (which enjoyed an implicit government backing) outstanding, and their acquisitions of these instruments increased in the period leading up to the Crisis.<sup>162</sup> These acquisitions increased the aggregate demand for highly rated instruments and reduced the yields and availability of the safest assets. As a result, even though the GSG countries were not avid purchasers of privately issued AAA-rated instruments, their activity helps to explain the excess demand for these instruments.<sup>163</sup>

*b. CDOs*

Another financial innovation that arose and spread, at least in part, to satisfy the excess demand for AAA instruments prior to the Crisis is the CDO backed by MBS. CDOs of the type here at issue are second-level securitization structures in which MBS and potentially other credit instruments are packaged together into a new securitization structure. The rise of CDOs addressed the demand for AAA instruments in two ways. First, CDO transactions directly created more AAA-rated instruments by producing such instruments from lower rated credit instruments. Again, this was possible because of diversification requirements and the creation of hierarchical tranches that gave certain classes of the instruments issued payment priority over others. Second, CDOs served as ready buyers of MBS that did not have a AAA rating. Because the need to find a buyer for these tranches was often a friction on the rate at which MBS transactions could be consummated, the rise of CDOs increased the rate at which MBS transactions could be consummated.<sup>164</sup>

The important role of CDOs along both dimensions is reflected in the dramatic relative growth of these transactions, which proliferated even more quickly than MBS.<sup>165</sup> Between 2004 and 2006 alone, the height of the boom,

---

<sup>162</sup> See Bernanke et al., *supra* note 8, at 22 fig.2, 24 fig.4 (showing that China, other Asian countries, and the OPEC countries all had quite substantial positive current account surpluses between 2003 and 2007); see also Ben S. Bernanke, Chairman, Fed. Reserve, Remarks on the The Global Saving Glut and the U.S. Current Account Deficit (Mar. 10, 2005).

<sup>163</sup> See Bernanke et al., *supra* note 8, at 24 fig.4.

<sup>164</sup> See Judge, *supra* note 147, at 694 (describing how the rise of CDOs as buyers of BBB-rated MBS facilitated MBS transactions by enabling placement of the most informationally sensitive tranche); FIN. CRISIS INQUIRY COMM'N, *supra* note 161, at 128–30 (2011) (explaining how “CDOs [became] the dominant buyers of the BBB-rated tranches of mortgage-backed securities” and the effects of this shift).

<sup>165</sup> See FIN. CRISIS INQUIRY COMM'N, *supra* note 161, at 18 (“[F]rom the third quarter of 2006 on, banks created and sold some \$1.3 trillion in mortgage-backed securities and more than \$350 billion in mortgage related CDOs.”); *id.* at 129 (“Between 2003 and 2007, as house prices rose 27% nationally and \$4 trillion in mortgage-backed securities were created, Wall Street issued nearly \$700 billion in CDOs that included mortgage-backed securities as collat-

the issuance of new CDOs increased by roughly 250%.<sup>166</sup> One indirect effect of this proliferation of CDOs is that many of the banks sponsoring these transactions, which often retained a portion of the instruments issued, sought to hedge those positions using swaps. This led to greater interconnections among financial institutions and, ultimately, played a critical role in explaining why and how insurance company AIG ended up so exposed to the mortgage market.<sup>167</sup>

*c. Asset-backed Commercial Paper*

Although much of the demand for AAA-rated instruments came from banks, pension funds, and other investors that intended to hold the instruments, another meaningful source of the demand was institutions that intended to transform those assets into short-term, money-like instruments. An important financial innovation that used MBS and other asset-backed securities to produce money claims was asset-backed commercial paper (ABCP) programs.<sup>168</sup> At its height in 2007, total ABCP outstanding reached \$1.2 trillion.<sup>169</sup> This amount exceeded the aggregate value of unsecured commercial paper outstanding, including that issued by financial and nonfinancial firms, and it also exceeded the aggregate value of Treasury bills then outstanding.<sup>170</sup>

---

eral.”); Miguel Segoviano et al., *supra* note 159, at 9 (“At the global level between 2000 and 2007, issuance of collateralized obligation (CDO) increased more than six times to US\$1 trillion, while issuance of CDO-squared product increased eleven-fold to around US\$300 billion.”).

<sup>166</sup> See Faten Sabry & Chudozie Okongwu, *How Did We Get Here? The Story of the Credit Crisis*, 15 J. STRUCTURED FIN. 53, 61 (2009).

<sup>167</sup> See generally Serena Ng and Carrick Mollenkamp, *Goldman Fueled AIG Gambles*, WALL ST. J. (Dec. 12, 2009), <http://www.wsj.com/articles/SB10001424052748704201404574590453176996032>.

<sup>168</sup> For a more in-depth analysis of how these structures work, see, for example, DBRS, ASSET-BACKED COM. PAPER CRITERIA REP.: U.S. & EUROPEAN ABCP CONDUITS - REQUEST FOR COMMENT (2013), <http://www.dbrs.com/research/263140/asset-backed-commercial-paper-criteria-report-u-s-european-abcp-conduits-archived.pdf>; FITCH RATINGS, ASSET-BACKED COM. PAPER EXPLAINED (2001), <http://people.stern.nyu.edu/igiddy/ABS/fitchabcp.pdf>; BASEL COMM. ON BANKING SUPERVISION: THE JOINT FORUM, REPORT ON SPECIAL PURPOSE ENTITIES (2009), <http://www.bis.org/publ/joint23.pdf>.

<sup>169</sup> FIN. CONDUCT AUTHORITY, MARKET-BASED FIN.: ITS CONTRIBUTIONS AND EMERGING ISSUES, at 9 (2016), <http://www.fca.org.uk/static/documents/occasional-papers/occasional-paper-18.pdf> (explaining that the aggregate value of U.S. ABCP peaked in July 2007 at \$1.2 trillion and had fallen to “just \$226 billion at the end of 2015”); see also Viral Acharya & Philipp Schnabl, *Do Global Banks Spread Global Imbalances? The Case of Asset-Backed Commercial Paper During the Financial Crisis of 2007–09*, 58 IMF Econ. Rev. 37, 38 (explaining that the value of outstanding ABCP was roughly \$260 billion more than the value of outstanding Treasury bills).

<sup>170</sup> See Daniel Covitz et al., *The Evolution of a Financial Crisis: Panic in the Asset-Backed Commercial Paper Market* Fed. Res., Working Paper No. 2009-36, (2009), <https://www.federalreserve.gov/pubs/feds/2009/200936/200936pap.pdf>; for detailed information about the types and amounts of CP outstanding see BD. GOVERNORS FED. RESERVE SYS., COM. PAPER RATES AND OUTSTANDING SUMMARY (2018), <http://www.federalreserve.gov/releases/cpl/>.

These structures allow MBS and CDOs, among other assets, to be used to issue money-like claims.<sup>171</sup> They do so through a complex set of arrangements that bear some similarities to securitization structures, in that underlying assets are packaged together in a new vehicle that issues effectively senior claims—in this case, claims with much shorter maturities—and lower priority instruments. These programs also have a number of additional features, such as arrangements with the bank sponsoring the ABCP program that often enable the vehicle to obtain liquidity support from the bank if needed.<sup>172</sup> These structures also vary in important ways, and benefit from implicit as well as explicit commitments from the sponsoring banks.<sup>173</sup> These details are beyond the scope of this Article, but they reflect the complexity that arises from investor-driven financial innovations and the ways such innovations can create mechanisms of contagion that may not be readily apparent.<sup>174</sup> Collectively, these arrangements allowed the issuance of short-term, safe assets of the type that the work by Carlson and his colleagues found operate as a substitute, even if not a perfect one, for short-term Treasuries.<sup>175</sup> The rapid growth of these structures in the years leading up to the Crisis is also consistent with Pozsar's findings regarding the growth of institutional cash pools during this period.<sup>176</sup> As he explains, "because institutional cash pools' money demand is not for transaction purposes, but for liquidity and collateral management as well as investing purposes,"<sup>177</sup> that demand is usually best satisfied by non-M2 types of money, such as ABCP.

*d. Exchange-traded Funds*

Exchange-traded funds (ETFs) and the mutual funds with which they compete are both investor-driven financial innovations. In contrast to the other forms here described, these innovations arose primarily in response to investor demand for low-cost ways to invest in diversified pools of assets while also ensuring the structure itself imposes constraints on how the in-

---

<sup>171</sup> See Covitz et al., *supra* note 170, at 10 (noting that two Moody's reports suggested that between 25-27% of the assets underlying structured investment vehicles that Moody's rated—a form of ABCP—were highly rated residential MBS); *id.* at 9 ("There were 36 ABCP CDO programs in July 2007, with ABCP outstanding of \$47 billion").

<sup>172</sup> See, e.g., *id.* at 8-9 ("A liquidity bank, typically the conduit's bank sponsor, provides a liquidity facility for each transaction to address timing mismatches between the payment streams of the assets and the CP maturity dates or to repay CP investors in the event that CP cannot be rolled, namely a market disruption."); see also FITCH RATINGS, *supra* note 101 (explaining that "sponsors usually retain a financial stake in the ABCP program by providing credit enhancement, liquidity support, or both"). The structure here can be quite different than a securitization structure as many ABCP programs were designed as ongoing, evolving conduits that would regularly acquire new underlying assets as the existing ones matured in addition to regularly issuing nominally new CP as the CP outstanding was constantly maturing.

<sup>173</sup> See DBRS, *supra* note 168.

<sup>174</sup> See *infra* Part III.B.

<sup>175</sup> See *infra* Part III.B.

<sup>176</sup> See *infra* Part III.B.

<sup>177</sup> Pozsar, *supra* note 70, at 284.

vestment manager can invest the capital in any given fund.<sup>178</sup> Both have grown rapidly. The aggregate value of funds in registered investment companies, a category dominated by mutual funds and ETFs, grew from less than \$5.8 trillion in 1998 to more than \$19 trillion in 2016.<sup>179</sup> On a relative basis, ETFs have grown far more rapidly in recent years. Although they first appeared in the 1990s, and only began to grow meaningfully in the 2000s, total assets invested in ETFs now stand in excess of \$3 trillion.<sup>180</sup> This is nearly triple the amount invested in such funds just six years ago.<sup>181</sup> Moreover, while mutual funds experienced net outflows of nearly \$230 billion in 2016, ETFs enjoyed an increase in issuances in excess of \$280 billion during the same period.<sup>182</sup>

Like mutual funds, ETFs commit to a particular investment strategy.<sup>183</sup> That strategy may require the fund to closely track an identified index, like the S&P 500, or it may encourage the investment manager to seek above-market returns but in a given space, such as mid-cap growth companies or in U.S. healthcare companies. The primary difference between mutual funds and ETFs, from the perspective of a retail investor, is in how one acquires and sells shares of an ETF. For most traditional mutual funds, a holder would buy and sell his shares directly from the mutual fund issuing them, with the price of that exchange determined only once a day, based on the fund's assessment of its net asset value.<sup>184</sup> ETFs, by contrast, are actively traded. This enables retail holders to buy and sell shares anytime the relevant exchange is open, and at prices that are constantly adjusting.<sup>185</sup> It also reduces the pressure on ETFs to regularly expand and contract their holdings

---

<sup>178</sup> See generally SEC, MUTUAL FUNDS AND EXCHANGE-TRADED FUNDS (ETFs)—A GUIDE FOR INVESTORS (2018), <https://www.sec.gov/reportspubs/investor-publications/investor-pubsinwsmfhtm.html> [hereinafter SEC MUTUAL FUNDS GUIDE]. Delving into the history of mutual funds reveals a more complicated story, one that suggests that the rise of actively managed mutual funds may have more to do with the influence of stockbrokers and the need to maintain revenue in the face of declining trading costs. See generally Kathryn Judge, *Intermediary Influence* 82 UNIV. CHI. L. REV. 573 (2016). Even in this environment, however, the providers of capital need to be told, and need to believe, a story about why the innovation is cost-justified. See *id.*

<sup>179</sup> See INV. CO. INST., 2017 INVESTMENT COMPANY FACT BOOK: A REVIEW OF TRENDS AND ACTIVITIES IN THE INVESTMENT COMPANY INDUSTRY, at 9, fig.1.1 (2017), [https://www.ici.org/pdf/2017\\_factbook.pdf](https://www.ici.org/pdf/2017_factbook.pdf); see generally SEC MUTUAL FUNDS GUIDE, *supra* note 178.

<sup>180</sup> See Jeff Cox, *Why the Massive Rise of ETFs May be Just Getting Started*, CNBC, July 17, 2017, <https://www.cnbc.com/2017/07/17/meteorite-rise-of-etfs-just-getting-started-black-rock-larry-fink-says.html>; see generally PwC, *ETFs: A ROADMAP TO GROWTH* (2016), <https://www.pwc.com/gx/en/asset-management/publications/pdfs/etfs-a-roadmap-to-growth.pdf>.

<sup>181</sup> See Cox, *supra* note 180; see also PwC, *supra* note 180.

<sup>182</sup> See INV. CO. INST., *supra* note 179.

<sup>183</sup> See SEC MUTUAL FUNDS GUIDE, *supra* note 178.

<sup>184</sup> See *id.* Work by Jeremy Stein suggests that most funds traditionally were open-ended, because allowing investors to redeem shares on a daily basis served as a signal of quality in a field in which skill levels varied, leading to an equilibrium in which all funds are open-ended. Jeremy C. Stein, *Why are Most Funds Open-end? Competition and the Limits of Arbitrage*, 120 Q. J. ECONOMICS 24 (2005).

<sup>185</sup> See SEC MUTUAL FUNDS GUIDE, *supra* note 178.

in response to acquisitions and redemptions, providing tax advantages to the holders of many ETFs.<sup>186</sup>

## B. *The Consequences*

### 1. *Some Benefits*

ETFs represent a classic form of innovation. They are similar to mutual funds but in a form that often results in lower costs while also providing some additional benefits (in the form of liquidity and more favorable tax consequences). Finding ways to produce goods that are close substitutes to existing goods, but which are slightly less expensive or which offer additional functionality, is a traditional way that innovations create value. Moreover, consistent with innovation in other domains, the amount of value created depends not only on the size of the marginal improvements but the size of the market for the goods produced. The strong and still growing demand for low-cost ways to hold diversified pools of assets helps to explain why ETFs have spread so quickly and may continue to do so.

The structure of ETFs may also yield systemic benefits relative to mutual funds. At least in theory, ETFs do not face the same run risk as open-end mutual funds, even when backed by relatively illiquid assets.<sup>187</sup> This immunity from runs is sufficiently valuable in terms of promoting systemic stability that two leading economists have proposed converting mutual funds into ETFs to capture this benefit. Although others have quite different takes on the implications of the spread of ETFs,<sup>188</sup> this highlights the potential for innovations to, at times, have systemic benefits, particularly when they are displacing other innovative structures.<sup>189</sup> The more ETFs there are relative to traditional mutual funds, the greater the systemic benefits in this regard.<sup>190</sup> ETFs thus also illustrate the ways that the development and spread of investor-driven innovations can have important systemic ramifications.

---

<sup>186</sup> ETFs buy and sell shares to select authorized participants, an important mechanism for keeping the price of ETFs in line with the value of the underlying assets. But providing investors liquidity in a way that does not require the fund to sell underlying assets can have tax benefits for ETF holders. See generally Srichander Ramaswamy, *Market Structures and Systemic Risks of Exchange-traded Funds* (BIS Working Paper No. 343, 2011), <https://www.bis.org/publ/work343.pdf>; see also Michael Chamberlain, *What's the Difference? Mutual Funds and Exchange Traded Funds Explained*, FORBES (Jul. 18, 2013), <https://www.forbes.com/sites/feonlyplanner/2013/07/18/whats-the-difference-mutual-funds-and-exchange-traded-funds-explained/#8d0f00f18ac4>.

<sup>187</sup> See Stephen Cecchetti & Kim Schoenholtz, *Reforming Mutual Funds: A Proposal to Improve Financial Market Resilience*, VOX EU (Nov. 15, 2016), <http://voxeu.org/article/reforming-mutual-funds-proposal-improve-financial-market-resilience>.

<sup>188</sup> See *infra* Part III.B.1.c.

<sup>189</sup> *Id.*; see also Itay Goldstein, Hao Jiang & David Ng, *Investor Flows and Fragility in Corporate Bond Funds*, 126 J. FIN. ECON. 592 (2017); Qi Chen, Itay Goldstein & Wei Jiang, *Payoff Complementarities and Financial Fragility: Evidence from Mutual Fund Outflows*, 97 J. FIN. ECON. 239 (2010).

<sup>190</sup> See Cecchetti & Schoenholtz, *supra* note 187.

The question of whether and how securitization, the foundation of each of the other innovations just described, truly creates value is not going to be answered any time soon. As Joshua Lerner and Peter Tufano noted in a recent review of the literature, not only is it difficult to “determin[e] social welfare implications of securitization . . . , even establishing simpler facts . . . is not simple.”<sup>191</sup> Although there is a “large body of papers,” “studies reach contradictory conclusions about” fundamental issues, including “whether riskier banks use securitization, whether they have lower funding costs, or whether securitization increases loan supply.”<sup>192</sup> Despite the difficulty of drawing broad conclusions, there is evidence supporting the existence of both some benefits and some drawbacks.

One of the most important benefits of investor-driven innovation is its potential to improve price efficiency and reduce the cost of capital for borrowers. For example, by expanding the types of investors who could provide capital to home loans, the innovations just described should have, and seemingly did, reduce the cost of getting a home loan.<sup>193</sup> One study, outside the mortgage space, found that corporate borrowers paid an interest rate that was 17 basis points lower when their loan was subsequently securitized relative to otherwise similar loans that were not securitized.<sup>194</sup> There was also an increase in the range of persons who could qualify for a home loan, contributing to the overall rate of U.S. home ownership reaching a record-breaking high of 69.2% in 2006.<sup>195</sup>

In addition, to the extent that investors enjoyed nonpecuniary benefits from holding the types of instruments these innovations produced, the increase in the effective supply of these instruments should also have increased those benefits. None of this is to say that these “innovations” were net positives or even that every instance in which they were used had benefits of the type just mentioned. But by understanding the driving forces behind the spread of these new types of financial instruments, we can also see some of the benefits that may have flowed from their spread. These are help-

---

<sup>191</sup> Lerner & Tufano, *supra* note 39, at 77.

<sup>192</sup> *Id.*

<sup>193</sup> *E.g., id.* at 76 (noting that “some early studies suggest that the first decades of securitization led to lower interest rates for borrowers” and providing citations to the relevant studies).

<sup>194</sup> See Taylor Nadauld & Michael Weisbach, *Did Securitization Affect the Cost of Corporate Debt?*, 105 J. FIN. ECON., 332, 352 (2012) (“Controlling for other factors, including the risk of the loan facility, facilities that are securitized are issued at about a 17 basis point lower spread than an otherwise identical facility that was not securitized.”).

<sup>195</sup> See Press Release, U.S. Dep’t of Commerce, U.S. Census Bureau News: Residential Vacancies and Homeownership in the Second Quarter 2016 (July 28, 2016) (showing homeownership rates from 1995–2016), <https://census.gov/housing/hvs/files/qtr216/qtr216hvs.press.pdf>; see also NEIL BHUTTA ET AL., BD. OF GOVERNORS OF THE FED. RESERVE, THE 2014 HOME MORTGAGE DISCLOSURE ACT DATA, 101 THE FED. RESERVE BULLETIN 4 (showing that the number of home loans originated in 2005 and 2006 far exceeded earlier or subsequent figures), [http://www.federalreserve.gov/pubs/bulletin/2015/pdf/2014\\_HMDA.pdf](http://www.federalreserve.gov/pubs/bulletin/2015/pdf/2014_HMDA.pdf).

ful to consider alongside the changing risks and other drawbacks that also accompany their spread.

## 2. *The Changing Risks*

### a. *Identifiable Risks Borne by the Parties Involved*

Virtually all investor-driven financial innovations create risks that would not otherwise exist.<sup>196</sup> Some of these costs are identifiable and borne entirely by the parties involved. Separating the roles of originating a credit instrument and holding that instrument to maturity, for example, can give rise to moral hazard by reducing the incentives the originator has to ensure that the loan is an appropriate one to extend and the terms are commensurate with the underlying risk.<sup>197</sup> Readily identifiable challenges are often mitigated through contractual and other means, and the incremental cost of using such devices tends to go down as an innovative structure spreads. Nonetheless, these tools remain costly, and are thus one of the reasons that the types of instruments here described are usually imperfect substitutes for sovereign or corporate bonds with similar ratings.

The Crisis also revealed that many of the tools used to mitigate these costs were less effective than parties appreciated at the time. Despite the legal and reputational devices intended to ensure that originators were diligent when originating a loan for securitization, for example, the data shows there were weaknesses in these checks. According to one study, loans that could be readily securitized were 10–25% more likely to default than otherwise similar loans that were not as conducive to securitization.<sup>198</sup> Nonetheless, for the most part, risks that are readily identifiable and internalized by the parties involved are more usefully thought of as among the costs of using innovative instruments than a source of concern for policymakers.

### b. *Context-dependent Risks*

Other risks created by the spread of investor-driven financial innovations are borne, at least in part, by the parties to the transaction, but are not readily apparent when the transaction is consummated. One reason for unforeseen risks is that a risk may not arise directly from the transaction but instead from interactions between the structure a transaction creates and the environment in which the obligations subsequently arise. The risks associated with securitizing home loans illustrate these dynamics. Recall, when a

---

<sup>196</sup> See, e.g., Fin. Conduct Auth., *Market-Based Finance: Its Contributions and Emerging Issues*, 23–25 (2016), <http://www.fca.org.uk/static/documents/occasional-papers/occasional-paper-18.pdf>, (describing the range of market failures that can arise from market-based finance, which includes many forms of preference arbitrage).

<sup>197</sup> Coffee, *supra* note 133, at 406.

<sup>198</sup> E.g., Benjamin J. Keys et al., *Did Securitization Lead to Lax Screening? Evidence from Subprime Loans*, 125 Q. J. ECONOMICS 307 (2010).

loan is placed into a securitization vehicle, a servicer is employed to collect payments on the loan and address any logistical challenges that arise, but the rights to the cash flows from that loan now belong to the dispersed investors who hold the MBS issued. The best way to maximize the value of a loan in default changed, however, when housing prices nationwide fell dramatically, and most servicing agreements failed to provide servicers the discretion and incentives to make the modifications required to maximize loan value in the changed environment.<sup>199</sup> This contributed to securitized loans being foreclosed at significantly higher rates than comparable loans retained by the originating bank, which did have good incentives and flexibility.<sup>200</sup>

This example illustrates two distinct reasons that private mechanisms do not suffice to address the risks associated with investor-driven financial innovations. First, the inherent complexity and newness of many forms of preference arbitrage, coupled with the context-dependent nature of certain risks, virtually ensures that the parties will fail to identify and address all of the risks that might arise.<sup>201</sup> Second, risks may be inadequately identified and addressed because they also impose costs on persons completely outside the regime. By increasing the proportion of home loans in default that were foreclosed upon, securitization accentuated a cycle of further depressing home values, and triggering yet more defaults and more foreclosures.<sup>202</sup> The excess foreclosures thus affected neighboring homeowners, lenders to those homeowners, and other third parties. The parties to a securitization transaction, however, had little incentive to consider the costs that the transaction might impose on such persons.

### c. Systemic Risk

It is not a coincidence that many of the innovations described here had starring roles in the mechanisms through which the Crisis became manifest and spread through the rest of the financial system. Very often, to manufacture financial claims with characteristics that do not otherwise correspond to the characteristics of persons seeking financing entails steps that increase the complexity and interconnectedness of the financial system, which can in-

---

<sup>199</sup> See, e.g., DIANE E. THOMPSON, NAT'L CONSUMER L. CTR. INC., WHY SERVICERS FORECLOSE WHEN THEY SHOULD MODIFY AND OTHER PUZZLES OF SERVICER BEHAVIOR: SERVICER COMPENSATION AND ITS CONSEQUENCES (2009), <https://www.nclc.org/images/pdf/pr-reports/report-servicers-modify.pdf>; Gelpert & Levitin, *supra* note 150.

<sup>200</sup> Tomasz Piskorski et al., *Securitization and Distressed Loan Renegotiation: Evidence from the Subprime Mortgage Crisis*, 97 J. FIN. ECON. 369, 370 (2010); *id.* at 371 (finding "that the foreclosure rate of bank-held loans is lower as compared to securitized loans by around 3% to 7% in absolute terms (13% to 32% in relative terms)"); see also Manuel Adelino et al., *Why Don't Lenders Renegotiate More Home Mortgages? Redefaults, Self-cures and Securitization* (NBER Working Paper Series, Working Paper No. 15159, 2009), <http://www.nber.org/papers/w15159>.

<sup>201</sup> See FRANK PORTNOY, INFECTIOUS GREED: HOW DECEIT AND RISK CORRUPTED THE FINANCIAL MARKETS (2d ed. 2009).

<sup>202</sup> See Judge, *supra* note 147.

crease systemic risk. As Lerner and Tufano have explained, “[g]iven the interconnected nature of the financial system, it would be surprising if the most widely adopted financial innovations did not contribute to systematic risk.”<sup>203</sup>

The specific examples here provided bring this dynamic to life. The Financial Crisis Inquiry Commission, for example, concluded that CDOs contributed to the Crisis by “fuel[ing] demand for nonprime mortgage securitization and contribut[ing] to the housing bubble.”<sup>204</sup> That MBS and CDO structures precluded securitized loans from being modified as often as loans held by banks likely also accentuated the depths of the bust that followed.<sup>205</sup>

Focusing on information dynamics reveals another set of mechanisms through which the financial innovations described here contributed to the Crisis. For example, given that CDO managers conducted relatively little due diligence with respect to the assets that they placed into CDOs, and CDO structures were themselves complex arrangements, the spread of CDOs contributed to growing information gaps, that is, growing pools of pertinent information not known to any party, private or public. So long as confidence reigned, these information gaps had little effect on market functioning. Once questions started to arise about the value of MBS, however, investors became far less willing to acquire MBS, CDOs, or instruments exposed to MBS or CDOs, without better information. Because no one had the relevant information and because the pre-Crisis conditions led to an underinvestment in the technology required to produce the information,<sup>206</sup> these information gaps increased the degree of market dysfunction once panic set in.<sup>207</sup> The increased interconnectedness of the financial system that often accompanies the spread of innovations similarly adds to the fragility of the overall system. In a paper formalizing these dynamics, Ricardo Caballero and Alp Simsek explain that “[d]uring normal times, banks only need to understand the financial health of their direct counterparties.” By contrast “when a surprise liquidity shock hits[,] . . . a domino effect of bankruptcies becomes possible, and banks become concerned that they might be indirectly hit.”<sup>208</sup> These concerns and the lack of information regarding their counterparties’ counterparties motivate banks to “hoard liquidity and turn into sellers”—activities that directly contribute to the spread of a financial crisis.<sup>209</sup>

<sup>203</sup> Lerner & Tufano, *supra* note 39, at 47.

<sup>204</sup> FIN. CRISIS INQUIRY COMM’N, *supra* note 161, at 155.

<sup>205</sup> See Piskorski et al., *supra* note 200; Judge, *supra* note 147.

<sup>206</sup> See Hanson & Sunderam, *supra* note 160.

<sup>207</sup> See Judge, *supra* note 160.

<sup>208</sup> Ricardo J. Caballero & Alp Simsek, *Fire Sales in a Model of Complexity*, 68 J. FINANCE 2549, 2550 (2013).

<sup>209</sup> *Id.*

ABCP were also central to the Crisis.<sup>210</sup> Daniel Covitz and co-authors, for example, show that the ABCP market underwent a swift and sharp contraction during the early stages of the Crisis.<sup>211</sup> The “proximate cause” was a concern about exposure to the subprime MBS market, the effects of which were magnified by the lack of information ABCP had about the assets backing the ABCP that they held.<sup>212</sup> Other studies reveal that the terms of the ABCP that survived changed materially during this period, with durations generally getting shorter, further increasing the vulnerability of the system to further shocks.<sup>213</sup> And work by Viral Acharya and Philipp Schnabl shows how problems in the ABCP market led to problems for the banks who had sponsored ABCP programs.<sup>214</sup> The contraction in the ABCP, even though triggered by concerns about a subset of instruments produced in the United States, thus quickly became a critical mechanism through which the adverse effects of the Crisis spread internationally.<sup>215</sup>

Although more at the stage of speculation than realization, questions have also been raised about the systemic implications of the rapid spread of ETFs. As noted above, their structure has some benefits relative to mutual funds, the innovation that they are displacing, that may enable them to avoid runs during periods when mutual funds would be plagued by destabilizing withdrawals.<sup>216</sup> Others, however, have identified a number of mechanisms through which ETFs may increase fragility. A BIS paper, for example, identified four ways that they could undermine stability including the potential that complexity could undermine effective monitoring.<sup>217</sup> In a similar spirit, the SEC has initiated an effort to explore the ramifications of the spread of ETFs.<sup>218</sup> As one Commissioner recently argued, in light of recent disruptions causing the price of ETFs to deviate significantly from the underlying assets, “it may be time to reexamine the entire ETF ecosystem.”<sup>219</sup>

<sup>210</sup> See Judge, *supra* note 160.

<sup>211</sup> See Covitz et al., *supra* note 170, at 815–17 (finding that ABCP outstanding shrunk by nearly \$190 billion in just the first month of the Crisis and an additional \$160 billion by the end of the 2007).

<sup>212</sup> See *id.* at 829; Judge, *supra* note 160.

<sup>213</sup> See Covitz et al., *supra* note 170, at 815–17, 824 fig.1 (“[I]n the summer 2007, . . . yields soared and maturities shortened for new issues . . . . [T]he average maturity of new-issue paper dropped to about 21 days on average in the last 5 months of 2007, from 33 days on average in the first 7 months of the year . . . . [O]vernight ABCP yield spreads over the target federal funds rate across all program types soared to an average of 47 basis points in August, and remained high and volatile through the end of the year, up from monthly averages of between two and six basis points in the first 7 months of 2007.”); Acharya & Schnabl, *supra* note 169, at 40 fig.2.

<sup>214</sup> See Acharya & Schnabl, *supra* note 169, at 64–65.

<sup>215</sup> See *id.* at 63 fig.8.

<sup>216</sup> See Cecchetti & Schoenholtz, *supra* note 187.

<sup>217</sup> See Ramaswamy, *supra* note 186, at 11.

<sup>218</sup> See SEC, Release No. 34-75165, Request for Comment on Exchange-Traded Products (2015), <https://www.sec.gov/rules/other/2015/34-75165.pdf>.

<sup>219</sup> Luis A. Aguilar, Comm’r, SEC, How Can the Markets Best Adapt to the Rapid Growth of ETFs (Oct. 15, 2015), <https://www.sec.gov/news/statement/how-can-markets-adapt-to-rapid-growth-etfs.html>.

As these examples illustrate, investor-driven financial innovations can play an important role bridging the gap when investor demand for a particular type of financial instrument exceeds the natural supply. The spread of investor-driven financial innovations can thus play an important role enabling constrained capital to flow into new domains in ways that benefit investors and borrowers alike. But new financial innovations also pose a range of challenges that are often inadequately addressed by the parties involved. This may be due to the newness of the instrument or to the tendency of economic booms, during which innovations often spread, to disguise risks.<sup>220</sup> The more important challenge, and the one directly relevant to policymakers, is that the creation and spread of investor-driven financial innovations can increase the complexity, interconnectedness, and rigidity of the financial system—all changes that have been shown, at least in some environments, to increase systemic risk.<sup>221</sup> And there are likely an array of other mechanisms through which they may further exacerbate fragility or reduce resilience in ways that are hard to identify and address in advance.<sup>222</sup> To be sure, as in the case of ETFs, there is the possibility that a new innovation will change financial intermediation in ways that reduce rather than exacerbate fragility. Context is critical. That investor-driven financial innovations can both enhance and harm systemic resilience, however, only increases the importance of having regulators to pay heed to these dynamics when taking actions that could spur system-changing innovations.

#### IV. REGULATION, PREFERENCES, AND INNOVATION

The first two Parts provide the descriptive groundwork needed to consider when regulation will lead to innovation and why policymakers should care. This Part builds on that groundwork to consider two conditions for an intervention to affect innovation—a change in aggregate demand and a price impact. This first subpart provides an overview of the different ways that regulation may affect the aggregate amount of constrained capital in the financial system and the amount of capital subject to a particular constraint. The second addresses cost as a friction for innovation.

---

<sup>220</sup> See Gelpert & Gerding, *supra* note 8, at 376 (“In a credit boom, many public and private contracts look safe, substitute for one another, and serve as inputs in new private safe assets.”).

<sup>221</sup> The focus here is on how the innovations change the structure of financial markets in ways that contribute to systemic and other risks. Important, but not discussed here, is the possibility that constrained capital may also contribute to systemic risk through other mechanisms.

<sup>222</sup> *E.g.*, Daniel Schwarcz & Steven Schwarcz, *Regulating Systemic Risk and Insurance*, 81 U. CHI L. REV. 1569, 1575 (2014) (explaining that “systemic risk in insurance . . . can crop up in new and distinctive guises due to the massive complexity and interconnections that have evolved, and continue to evolve, within our financial system”).

## A. The Role of Regulation

### 1. Substitute for Private Monitoring

Even in the absence of any regulation, banks, insurance companies, pension funds, and most other financial institutions would face constraints in how they could deploy the capital in their possession. During the “free banking era,” for example, banks had larger capital cushions than they currently do and many also stockpiled cash as a way of assuring depositors of the sufficiency of their liquidity reserves.<sup>223</sup> Even today, many banks hold more capital or liquid assets than regulations require.<sup>224</sup> This is because, as noted in a recent IMF Report, “Banks have intrinsic incentives to hold safe assets . . . . Safe assets—particularly short-term government securities—play a key role in banks’ day-to-day asset-liability management.”<sup>225</sup> Among other virtues, “[s]horter-term safe assets permit banks to curb unwanted maturity mismatches and manage their short-term funding needs.”<sup>226</sup>

Banks also have non-regulatory reasons for wanting to be well capitalized.<sup>227</sup> Today, the government is often inextricably intertwined with these institutions, as the government now provides formal guarantees to claim holders in each of these settings, creating moral hazard that can only be mitigated through oversight and risk restrictions. Nonetheless, the overall edifice serves aims that, at least in part, would be addressed through market-based mechanisms in the absence of regulation.<sup>228</sup>

Developing a baseline to assess the actual role of regulation in these settings is exceptionally difficult. This is in part because of the long history of regulation in these domains. It also reflects the fact that explicit and implicit government guarantees distort incentives even in the absence of regulation. As a result, a regulatory intervention that reduces moral hazard arising from the government intervention may appear to increase the aggregate demand for a particular type of financial instrument, but it may in fact

<sup>223</sup> See, e.g., Charles W. Calomiris, *How to Regulate Bank Capital*, 10 NAT'L AFF. 41, 55–56 (2012) (stating that “[b]efore banks’ debts were protected by government deposit insurance and bailouts, markets ensured that banks maintained adequate amounts of capital and cash assets, and rewarded bankers who engaged in better risk management with lower costs for raising funds”); KING, *supra* note 96, at 280 (“A century ago, the [capital] ratio for many banks was 25 per cent!”).

<sup>224</sup> See Jakovljevic *supra* note 50, at 425 (noting that “the predominant conclusion of empirical work is that the effect of capital regulation might vary accordingly to the level of capital held by the banks that exceeds the regulatory requirement”).

<sup>225</sup> IMF, *supra* note 52.

<sup>226</sup> *Id.*

<sup>227</sup> See, e.g., Jakovljevic et al., *supra* note 50, at 425 (explaining that banks may hold more capital that regulations require for a range of reasons including “to insure themselves against insolvency risk . . . or economic recession,” “to satisfy the criteria of rating agencies,” and “to optimize their market value” (citations omitted)).

<sup>228</sup> See generally, Mathias Dewatripont & Jean Tirole, *Efficient Governance Structure: Implications for Banking Regulation*, in CAPITAL MARKETS AND FINANCIAL INTERMEDIATION (Colin Mayer & Xavier Vives eds., 1995).

merely be reducing the aggregate distortion arising from government intervention. The process of conceptually focusing on what a baseline might look like is key to understanding just how distortive government policies are, and are not, in these domains.

An additional value in establishing this type of baseline is that it can provide guidance with respect to the relative power, and impotence, of changes in the regulatory regime. Although the focus here is on the way a regulatory regime that serves as a substitute for private monitoring does not necessarily increase constrained capital, the inverse is also true: Removing regulations that are a substitute for private monitoring does not necessarily reduce the amount of constrained capital. This is reflected in the mixed results of efforts to reduce regulatory reliance on credit ratings.<sup>229</sup> Monitoring risk-taking is tricky business, whether done by regulators or market participants, and proxies are exceptionally useful when information asymmetries and information costs are taken into account. Thus, prohibiting reliance on a particular type of proxy cannot be assumed to bring about a meaningful change in behavior unless accompanied by an assessment of why the proxy is being used and what else might serve that function. Similarly, when a firm's capital structure subjects it to private discipline alongside the regulatory regime, changing a regulatory burden will not necessarily result in less stringent constraints or less constrained capital.

Collectively, this suggests that many of the regulatory regimes that most obviously produce constrained capital are not as transformative as they superficially appear.<sup>230</sup> This does not deny that these types of interventions may impact investor preferences in ways that influence innovation. Even when a regulatory regime is nothing but a substitute for private monitoring, the particular rules adopted can shape the thresholds around which demands for constrained capital arise and the size of the demand around those thresholds.<sup>231</sup> Nonetheless, the importance of these interventions with respect to innovation is likely to be more modest than is commonly assumed.

## 2. Other Policy Aims

Financial regulation also serves aims beyond coordinating the protections that stakeholders would otherwise demand. To the extent that a regulatory intervention aims to reduce negative externalities, or to further other policy aims, the intervention is far more likely to fundamentally alter the amount and type of constrained capital in the financial system. Although

---

<sup>229</sup> See *supra* Part II.A.2.

<sup>230</sup> For further discussion of implications and alternatives, see Part IV.

<sup>231</sup> See, e.g., Richard Stanton & Nancy Wallace, *CMBS Subordination, Ratings Inflation, and Regulatory-Capital Arbitrage* (U. Cal. Berkeley Fisher Ctr. for Real Estate & Urban Econ., Working Paper, 2012) (showing that the price of highly rated commercial MBS fell relative to corporate debt when the capital adequacy requirements applicable to such instruments were reduced).

often difficult in practice to distinguish regulations that replicate private constraints from those that address externalities, this distinction is key to understanding conceptually when the law alters the amount of constrained capital in the system.

Banking illustrates how regulatory interventions can serve multiple aims. The capital requirements imposed on banks, for example, function in part as a substitute for what the market would otherwise require. Because of deposit insurance and other expectations of government support, these types of regulations are required to re-establish the market discipline that would be imposed on banks in the absence of government support. At the same time, these regulations are designed to reduce the negative externalities that can arise when a bank fails. Because of contagion and information loss, bank failures may result in social costs that exceed the costs borne by a bank's stakeholders.<sup>232</sup> As a result, capital requirements imposed by reference to the riskiness of a bank's assets are often more demanding than would be required if the sole function was to substitute for private oversight.

Another example of the law intervening to both replicate private discipline and address spillovers is the changes underway in the derivatives market. To address concerns about the role derivatives played in the Crisis, the Dodd-Frank Act mandates a number of important changes in how this market operates.<sup>233</sup> Of particular relevance here are new requirements that standardized derivatives be centrally cleared and heightened collateral requirements for derivatives that are instead executed over-the-counter (OTC), that is, as bilateral agreements.<sup>234</sup> These changes reduce the probability that parties will experience losses as a result of counterparty failure, so they clearly overlap with the type of private protections derivative market participants have long demanded. Yet, the requirements are more robust than those the market had demanded previously and are in forms that the market had not otherwise embraced on a widespread basis, which is consistent with policymakers' belief that derivative exposures can be a mecha-

---

<sup>232</sup> See XAVIER FREIXAS & JEAN-CHARLES ROCHET, *MICROECONOMICS OF BANKING* 310 (2d ed. 2008) (identifying the social costs that justify bank regulation).

<sup>233</sup> Whether derivatives played a significant role in contributing to the Crisis remains contested. See, e.g., Tuckman, *supra* note 152.

<sup>234</sup> The combination of statutory and regulatory changes required to effectuate these changes are complex, in significant part because authority remains divided between the SEC and the CFTC. See Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 712, 124 Stat. 1641. (2010) (codified at 15 U.S.C.A. § 8302); Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 114-113, § 705(a), 129 Stat. 3025 (2015) (codified at 7 U.S.C.A. § 2); Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 114-1, § 302(a), 129 Stat. 28. (2015) (codified at 7 U.S.C.A. § 6s); see also Paula S. Greenman et al., *Regulation of Over-the-Counter Derivatives Under the Dodd-Frank Wall Street Reform and Consumer Protection Act*, CAPITAL MARKETS (Skadden, Arps, Slate, Meagher & Flom, New York, N.Y.), at 3, [http://www.skadden.com/newsletters/FSR\\_A\\_Regulation\\_of\\_Over-the-Counter\\_Derivatives.pdf](http://www.skadden.com/newsletters/FSR_A_Regulation_of_Over-the-Counter_Derivatives.pdf) (stating that “[t]he Act divides the regulation of the OTC derivatives market between ‘swaps’ regulated by the CFTC and ‘security-based swaps’ regulated by the SEC” but “[t]he dividing line between the categories, however, is not entirely clear”); *id.* at 7–8 (discussing the new clearing and collateral requirements).

nism of contagion during periods of financial distress and that, therefore, there are externalities that the parties are not incentivized to address. The long-term ramifications of these changes remain uncertain and staged implementation makes the impact of the regulations difficult to parse, but initial estimates suggest that the revised regime will require derivatives market participants to post and maintain significantly more collateral than the market previously demanded and thus will increase aggregate demand for safe assets.<sup>235</sup>

### 3. Indirect Effects

The focus thus far has been on regulatory regimes that expressly require or incentivize institutions to hold particular types of financial claims. But the law can also have powerful indirect effects on investor preferences. This is illustrated by some of the ways that the law affects the demand for money and other safe assets. One of the primary reasons that people demand such assets is as a way of self insuring in anticipation of future, and often uncertain, needs.<sup>236</sup> This demand is not determined in a vacuum, but rather is shaped by people's expectations regarding their ability to access external financing when needed.

A traditional function of banks is to provide clients liquidity insurance. When a person puts money into a demand deposit account, the bank assumes the obligation to make those funds available to the depositor whenever the depositor needs liquidity in the future. A different way that banks provide liquidity insurance is through lines of credit. Individuals, for example, may have a home equity line of credit.<sup>237</sup> This might be used as a safety cushion against the risk of temporary unemployment or an unexpected expenditure. Companies, similarly, use lines of credit to address the risk that information problems, commitment concerns, or external developments may impede their ability to access credit in a timely and cost-effective manner at some point in the future.

State actors also play an important role in providing liquidity insurance. Since its founding, a core role of the Federal Reserve is to provide a form of liquidity insurance by committing to make collateralized loans to banks facing excess withdrawals.<sup>238</sup> This role, commonly referred to as the lender of last resort, is one that the Fed and other central banks continue to play to this

---

<sup>235</sup> *E.g.*, J.P. MORGAN, *supra* note 101, at 7 (stating that “[d]emand will significantly increase for the same high quality collateral called for by Basel III, Solvency II, etc.” and that “the consensus is that there will be a significant reduction in availability” of qualifying high-quality assets).

<sup>236</sup> *See supra* Part II.A.1.

<sup>237</sup> *See generally* Fed. Reserve Bd., *What You Should Know about Home Equity Lines of Credit* (2012), [http://files.consumerfinance.gov/f/201204\\_CFPB\\_HELOC-brochure.pdf](http://files.consumerfinance.gov/f/201204_CFPB_HELOC-brochure.pdf).

<sup>238</sup> *E.g.*, ALLAN H. MELTZER, *A HISTORY OF THE FEDERAL RESERVE, VOLUME 1: 1913-1951*, at 3 (2004).

day.<sup>239</sup> When the legal rules governing the capacity of the Fed to provide liquidity support to banks and nonbanks change, it changes the calculations financial institutions must undertake when assessing the optimal level of liquid reserves to hold. This example also highlights the difficult tradeoffs at stake, many of which are beyond the scope of this analysis. Forcing banks and nonfinancial firms to hold high levels of liquid assets by limiting access to a reliable form of liquidity provision can minimize moral hazard, but it can also impose significant costs on these institutions and may deter lending and investments that are otherwise socially valuable.<sup>240</sup>

Shifting yet one more level, loans from the International Monetary Fund (IMF) to countries unable to pay their debts are yet another insurance-like product—one that alters the incentives a country faces when assessing the level of liquid reserves. The more difficult it is to obtain such a loan, or the less acceptable the terms imposed on it, the greater incentive a country has to self insure.

Each of these examples illustrate the importance of taking a broad view of the range of government actions that affect the amount of constrained capital in the financial system. As Bernanke explained, the global saving glut, which appears to have played a significant role in shaping pre-Crisis financial markets, arose because emerging market countries sought to build up “‘war chests’ of foreign reserves” that could “be used as a buffer against potential capital outflows” following the financial crises that spread through Asia and Latin America in the 2000s.<sup>241</sup> This heightened demand for safe assets was shaped not only by countries’ increased appreciation of how quickly foreign capital could exit, but also in light of new information regarding the loss of autonomy that a country would face as a result of the onerous conditions that accompanied any effort to address those shortfalls by borrowing from the IMF.<sup>242</sup> Had IMF loans been more forthcoming and less conditioned, the IMF interventions would have resulted in even more moral hazard than they did; but, the magnitude of the global saving glut might also have been smaller, as countries may have felt less compelled to self insure to address future capital needs. Regardless of the merits of the IMF decision, the example illustrates the importance of looking beyond rules that explicitly require or incentivize firms to hold particular types of assets

---

<sup>239</sup> *E.g.*, OFFICE OF THE INSPECTOR GEN., FED. RESERVE, THE FEDERAL RESERVE’S SECTION 13(3) LENDING FACILITIES TO SUPPORT OVERALL MARKET LIQUIDITY: FUNCTION, STATUS, AND RISK MANAGEMENT 31 (2010), [https://oig.federalreserve.gov/reports/FRS\\_Lending\\_Facilities\\_Report\\_final-11-23-10\\_web.pdf](https://oig.federalreserve.gov/reports/FRS_Lending_Facilities_Report_final-11-23-10_web.pdf).

<sup>240</sup> *E.g.*, FREIXAS & ROCHET, *supra* note 232, at 20 (“A very natural idea for justifying the existence of depository institutions is to consider them as pools of liquidity that provide households with insurance against idiosyncratic shocks that affect consumption needs.”).

<sup>241</sup> Ben S. Bernanke, Chair, Bd. Governors Fed. Reserve Sys., Remarks at the Homer Jones Lecture (Apr. 14, 2005), <http://www.federalreserve.gov/boarddocs/speeches/2005/20050414/>.

<sup>242</sup> *E.g.*, KING, *supra* note 93.

in seeking to assess how state actions affect the amount of constrained capital in the financial system.

The new liquidity coverage ratio (LCR), designed to enhance the capacity of banks to withstand periods of systemic distress, further illustrates the challenge of assessing the impact of government interventions and the optimal degree of self insurance. The LCR requires subject banks to hold sufficient high-quality liquid assets to support the bank's operations for thirty days during a period of systemic distress.<sup>243</sup> It is individualized in the sense that it focuses on that bank's expected cash inflows and outflows, but it ignores a range of factors that would otherwise be material in assessing just how much liquidity a bank should hold.<sup>244</sup> The standardized nature of the requirement suggests it is almost inevitably distortive, but whether this is more or less liquidity than an average bank would hold absent any type of government intervention in the banking system is far from clear. On the one hand, the LCR requires virtually all affected banks to hold more safe assets than they held in the absence of the LCR.<sup>245</sup> On the other hand, a primary rationale for the LCR is that pre-Crisis banks held too few safe assets, in part because of expectations of government support.<sup>246</sup>

These examples illustrate the challenge of trying to develop an appropriate baseline from which to assess the effects of an intervention or other rule change. When a central bank stands ready as a lender of last resort, banks have less incentive to carry adequate liquidity to address depositor demands. At the same time, the only way to ensure banks have sufficient reserves to meet depositor demands in the absence of external support—requiring banks to hold 100% reserves against deposit—has been rejected time and again for more than a century, seemingly reflecting a consensus that the drawbacks exceed the stability-enhancing benefits.<sup>247</sup> Additionally, the market-only approach of allowing banks to issue as many money claims as the market will allow, but denying any government support in the event of failure, has not been followed by any industrialized nation, presumably because of the adverse spillover effects on the real economy that flow from

---

<sup>243</sup> See BASEL III: THE LIQUIDITY COVERAGE RATIO, *supra* note 102 (“The LCR builds on traditional liquidity ‘coverage ratio’ methodologies used internally by banks to assess exposure to contingent liquidity events. The total net cash outflows for the scenario are to be calculated for 30 calendar days into the future. The standard requires that, absent a situation of financial stress, the value of the ratio be no lower than 100% (i.e. the stock of HQLA should at least equal total net cash outflows).”).

<sup>244</sup> See generally 49 U.S.C. § 329 (2014).

<sup>245</sup> Mark Carlson et al., *Why Do We Need Both Liquidity Regulations and a Lender of Last Resort? A Perspective from Federal Reserve Lending During the 2007–09 U.S. Financial Crisis*, Bd. of Governors of the Fed. Reserve Fin. Econ. Discussion Series, 2–3 (2015), <http://dx.doi.org/10.17016/FEDS.2015.011> (explaining that “[t]he scale of Federal Reserve intervention in financial markets during the crisis generated considerable controversy,” and new “liquidity regulations” were among the post-Crisis reforms designed to reduce such interventions in the future).

<sup>246</sup> *Id.*

<sup>247</sup> *E.g.*, RICKS, *supra* note 83 (explaining the drawbacks of this type of reform).

banking crises.<sup>248</sup> The analysis here does not require or provide a conclusion regarding the optimal level of insurance to allow in today's multi-leveled system, nor does it address the full range of costs associated with self insurance. This Article does, however, contribute to this discussion by drawing attention to the often-overlooked relationship between the amount of insurance provided and the complexity and fragility of the financial system.

### B. *The Importance of Price*

Having established when an intervention is properly credited with changing investor preferences, and thus increasing the aggregate demand for a particular type of financial instrument, the question becomes when such increased demand will spur innovation. This leads to the second condition this Article identifies as key—a price impact. This is required because innovations are costly to produce and costly to deploy.<sup>249</sup> These costs take different forms. Some, like the fees paid to the lawyers, servicers, and other parties involved when a securitization transaction is consummated, are readily identifiable as costs. Others, like the new risks that arise from a transaction structure and the tools deployed to minimize those risks, are not as readily monetized. The costs of deploying an innovation can also go down, sometimes quite significantly, as structures become more pervasive and the tools used to manage the risks are more standardized. Nonetheless, to the extent they are known or suspected by the parties at the time a transaction is consummated, they effectively function as a cost that will cause the parties to discount the innovative technique relative to the original. This is consistent with the evidence that private claims can serve as substitute for publicly issued safe assets, but that they seem to be imperfect substitutes and the demand for such private instruments tends to wane when there is a robust supply of public instruments available.<sup>250</sup>

This requirement serves as an important filtering device for identifying when the tendency of an intervention to produce constrained capital is likely to lead to the spread of innovations in ways that alter the structure of the financial system. It highlights that it is not constrained capital by itself that is problematic (at least for the reasons identified here), but rather, constrained capital in settings where there is a high degree of buildup around a particular threshold.

Two additional considerations can help when translating this concept into guidelines for policymakers. First, innovation itself may be a flag of a muted price impact. Like innovation generally, financial innovation increases the supply of close substitutes for a desired product, causing prices

---

<sup>248</sup> See Gerald Dwyer and R. Alton Gilbert, *Bank Runs and Private Remedies*, May/June 1989 FED. RES. BANK OF ST. LOUIS REV., 43.

<sup>249</sup> *E.g.*, Lerner & Tufano, *supra* note 39, at 45; see also *supra* Part III.A.

<sup>250</sup> See *supra* Part II.A.

to fall and yields to rise. As a result, although depressed yields on a particular category of assets indicate a domain where it may be possible to cover the cost of innovation, the lack of recognizably lower yield does not rebut this possibility; it may indicate instead that innovation already underway has minimized the price impact that would otherwise have developed.

Second, price impact is not static. The impact of an intervention, both in terms of the demand it helps create and the readily available supply, may vary over the course of a credit cycle and in response to other exogenous developments. These are particularly important considerations for so-called safe assets. The post-Crisis reforms, like many reform efforts, were put into place shortly after a massive financial crisis which caused market participants and policymakers alike to fundamentally reassess the risks associated with particular types of assets and unload assets that were riskier or about which less was known. These patterns are common.<sup>251</sup> As a result, even without any regulatory reform, the Crisis would have triggered significant changes in how financial institutions manage risks, the pricing of risk, and the range of assets that market participants would be willing to treat as safe. And, if history is any indication, there will again be a period of normalcy that eventually leads to another period of froth; and it is during the period of froth that demand for safe assets will most likely exceed the supply and that market participants may be most ready to accept innovative substitutes as safe.<sup>252</sup> The recent empirical work in this domain also highlights the importance of understanding how the supply of Treasury instruments affects the demand for privately issued instruments.<sup>253</sup> Current government spending could ease the excess demand for safe assets in the near future, perhaps quite significantly, but that would not moot the potential for interventions to have important distortive effects in time.

## V. IMPLICATIONS FOR POLICYMAKING

Having identified a concrete mechanism through which the law affects the structure and resilience of the financial system, this Article also demonstrates why regulators must think in structural terms about the ramifications of proposed regulatory changes. One of the core mantras to emerge from the Crisis is that maintaining systemic stability requires policymakers to consider how market developments and regulations affect the financial system as a whole. Excessive focus on microprudential aims, that is, promoting the

---

<sup>251</sup> *E.g.*, BAGEHOT, *supra* note 86; GORTON, *supra* note 42, at 6.

<sup>252</sup> GORTON, *supra* note 42, at 30 (explaining that “[w]hen there is a shortage of publicly produced safe assets, the private sector produces substitutes,” a pattern that has repeated itself “through human history”); ADAIR TURNER, BETWEEN DEBT AND THE DEVIL: MONEY, CREDIT, AND FIXING GLOBAL FINANCE 6 (2015) (“Self-reinforcing credit and asset price cycles of boom and bust . . . are inherent to any highly leveraged bank system” and “can also be generated by the complex chains of nonbank origination, trading, and distribution . . .”).

<sup>253</sup> *See supra* Part II.A.

safety and soundness of individual institutions, and insufficient attention to macroprudential aims, that is, ensuring the stability of the financial system as a whole, is widely recognized as one of the major regulatory shortcomings pre-Crisis.<sup>254</sup> This Article provides fresh support for the importance of taking a systemic perspective on financial regulation, and it provides new insight into what is needed to achieve that aim.<sup>255</sup>

All of the policies identified here as contributing to constrained capital are designed to further important policy aims. This reflects the fact that the regulators promulgating these policies often lack the means and incentives to consider the systemic implications of the policies they are adopting. This is in part due to regulatory architecture, which remains fragmented and balkanized in the United States despite modest post-Crisis improvements. But it is also a byproduct of the type of factors regulators are required or encouraged to consider when engaging in rulemaking. Most important, by far, are the costs and benefits of a particular regulatory change. Although there is much to this approach conceptually, as John Coates has shown, quantified cost-benefit analysis is poorly suited to financial rulemaking. Among the reasons for the poor fit is that “finance . . . is characterized by non-stationary relationships that exhibit secular change (that is, long-term structural changes),” reducing the benefits of cost-benefit analyses in finance that are and “are likely to remain low.”<sup>256</sup>

#### A. *Investor Demand and Innovation Analysis*

In making concrete an important mechanism through which the law affects the structure and fragility of the financial system, this Article also shows how to improve the rulemaking process so regulators consider the more speculative, but often more important, structural ramifications of their actions. One way of understanding the proposed framework is as a two-part filter for identifying the types of interventions most likely to spur innovation in unintended ways, and thus the domains where greater caution is war-

---

<sup>254</sup> E.g., Daniel K. Tarullo, Governor, Bd. of Governors of the Fed. Reserve, Speech at the Office of Financial Research and Financial Stability Oversight Council’s 4th Annual Conference on Evaluating Macroprudential Tools: Complementarities and Conflicts (Jan. 30, 2015), <https://www.federalreserve.gov/newsevents/speech/tarullo20150130a.htm> (“The imperative of fashioning a regulatory regime that focuses on the financial system as a whole, and not just the well-being of individual firms, is now quite broadly accepted.”); Ben S. Bernanke, Chairman, Bd. of Governors of the Fed. Reserve, Speech at the 47th Annual Conference on Bank Structure and Competition, Implementing a Macroprudential Approach to Supervision and Regulation (May 5, 2011) <https://www.federalreserve.gov/newsevents/speech/bernanke20110505a.htm> (stating that “incorporation of macroprudential considerations in the nation’s framework for financial oversight represents a major innovation in our thinking about financial regulation,” one that “may be contrasted with that of the traditional, or ‘microprudential,’ approach to regulation and supervision”).

<sup>255</sup> Cf. Bernanke, *supra* note 254 (describing the ways the Dodd-Frank Act attempts to incorporate new insights about the importance of a macroprudential approach).

<sup>256</sup> John C. Coates IV, *Cost-Benefit Analysis of Financial Regulation: Case Studies and Implications*, 124 YALE L. J. 882, 888 (2015).

ranted. This framework may be used to identify those interventions most likely to spur financial innovation. The claim is that when this framework warrants, regulators should be required to estimate how their actions will affect aggregate investor demand and to provide a written analysis of how the markets might respond in light of the changed demand. They should further be required to undertake follow up analyses subsequent to implementing the change to assess the accuracy of their original assessments and identify any unexpected changes.

At first, it may be challenging for regulators to undertake the proposed “Investor Demand and Innovation” analyses. Fortunately, regulatory competence is not static. Rather, it evolves over time in light of the demands regulators face. In response to the demand to engage in cost-benefit analyses, regulators hired economists and fundamentally altered their rulemaking processes to satisfy new demands.<sup>257</sup> The process proposed is likely to reveal significant deficiencies in regulatory competencies in addition to exposing gaps in the data regulators have available to them and the models that can be used to project how changes in investor preferences will alter market practices. That financial regulators may not be well positioned to undertake these analyses currently is thus not a reason to avoid such a mandate, but a reason to impose it.

### B. Two Starting Points

In addition to showing why regulators should be required to assess the structural impact of their actions, the analysis above identifies two categories of actions where such analyses should be required. First, whenever regulatory changes directly require or incentivize market participants to hold particular classes of financial assets, regulators should be required to undertake the proposed *ex ante* and *ex post* Investor Demand and Innovation analyses. The framework here reveals that many such interventions may be less transformative than is commonly assumed. Nonetheless, the reason for that is that these are areas where market-based forces may otherwise play an important role in producing constrained capital along the same lines the regulatory change mandates. As the examination here reveals, innovations are most likely to arise and spread when there is significant buildup in demand around a particular threshold. Forcing regulators to develop a more sophisticated understanding of the private sources of constrained capital is thus nearly as important, and an important complement to, efforts to understand how legal changes alter investor demand.

Second, the analysis here further supports requiring regulators to engage in Investor Demand and Innovation analyses when making changes

---

<sup>257</sup> Michael A. Livermore, *Cost-Benefit Analysis and Agency Independence*, 81 U. CHI. L. REV. 609 (2014) (documenting how the Environmental Protection Agency evolved to develop expertise in cost-benefit analyses).

that are likely to have a material impact, either by increasing or decreasing the aggregate demand for safe assets. The framework proposed here identifies this as a critical site for heightened regulatory attention. Starting first with the required price impact, the evidence available highlights that safe assets, including but not limited to those with short-term durations that function in ways similar to money, often are issued at prices below what the risk-adjusted returns would seem to demand.<sup>258</sup> As reflected in the examples of financial-driven innovation here,<sup>259</sup> but also in the much longer history of safe assets going back to precious metals and bank notes, the demand for safe assets has often been a driver of transformative financial innovations. These different types of evidence all point to safe assets as a domain where changes in aggregate demand may well spur innovation. Having established this, the framework's first condition—that legal interventions matter when they alter aggregate demand—then serves as the mechanism for identifying the range of government interventions that merit heightened attention.

Significantly, this requirement would help regulators to pay greater heed to the indirect mechanisms through which their actions can affect investor demand. For example, this requirement would promote the development of the models and data required to understand how legal interventions that affect incentives to self insure can drive innovation. Just as importantly, this type of analysis could enable regulators to identify interventions that might *reduce*, not just exacerbate, systemic fragility. As an example, recent work by Jeremy Stein and other leading economists suggests that the government should increase its production of short-term safe assets to reduce the production of private substitutes that are so often the source of fragility.<sup>260</sup> The proposed Demand and Innovation analyses would function as an institutionalized mechanism for assessing the value of such changes and where best to make them.

### C. Regulatory Architecture

Apart from providing new insight into how best to institutionalize structural analyses into financial rulemaking, the examination here also provides new support for a well-recognized regulatory challenge: regulatory architecture. All of the policies identified here as contributing to constrained capital are designed to further important policy aims. The challenge is that bank regulators remain incentivized to maintain healthy banks, while insurance regulators want to promote the health of insurance companies and the SEC wants to ensure that mutual funds function as investors expect. These regulators often also regularly lack the information and competence required

---

<sup>258</sup> See *supra* Part II.A.

<sup>259</sup> See *supra* Part III.A.

<sup>260</sup> See Carlson et al., *supra* note 79; Robin Greenwood, Samuel G. Hanson, & Jeremy C. Stein, Economic Policy Symposium Proceedings, Jackson Hole: Federal Reserve Bank of Kansas City, *The Federal Reserve's Balance Sheet as a Financial-Stability Tool* (2016).

to design policies that take into account the ways regulations may spur innovation.

This Article thus provides yet further evidence of the drawbacks inherent in the disaggregated financial regulatory regime still in place in the United States.<sup>261</sup> It thus affirms the importance of some of the structural changes to that architecture that have emerged post-Crisis, like the creation of the Financial Stability Oversight Council (FSOC)<sup>262</sup> and the Office of Financial Research (OFR)<sup>263</sup> in the United States and the Financial Stability Board (FSB) at a global level.<sup>264</sup> It further suggests these types of bodies should likely have more authority and resources than they do, or we should make more fundamental changes to the federal financial regulatory architecture. Having bodies specifically designed to have a systemic view and tasked with promoting systemic stability is critical to developing the infrastructure required to identify the range of public and private actions affecting the amount of constrained capital around particular thresholds and to assess the ramifications of that demand on innovation and fragility.

The call for Investor Demand and Innovation analyses also provides yet another mechanism through which to enhance coordination across regulatory bodies. For example, it may be appropriate to require any financial regulatory body that wants to undertake a rule change of the kind that would require such an analysis to either undertake that work independently or to work with the FSOC and OFR to produce the required analyses. This could expedite the rate at which data and other deficiencies are identified and addressed, in addition to potentially promoting the background work, like financial system mapping, that could further enhance the capacity of regulators to assess the systemic ramifications of their actions.

#### D. Bigger Picture

The process of undertaking the proposed analyses and the mapping that would emerge from these efforts also might enable a more fruitful approach to financial regulation. There is a large and ever-growing body of research on the sources of financial fragility and how best to promote financial stability. Most of the research that has been done on systemic stability, however, focuses on identifying sources of fragility or weakness. This is valuable research and has produced powerful insights regarding mechanisms through which crises spread and hamper economic growth. But, as one might expect,

---

<sup>261</sup> See, e.g., THE VOLCKER ALLIANCE, *RESHAPING THE FINANCIAL REGULATORY SYSTEM* (2015).

<sup>262</sup> Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 111, 124 Stat. 1392 (2010) (codified at 12 U.S.C.A. § 5321); *id.* at § 112, 124 Stat. 1394 (codified at 12 U.S.C.A. § 5322).

<sup>263</sup> *Id.* at § 118, 124 Stat. 1408 (codified at 12 U.S.C.A. § 5328).

<sup>264</sup> Financial Stability Board, *Our History*, <http://www.fsb.org/about/history/> (last visited Aug. 4, 2016).

research focused on identifying weak spots in a financial system leads to policy recommendations aimed at shoring up those weaknesses. The heightened capital and liquidity requirements being imposed on banks, for example, are the byproduct of research into bank fragility and the adverse effects of banking panics. The recent efforts to impose liquidity requirements on mutual funds are similarly motivated by new insights regarding the fragility of these structures.<sup>265</sup> The analysis here does not undermine the value of such research and reforms, but it does suggest that they may have unintended, adverse side effects. By increasing the amount of constrained capital in the system, these reforms may well spur investor-driven financial innovations not all that different in kind from those that contributed to the Crisis.

Recognizing the numerous ways that the law shapes financial market structures and the heterogeneity in the resilience of those structures demonstrates the value in taking a fundamentally different approach to studying financial stability. It starts with the recognition that credit creation and liquidity transformation are socially valuable activities that play an important role contributing to economic growth. Yet, they also entail risk. Some of these risks, like credit and liquidity risk, are inevitable. Others, like the fragility that arises from interconnectedness and complexity, are not. Rather, it is the design of the institutions that extend credit and engage in maturity transformation that determines the magnitude of these ancillary risks. This Article shows how legal interventions, including some specifically designed to promote stability, can cause the design of the financial system to morph in ways that increase ancillary risks.

An alternative approach to studying financial stability would build on the fact that extending credit and producing money-like assets entail risks, and then ask who is best suited to bear those risks. In other words, in addition to identifying points of weakness and mechanisms through which adverse shocks trigger market dysfunction, research could focus on identifying nodes in the system capable of withstanding losses and structures that would dampen the ripple effects that can emanate from shocks. In contrast to the typical policy recommendations, which aim to reduce the risks certain institutions assume, this could lead to recommendations to encourage institutions that are well suited to bear certain risks to assume those risks.<sup>266</sup>

The question of how best to construct a financial system that can absorb losses without triggering panics is closely related to another issue embedded in the analysis here—what is the optimal degree of self insurance against various needs, and when, if ever, should the state play a role in providing insurance when the market does not—or cannot? Again, there is already

---

<sup>265</sup> SEC, Investment Company Liquidity Risk Management Programs, 17 C.F.R. Pts. 210, 270, 274 (2017).

<sup>266</sup> There is a growing body of research that uses network analyses to study financial stability and resilience, some of which takes an approach akin to that called for here. See generally, EUROPEAN CENTRAL BANK, RECENT ADVANCES IN MODELING SYSTEMIC RISK USING NETWORK ANALYSIS (2010).

some very valuable research in this vein, but the questions that remain dwarf the insights thus far provided.<sup>267</sup> Both approaches highlight the importance of thinking in systemic terms in the ongoing effort to create a financial system capable of supporting growth, while minimizing unnecessary sources of fragility.

## VI. CONCLUSION

Investor-driven financial innovation is far from a new phenomenon. Nonetheless, discontinuities in investor demand continue to be assumed away in much of the legal and financial literature and ignored by policymakers who rely on that literature. This Article highlights the costs of those simplifying assumptions. It brings to light the first-order importance of investor preferences in shaping today's financial markets and the way investor-driven financial innovations can increase the fragility of those markets. More importantly, in providing a framework for understanding the relationship among constrained capital, investor-driven financial innovations, and the law, this Article lays the groundwork for identifying the interventions most likely to have unintended, systemic consequences.

---

<sup>267</sup> See, e.g., Viral Acharya et al., *Credit Lines as Monitored Liquidity Insurance: Theory and Evidence*, 112 J. FIN. ECON. 287 (2014); Anil K. Kashyap, Raghuram Rajan & Jeremy C. Stein, *Banks as Liquidity Providers: An Explanation for the Co-Existence of Lending and Deposit Taking*, 57 J. FINANCE 33 (2002); Paul Tucker, *The Lender of Last Resort and Modern Central Banking: Principles and Reconstruction*, BANK FOR INT'L SETTLEMENTS 10 (Sept. 2014), <http://www.bis.org/publ/bppdf/bispap79.pdf>.