Investor-Driven Financial Innovation

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In response to the 2007-2009 financial crisis, financial regulators have imposed new or heightened capital and liquidity requirements on banks, insurance companies, and even mutual funds. Viewed in isolation, these requirements are well designed to improve the resilience of these institutions. Yet this paper suggests that these reforms may also have the unintended consequence of contributing to the fragility of the financial system. By increasing the demand for certain types of financial instruments beyond the natural supply of those instruments, the new requirements could spur financial innovations that make the financial system more complex, rigid, and interconnected—all factors that contributed to the last crisis.

This paper's main contribution is to provide a framework for understanding the relationship among regulations, investor preferences, and financial innovation. The claim has two elements. First, a legal intervention will drive the creation and spread of innovative financial instruments when that intervention causes the aggregate investor demand for a particular type of financial instrument to exceed the readily available supply. Second, to assess the impact of a legal intervention on aggregate demand, it is necessary to devise of baseline of what demand would be in the absence of that intervention. The first element highlights the importance of understanding other sources of demand for the types of assets that regulators want institutions to hold. The second element emphasizes the importance of considering the type of private ordering that would otherwise occur. Both elements illuminate the importance of understanding how market forces interact with the regulatory regime over the business cycle. The frame provided also sheds surprising new light on the types of regulatory interventions most likely to motivate investor-driven financial innovations.

In addition to this theoretical contribution, the paper provides the institutional context required to appreciate the importance of investor-driven financial innovation. In doing so, the article shows that that contrary to the assumptions underlying most standard asset pricing models, investor preferences play a first-order role shaping the type of financial instruments produced and the pricing of those instruments. The article draws on a growing body of empirical work documenting systematic price discrepancies in conjunction with case studies to illustrate how excess demand spurs financial innovations and the risks that can arise as a result.

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When two economically comparable financial instruments trade at different prices, an investor can profit by acquiring the instrument that is relatively underpriced, selling the instrument that is overpriced, and waiting for the two prices to converge. This is arbitrage in its most classic form. Because the investor's activities increase the demand, and therefore price, of the underpriced instrument while putting downward pressure on the demand, and hence price, of the overpriced instrument, arbitrage promotes the relative efficiency of financial markets. Moreover, arbitrage enables investors to profit without assuming market risk, investors are often highly motivated to undertake these

transactions.[1] An assumption that such opportunities will be quickly and fully exploited underlies many models of how financial markets work.[2]

Less recognized is the way market participants respond when discontinuities arise at the other end of an intermediation chain. Today, much of the capital flowing into financial markets is subject to constraints that alter the incentive or capacity of the person providing the capital to acquire particular types of financial instruments. A bank, for example, can lower its capital burden by holding assets rated AAA in lieu of unrated loans that pose an equivalent risk of default.[3] Insurance companies similarly face limits on the types of assets that they can hold and in what amounts.[4] Mutual funds and other asset managers attract capital by precommitting to an investment strategy that limits, often quite severely, the types of assets they can hold, in addition to sometimes facing regulatory constraints.[5]

Once constrained capital exists—that is, once the investors place a premium on an instrument's characteristics apart its risk-adjusted returns—a new profit opportunity arises. Now, money can be made by cater to investors' preferences, either by repackaging cash flows from existing financial instruments or using derivatives to create new instruments with the desired characteristics.[6] These processes have much in common with traditional arbitrage. By finding new ways to connect capital, on the one hand, and value-creating projects on the other, financial innovations driven by investor demand generally promote price efficiency and lower financing costs. These transactions also share the defining feature of arbitrage—the ability to turn a profit without assuming market risk. Other ramifications, however, are quite different. Whereas arbitrage requires capital that is flexible and responsive, investor-driven financial innovations tend to increase rigidity and limit future responsiveness. And in contrast to arbitrage, which encourages information generation, investor-driven innovation often produces information gaps.[7] Investor-driven financial innovations thus have the potential contribute to systemic fragility and can even inhibit efficiency.[8]

This paper's main contribution is to provide a framework for understanding the relationship among constrained capital, investor-driven financial innovation, and the law. Although there has been a significant amount of speculation regarding the role of regulation in driving the spread of innovative financial products, there is no cohesive theory for understanding when regulation provides the marginal demand leading to the spread of an innovative financial instrument.[9] This paper fills this gap. It argues that investor-driven innovations arise and spread when the aggregate demand for a type of financial asset exceeds the natural supply. A regulatory intervention drives the spread of

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[1] These processes reduce but do not eliminate inefficiencies. See, e.g., Samuel G. Hanson & Adi Sunderam, The Growth and Limits of Arbitrage: Evidence from Short Interest, 27 Rev. Fin. Stud. 1238 (2013); Andrei Shleifer & Robert W. Vishny, The Limits of Arbitrage, 52 J. Finance 35 (1997).
[2] See infra Part __.
[3] [Barr et al textbook]
[4] See infra Part __.
[5] Id.
[6] See infra Part I.
[7] See infra Part III.C.
[8] Id.
[9] See, e.g., [fill – use sources cited elsewhere]

such financial innovations when the intervention (1) increases aggregate demand to a level that above the natural supply of the instrument in question and (2) increases aggregate demand relative to what it would be in the absence of the intervention. Although some of the inputs are dynamic and not easily measured directly, this conceptual framework lays the groundwork for thinking systematically about relationships that thus far have eluded satisfying critical scrutiny.

This formulation also leads to some surprising insights about the types of regulations most likely to contribute to the spread of investor-driven financial innovations. 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.[10] This paper suggests that these constraints may be less important that 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 debates 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 also reveals that other regulatory interventions may be 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.[11] Interventions that encourage firms (or sovereigns) to self insure against the need for liquidity in the future can also have profound effects.[12] The paper thus provides the first comprehensive frame for understanding how seemingly disparate legal interventions interact with market forces to promote demand-driven financial innovation.

The model the paper provides for assessing when a regulatory intervention will increase aggregate constrained capital and when such capital, in turn, will drive the spread of innovative financial instruments is the main theoretical contribution. The paper, however, also seeks to shed light on the policy challenges currently facing regulators. This requires context. Much of the paper, accordingly, addresses the prevalence of constrained capital, a prerequisite for the dynamics highlighted here to occur, and the ramifications of investor-driven financial innovations on systemic stability, the reasons these dynamics are important.

Foundational to this paper is the assumption that investor preferences, which are assumed away in most models of how financial markets work and financial instruments

[10] Id.
[11] See infra Part II.
[12] See infra Part II.B.3.

are priced, have a first-order impact on both. Often these preferences arise because the instruments in question provide some additional utility to the holder. The most prominent examples are money-like claims and other safe assets, which serve an array of socially useful functions, including facilitating transactions, serving as a store of value over time, and functioning as collateral in connection with many types of financial transactions. Recent empirical work attests to the premium that attaches once a financial claim functions like money and the ways that changes in the supply of true money-like, namely short-term government instruments, affects the production of private substitutes.[13] Another, sometimes overlapping, source of constrained capital is reliance on proxies to facilitate monitoring and constrain risk taking. Today, the person making an investment decision is often not the ultimate (or sole) beneficiary of those investments.[14] To reduce agency costs, stakeholders often use proxies, like credit ratings, to monitor and limit the investments such an entity can hold.[15] Efforts by regulators to promote the health of institutions they oversee overlay and accentuate both of these patterns.[16]

Shifting from the existence of constrained capital to its effects, the paper uses case studies along to demonstrate why regulators should care about investor-driven financial innovation. These examples suggest that although investor-driven financial innovation is socially useful, the spread of these innovations can make the financial system more complex, interconnected, and rigid, increasing systemic risk. The case studies thus serve to help regulators understand and avoid some of the unintended consequences that are so common when regulators intervene in financial markets. A core theme that emerges is that regulators may be better served embracing risk than seeking to avoid it. Credit creation and liquidity transformation are socially useful undertakings. Some of the associated risks are inherent in those activities; others depend on the nature of the institutions performing the activity. This paper suggests that when prudential and other regulators seek to minimize the credit and liquidity risk to which the firms they oversee are exposed, they can inadvertently incentivize suboptimal institutional design choices.

This paper proceeds in four parts. Part I presents the paper's claim and uses a couple of examples to bring the dynamics at issue to life. Part II examines the origins of investor preferences and the ways that financial regulation and other government interventions shape the nature and amount of constrained capital in the 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 addresses implications.

I. The Framework

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

[13] See infra Part II.A.
[14] Ronald J. Gilson & Jeffrey N. Gordon, The Agency Costs of Agency Capitalism: Activist Investors and the Revaluation of Governance Rights, 113 Colum. L. Rev. 863, 865 (2013).
[15] See infra Part II.A.2.
[16] See infra Part __.

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.[17] He found that ratings were relatively 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 of time, 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."[18]

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 holds 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."[19] 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."[20] 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. (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.[21])

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.[22] 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.[23] He gained both credibility and clientele when high-yield bonds proved remarkably resilient even as equities crashed a few years later.[24]

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

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[17] W. Braddock Hickman, Corporate Bond Quality and Investor Experience 4 (1958).
[18] 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, David J. Wright & James A. Gentry, Historic Changes in the High Yield Bond Market, 21 J. Applied Corp. Fin. 65, 76 (2009).
[19] Hickman, supra note 17**Error! Bookmark not defined.**, at 214.
[20] Id. (emphasis added).
[21] See, e.g., Victoria Ivashina & Zheng Sun, Institutional demand pressure and the cost of corporate loans, 99 Journal of Financial Economics 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 are perfectly efficient")
[22] Stars of the Junkyard, The Economist, Oct. 21, 2010.
[23] Id.
[24] Id.

and to have Drexel underwrite those offerings.[25] The amount of high-yield debt outstanding grew rapidly, much of it underwritten by Drexel.[26] The market ultimately collapsed, bringing both Milken and Drexel down with it,[27] 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.[28]

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. As Glenn Yago has explained, "[t]he history of high-yield bonds is nearly as long as the history of public capital markets."[29] Nevertheless, for much of the twentieth century, "*all* new publicly issued bonds were investment grade."[30] The little high-yield debt trading in the secondary market consisted of "fallen angels," bonds that had been investment grade when issued but subsequently were downgraded.[31] The strong preference investors had for investment-grade debt, hence, not only affected pricing during this period, it effectively precluded the issuance of high-yield debt.

This story also sets the stage for a second vignette that illustrates how excess investor demand can lead to the development and proliferation of financial innovations. Investor demand for investment-grade bonds, particularly those rated AAA, not only created a profit opportunity for Milken's early clients, it is also contributed to the spread of securitization structures leading up to the Crisis.[32] Securitization enables unrated credit products, like home loans, to be transformed into rated credit products, like

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[25] Id.
[26] Id.
[27] Id.
[28] Frank K. Reilly, David J. Wright & James A. Gentry, Historic Changes in the High Yield Bond Market, 21 J. Applied Corp. Fin. 65, 67 (2009).
[29] Glenn Yago, Junk Bonds, The Concise Encyclopedia of Economics, Libr. Econ. & Liberty (2008) available at http://www.econlib.org/library/Enc/JunkBonds.html.
[30] Id.
[31] Id.
[32] E.g., Ben S. Bernanke et al., International Capital Flows and the Returns to Safe Assets in the United States, 2003-2007 2 (Int'l Fin. Discussion Papers, Paper No. 1014, 2011) ("verify[ing] that the '[global savings 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").

mortgage-backed securities (MBS) backed by those loans.[33] It also allows lower rated credit instruments, like a BBB-rated MBS, to be transformed into higher rated ones, like a AAA-rated CDO.

No voodoo 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 more risky than the original assets and others that are far less so.[34]

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.[35] 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 wanted to issue. Once the demand exceeded 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.[36] Of course, that was only half of the story. The Crisis revealed that these innovations and the ways these innovations altered the structure of the financial markets also gave rise to new risks and that many assets had been trading at inflated prices.[37] Nonetheless, the basic rationale for securitization remains sound and securitization transactions have rebounded accordingly.[38] 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 explanations for these transactions,[39] 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. Nonetheless, it is widely accepted that a primary explanation for these transactions was that they converted financial instruments that investors were not particularly keen to hold into forms that investors were very keen to hold.[40] The development of new forms of securitization and the proliferation of securitization structures thus exemplify investor-driven innovation.[41]

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[33] For an overview of how securitization works, see Steven L. Schwarcz, Structured Finance: A Guide To The Principles Of Asset Securitization (3d ed. 2003).
[34] See infra Part III.A.1.a.
[35] E.g., Bernanke et al., supra note 32; 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).
[36] See infra Part III.B.
[37] See infra Part III.C.
[38] E.g., Bd. of Governors of the Fed. Reserve, Consumer Credit- G.19, available at http://www.federalreserve.gov/releases/g19/hist/cc_hist_memo_levels.html (showing that there are currently over $1 trillion in auto loans outstanding); Josh Zumbrun, Total U.S. Auto Lending Surpasses $1 Trillion for First Time, Wall St. J. (Aug. 13, 2015), http://www.wsj.com/articles/total-u-s-auto-lending-surpasses-1-trillion-for-first-time-1439478198. However, the private label MBS market remains thin.
[39] [E.g., Bolton et al.; gorton]
[40] See Part __ infra.
[41] See infra Part III.A.

B. The claim

This paper's contribution is to provide a frame for understanding the relationship among investor preferences, financial regulation, and investor-driven financial innovation. The claim has two components. First, constrained capital drives the creation and spread of innovative financial instruments when the aggregate amount of capital seeking investments with a particular characteristic exceeds the natural supply of instruments with the desired feature. Second, a regulatory intervention drives the proliferation of investor-driven financial innovations when, as a result of that intervention, the aggregate demand increases to a level that exceeds the supply.

This frame may helps to explain why financial markets have the form they do in domains not readily explained by the assumptions that underlie much of the finance literature. For example, there is a growing body of literature showing that around certain thresholds, financial asset pricing often deviates systematically from the prices one would expect using standard asset pricing models or extrapolating from the prices of other assets that are similar along some dimensions but different along others.[42] Although it is widely assumed that investor preferences, and even regulation, play a role contributing to these discontinuities, there is not yet a cohesive framework for understanding when and why.

This frame also brings into focus how regulation shapes activity in these domains. In so doing, it also dispels common misunderstandings regarding the role of regulation. Sometimes simplistic assumptions are made that if a regulation requires or incentivizes regulated entities to hold a particular types of financial asset, the regulation necessarily increases investor demand for those assets and will lead to investor driven innovations. Putting regulatory arbitrage to the side, the formulation proposed here shows why such assumptions are often wrong.

First, the framework shows 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 proposed intervention. An intervention that affects a large volume of capital but in an environment wherein efforts to constrain agency costs would likely result in similar constraints in the absence of government intervention, the impact of the intervention itself may well be negligible. Only by first creating an appropriate baseline can one make meaningful assessments of how transformative a regulation actually is. In the same spirit, regulatory interventions that do not directly prescribe the types of assets firms (or sovereigns) should hold but indirectly alter their incentives may have a first-order impact on aggregate demand and could contribute to investor-driven financial innovation accordingly. The most salient example of such interventions are policies that affect incentives to self insure against possible adverse outcomes.[43]

Second, the framework shows that when aggregate demand is less than the readily available supply of a particular type of financial instrument, even a regulation that increases aggregate demand will not spur financial innovation. If markets are awash in long-term corporate debt, for example, a new requirement that life insurers increase their holdings of such debt would not suffice to spur innovation. This is not to say that such a regulation may not have unintended consequences. To the extent the "natural" supply of

[42] See infra Part II.A.
[43] See infra Part __.

an asset is elastic, such an intervention may well induce firms to increase their issuance of assets favored by the regulatory scheme[44] 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 here at issue. Regulatory arbitrage is a related, but distinct, dynamic.[45]

In order to illuminate the relationship between constrained capital and financial innovation, and the ways legal interventions can affect this dynamic, this paper holds constant or delays consideration of a range of otherwise relevant variables. Among the critical variables given secondary status for most of the analysis are the cost of developing new financial innovations, the transaction costs associated with using established financial innovations, and the "natural supply" of a given type of financial asset (including the myriad ways the government can affect and shape that supply). Cyclicality, which affects both investor demand and the range of assets investors are willing to treat as substitutes for desired assets, and the question of which actors are most likely to seek out substitutes are other important factors not incorporated directly in the framework offered here. These dynamics are too fundamental to be cabined entirely and are touched upon in some of the discussion that follows. Nonetheless, to make the analysis tractable, the core of the analysis generally assumes that assets of a given type are fungible, that the supply is fixed by exogenous factors, and that the cost of using new innovations is positive but not prohibitive. 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 paper's core claim.[46]

II. Constrained capital

This Part discusses two related factors that help to explain the amount of constrained capital in today's financial system and the role of regulation in creating such capital. In the first subpart, regulation is intertwined with the discussion of market-based sources of demand to establish the prevalence of constrained capital and some of the reasons for that prevalence. The second subpart disaggregates the role of regulation, focusing on when a regulation alters aggregate demand—one aspect of this paper's central claim. This two-part structure reflects this paper's claim that the ramifications of regulatory and other legal interventions can only be understood by reference to what the market would otherwise demand.

With respect to scope, the analysis uses empirical evidence and examples, but the aim is to illustrate rather than exhaust. Focusing on the primary reasons for constrained capital is helpful for understanding where discontinuities are likely to arise and why they may be difficult to eliminate. The analysis, however, makes no effort to provide a

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[44] E.g, [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)].
[45] See infra Part IV.
[46] Id.

complete account of the sources of constrained capital or the amount of capital subject to particular constraints.

A. Two sources of constrained capital

This paper's main contribution is the framework illuminating the importance of marginal demand in spurring investor-driven financial innovation and the need to use an appropriate baseline to assess when a regulatory intervention gives rise to that marginal demand. Much of the paper, however, is devoted to showing when these dynamics are likely to arise and why they matter. One prerequisite for the claim here to have any practical import is that the amount of constrained capital in the financial system be sufficient, both in the aggregate and around particular thresholds, to affect pricing and activity. This Subpart lays the groundwork for this assumption.

One way of conceptualizing this assumption is to place the capital flowing in the financial system in three buckets—smart capital, noise, and constrained capital. Traditional approaches to finance do not deny the possibility of constrained capital but often assume it can be grouped together with other noise traders, leading to a focus on whether informed trading can drown out that noise, resulting in a relatively efficient market.[47] The core question here is whether investor preferences are sufficiently powerful to create meaningful discontinuities in the types of assets produced and the prices paid for those assets. The empirical work reviewed here suggests this is the case.

1. Money and other safe assets

Financial instruments that can 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.[48] Precious metals, which were the original form of money, and the fiat currencies of modern economies, like dollar bills, are the most obvious form 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.[49] 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 all qualifies as "money" remain contested.[50] There is also

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[47] [Shleifer & Vishny (1997); Hanson & Sunderam (2013); Grossman & Stiglitz (1980); Gilson & Kraakman (1984)]

[48] These functions are sometimes characterized as the "transaction motive" and "asset motive" for holding money-like claims.

[49] See, e.g., Gary B. Gorton, Misunderstanding Financial Crises 10 (2012) (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), available at https://mises.org/files/prices-and-production5pdf/download?token=K4QOXtM- ("There can be no doubt that besides the regular types of the circulating medium, such as coin, notes and bank deposits, which are generally recognised 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 at 9 (Dec. 6, 2013), http://ssrn.com/abstract=2232016 ("Why insist on holding genuine Tbills when quasi-Tbills [, i.e., private money,] promise the same liquidity but with a slightly higher yield?").

[50] E.g., Stephem M. Goldfeld & Daniel E. Sichel, The Demand for Money, in Handbook of Monetary Economics 299, 300 (Benjamin M. Friedman & Frank H. Hahn eds., 1990) (explaining that "the demand

disagreement about the relevance of long-term "safe assets," as most money-like claims are quite short term.[51] 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 relative to the price one would expect such instruments to demand using a standard asset-pricing framework. 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.[52] They found a "monetary premium" that averaged 72 basis points between 1926 and 2008.[53] 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.[54] 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 the non-financial sector's willingness to pay a premium on liquid/safe debt."[55]

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.[56] They found "four-week bills have yields that are roughly 40 bps below their fitted values; for

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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").

[51] 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, X (2013) (distinguishing his work from that done by others in its focus on short-term safe assets); with Bernanke et al., supra note 32 (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 Erik Gerding & Anna Gelpern, Safe Assets, __ Yale J. Reg. __ (forthcoming 2016).

[52] Arvind Krishnamurthy & Annette Vissing-Jorgensen, The Aggregate Demand for Treasury Debt, 120 J. Pol. Econ. 233 (2012).

[53] Id.

[54] 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).

[55] Id. at *32.

[56] Greenwood, et al., supra note 51.

one-week bills, the spread is about 60 bps."[57] 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."[58]

While short-term Treasuries display an exceptional degree of moneyness, privately produced financial claims can also serve money-like functions. Recent studies, for example, show 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.[59] These findings suggest that such debt can serve as a money-like substitute for short-term Treasuries, but that investors will pay a moneyness premium for such instruments only when the more money-like Treasuries are in short supply relative to aggregate demand.

That private claims serve money-like functions is also illustrated in definitions of what constitutes money. For example, central banks often track at multiple indicators of the aggregate amount of money in the system at any given time: M1, includes only cash and coin in circulation, but M2 also includes short-term bank deposits and money market mutual funds and M3, used by some, goes even further and includes longer-term time deposits and money market mutual funds with more than 24-hour maturity.[60] 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."[61] In a provocative new book, 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.[62]

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.[63] Times of crisis, by contrast, are

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[57] 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).

[58] Greenwood et al., supra note 51, at 1687.

[59] E.g., Krishnamurthy & Vissing-Jorgensen, The Aggregate Demand for Treasury Debt, supra note 52; 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) ("find[ing] 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").

[60] E.g., M0, M1, M2, M3, M4, Fin. Times Lexicon, http://lexicon.ft.com/Term?term=m0,-m1,-m2,-m3,-m4 (last visited Aug. 1, 2016).

[61] E.g., Morgan Ricks, The Money Problem: Rethinking Financial Regulation 37 (2016).

[62] Id. at 230-37; Kathryn Judge, The Importance of Money, 130 Harv. L. Rev. ___ (forthcoming 2017) (reviewing Ricks, supra note 61).

[63] See, e.g., Gorton, supra note 49.

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.[64]

Taking a different tack to assessing the demand for money-like instruments, Zoltan Pozsar documents the growth of "institutional cash pools"--"large, centrally managed, short-term cash balances of global non-financial corporations and institutional investors such as asset managers, securities lenders and pension funds."[65] 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 instruments not held by foreign official investors by … at least $1.5 trillion," and potentially far more.[66] In his view, "the 'shadow' banking system rose to fill this gap."[67] 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 appropriately be construed, and in part because it appears that at least some investors independently value long-term but exceptionally safe assets, a growing number of economists and other academics have shifted to focus on the demand for "safe assets."[68] Again, a range of techniques have been employed to measure this demand and a broader 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-savings glut" and other efforts to understand global capital flows in the past decade and how, if at all, they affect systemic stability. Starting with an influential speech delivered in 2005, Bernanke has 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.[69]

Other economists have built upon and provided alternatives to Bernanke's account while sharing his assessment that investor demand for safe assets played 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

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[64] 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 49, at 6 ("Whatever the form of the bank money, financial crises are en masse demands by holders of bank debt for cash—panics.").

[65] Pozsar, Institutional Cash Pools, supra note 51, at 285.

[66] Id. at 284; see also id. at 290 fig. 5.

[67] Id. at 288. For an earlier discussion of this relationship, see Zoltan Pozsar, Does the Secular Rise of Wholesale Cash Pools Necessitate Shadow Banking? (2011) (working paper) (on file with author).

[68] E.g., Gorton, Lewellen & Metrick, supra note 51; Pierre-Olivier Gourinchas & Olivier Jeanne, Global Safe Assets (BIS Working Paper No. 399, 2012).

[69] Bernanke et al., supra note 32; Ricardo J. Caballero & Arvind Krishnamurthy, Global Imbalances and Financial Fragility, 99 Am. Econ. Rev. 584 (2009).

for safe debt instruments."[70] 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 sought the profits generated from bridging the gap between this rise in demand and the expansion of its natural supply."[71] Viral Acharya and Philipp Schnable similarly suggest that dynamics arising from the demand for safe assets but not captured by Bernanke were central to Crisis.[72] In their account, discussed further below, banks—rather than overall capital flows—served as the mechanism connecting the demand for safe assets to the Crisis, but innovative financial devices designed to satiate the excess demand for safe, money-like assets remain key. [73]

Given that empirical work necessarily documents what has gone before, it is worth momentarily looking ahead. Even apart from the cyclicality 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.[74] 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.[75] In his assessment, in a world plagued radical uncertainty, money-like claims satisfy the desire of individuals, companies and countries to self-insure against this increasingly uncertain future.[76] This view also helps to explain why safe assets can sometimes serve as a substitute for short-term claims.[77]

Safe assets also play an additional function in today's financial landscape, one not encompassed in established accounts of money, that is, serving as collateral.[78] As an initial matter, collateralized structures are a primary mechanism for converting safe (and sometimes less safe) assets into money-like claims.[79] But safe assets are also used as collateral in a range of other types of financial transactions as well. 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 monitoring parties must undertake. Post-Crisis

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[70] Ricardo J. Caballero, The "Other" Imbalance and the Financial Crisis 2 (Nat'l Bureau of Econ. Research, Working Paper No. 15636, 2010).
[71] Id. at 3.
[72] Viral Acharya & Philipp Schnabl, Do Global Banks Spread Global Imbalances? Asset-Backed Commercial Paper during the Financial Crisis of 2007-09, 58 IMF Econ. Rev. 37 (2010). For a richer discussion of their work, see infra Part III.C.3.
[73] Id.
[74] E.g., Ricks, supra note 61.
[75] Mervyn King, The End of Alchemy: Money, Banking, and the Future of the Global Economy 84-85 (2016).
[76] Id.
[77] Judge, The Importance of Money, supra note 62.
[78] Gorton, Lewellen & Metrick, supra note 51.
[79] A range of different transaction structures, from asset and repurchase agreements to asset-backed commercial paper program, 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.

regulatory reforms are contributing to and shaping, but not alone in creating, high demand for assets that can readily serve as collateral.[80]

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 United States and elsewhere, for example, are facing substantially heightened liquidity requirements.[81] 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,[82,] and separately, to enable an orderly resolution of the bank in a bankruptcy proceeding.[83]

The types of institutions subject to regulatory liquidity requirements are also expanding. Mutual funds, for example, which traditionally have been subject only to market-based constraints and disclosure requirements, are now facing liquidity requirements.[84] Less obvious but no less important, other post-Crisis reforms may be contributing to nonfinancial firms' demand for liquid assets. For example, recent changes 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.[85] 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, there are a number of ongoing debates in the literature, and further insight into the reasons investors want money-like instruments and the range of instruments that can serve this function will be useful in developing more granular accounts of how this demand drives particular types of financial innovation. Nonetheless, more precise answers to these questions are not necessary to establish the two points critical to the analysis here—(1) the existence of a sizeable amount of capital that is constrained by a preference for assets that are sufficiently safe that they can function like money and (2) this creates price and demand discontinuities of sufficient magnitude to affect market activity.

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[80] See, e.g., J.P.Morgan, Regulatory Reform and Collateral Management: The Impact on Major Participants in the OTC Derivatives Markets (2012); Basel Committee on Banking Supervision, Board of the Int'l Org. of Secs. Commissions, Margin Requirements for Non-Centrally Cleared Derivatives (2013).
[81] Treas. Reg. § 329 (2014); Basel Committee on Banking Supervision, Board of the Int'l Org. of Secs. Commissions, Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools (2013).
[82] Treas. Reg. § 329 (2014); Basel Committee on Banking Supervision, Basel III: The Liquidity Coverage Ratio , supra note 81. For earlier assessments of the impact of these new regulations, see, e.g., Mark House, Tim Sablik & John R. Walter, Fed. Reserve Bank of Richmond, Understanding the New Liquidity Coverage Ratio Requirements; Ryan N. Banerjee & Hitoshi Mio, The Impact of Liquidity Regulation on Banks (BIS Working Paper No. 470, 2014).
[83] See, e.g., William Nelson, Living Wills: The Biggest Liquidity Rule of Them All, Am. Banker, May 24, 2016; Liquidity Consideration Key in US Bank Resolution Plans, Fitch Ratings (Apr. 15, 2016), https://www.fitchratings.com/site/pressrelease?id=1002657.
[84] Open-End Fund Liquidity Risk Management Programs, 80 Fed. Reg. 62,274 (proposed Sept. 22, 2015) (to be codified at 17 C.F.R. § 270.22e-4); U.S. Sec. Exch. Comm., Comment Letters on Proposed Rule: Open-End Fund Liquidity Risk Management Programs, https://www.sec.gov/comments/s7-16-15/s71615.shtml.
[85] See infra Part II.B.3.

2. Use of proxies to facilitate monitoring

A second 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 for the credit risk of a given financial asset.[86] 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, like reducing the effort they must personally 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.

As Ron Gilson and Jeff Gordon have explained, "the agency costs of agency capitalism" has become a core challenge for financial markets. 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."[87] While Gordon and Gilson focus on the implications for firm governance, the trend they document also has important implications on investor preferences.

One way institutions investing on behalf of others provide assurances to would-be investors is through self-imposed limits on their holdings and other activities. Mutual funds, for example, regularly make precommitments 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.[88] 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.[89] Although alternative explanations have been proffered,[90] the finding

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[86] See generally Frank Partnoy & Aline Darbellay, Credit Rating Agencies under the Dodd-Frank Act, 30 Banking & Fin. Services Pol. Report 1 (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. Reg. 431 (2009).

[87] Gilson & Gordon, supra note 14, at 874. See also Avinash D. Persaud, How Not to Regulate Insurance Markets: The Risks and Dangers of Solvency II, Peterson Inst. for Int'l Econ., Policy Brief No. PB15-5 1 (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.") (citing Bank of England)).

[88] Andrei Shleifer, Do Demand Curves for Stocks Slope Down?, The Journal of Finance, Vol. 41, No. 3, p. 579. 583 (1986),

[89] Id. at 585-88.

[90] E.g., [SP Hegde, JB McDermott] The liquidity effects of revisions to the S&P 500 index: An empirical analysis, Journal of Financial Markets, (2003) (providing evidence that enhanced liquidity may help to explain the price impact of inclusion in the S&P 500); Honghui Chen et al., The Price Response to S&P 500 Index Additions and Deletions: Evidence of Asymmetry and a New Explanation, 59 J. Fin. 1901 (2004)

continues to be recognized as indicative of the influence of index funds on stock prices and more recent studies have documented the impact of institutional investors on financial market pricing in other domains.[91]

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."[92] The most restricted mutual fund type, money market mutual funds, are subject to stringent rules regarding both the quality and duration of the assets they can hold.[93] 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.[94] (The size of the money market mutual fund is also another testament to the demand for money-like claims, illustrating one of the ways that efforts to reduce agency costs and demand for money-like instruments can overlap.)

A number of settings fall outside the classic agency model yet give rise to similar challenges. Defined-benefit pension plans, which remain common for government employees, are one example. The structure of insurance companies and banks also introduce agency costs. 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.

In practice, individual policyholders and depositors do little monitoring of the insurance companies and banks they entrust with their funds. 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.[95] Examining the regulatory

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(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).

[91] E.g., Paul A. Gompers & Andrew Metrick, Institutional Investors and Equity Prices, Quarterly Journal of Economics Volume 116, p. 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).

[92] Fidelity Short-Term Bond Fund, https://fundresearch.fidelity.com/mutual-funds/summary/316146208 (last visited Aug. 2, 2016).

[93] 17 C.F.R. § 270.2a-7.

[94] For a discussion of the traditional rules and post-Crisis reforms underway, see U.S. Sec. Exch. Comm., 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.

[95] See generally Nat'l Ass'n Insurance Commissioners, IMF Financial Sector Investment Program, Self Assessment of IAIS Core Principles (2009); Robert W. Klein, A Regulator's Introduction to the Insurance

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.

As an initial matter, banks and insurance control a massive amount of capital. In the case of banks, this is well known. Focusing just on banks—not the larger bank holding companies in which they typically operate—their aggregate assets totaled $15.3 trillion at the end of 2014.[96] The U.S. insurance industry is also large and growing.[97] The net premiums taken in just 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.[98] According to the Federal Insurance Office, at year-end, life 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.[99] 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.[100]

Turning to the ways this capital is constrained, both banks and insurance companies are subject to investment restrictions and risk-based capital requirements. As such, the analysis 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 regulation, are promulgated at the state level. Most states follow one of two approaches promulgated by National Association of Insurance Commissioners (NAIC) so the regulations are more uniform than the dispersion of authority might suggest. 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

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Industry 146 (Nat'l Ass'n Inusrance Commissioners eds., 2d ed. 2005); Michael S. Barr, Howell E. Jackson & Margaret E. Tahyar, Financial Regulation: Law and Policy (2016); Federal Deposit Insurance Corporation, Who is the FDIC? (2014), https://www.fdic.gov/about/learn/symbol/index.html.

[96] Steve Schaefer, Five Biggest U.S. Banks Control Nearly Half Industry's $15 Trillion in Assets, Forbes (Dec. 3, 2014), http://www.forbes.com/sites/steveschaefer/2014/12/03/five-biggest-banks-trillion-jpmorgan-citi-bankamerica/#45806a0e1d43.

[97] See, e.g., 2015 U.S. Dep't of Treas., Ann. Rep. on Insurance Industry 12-13 (describing size and growth of the industry).

[98] Nat'l Ass'n. Insurance Commissioners Financial Regulatory Services, P&C, Title, Life/A&H, Fraternal, and Health Industry Snapshots for the Period Ended Dec. 31, 2015 (2016), available at http://www.naic.org/documents/topic_insurance_industry_snapshots_year_end.pdf; see also 2015 U.S. Dep't of Treas., supra note 97, at 13 fig.1 (documenting the size and growth of the insurance industry since 2005).

[99] 2015 U.S. Dep't of Treas., supra note 97, at 13.

[100] E.g., Ellul, A., C. Jotikasthira, C. T. Lundblad, and Y. Wang. 2015. Is historical cost accounting a panacea? Market stress, incentive distortions, and gains trading. Journal of Finance 70:2489–538 (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); Merrill, C. B., T. D. Nadauld, R. M. Stulz, and S. M. Sherlund. 2012. Did capital requirements and fair value accounting spark fire sales in distressed mortgage-backed securities? Working Paper No. 18270, NBER (finding that financially constrained life insurers sold downgraded residential mortgage-back securities during the financial crisis contributing to the decline in the prices of those assets).

large, contingent financial obligations.[101] 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."[102] 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.[103] The great majority of the states that followed one of NAIC's model acts, however, have opted for the standardized approach embodied in the first act.[104] These rules directly give rise to constrained capital.

Risk-based capital adequacy requirements operate slightly different 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.[105] Regulators have also started to require banks to 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.[106] Because banks perceive capital to be costly, these regulations give banks a reason to favor assets and activities that have lower capital requirements, holding all else equal.[107] 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.[108]

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[101] Klein, supra note 95, at 146.

[102] Id.

[103] E.g., Nat'l Ass'n Insurance Commissioners, IMF Financial Sector Investment Program, supra note 95, at 40 (explaining that in contrast to the first model act which "places restrictions on the amount that may be held in particular types of financial assets (e.g. limits on equities, noninvestment grade bonds, etc) as a means to achieve diversity," the second model act "utilizes a more principle-based approach" that "require[es] the board of directors to establish and monitor an investment policy that meets the specified criteria of the model").

[104] Klein, supra note 95, at 146.

[105] E.g., Basel Committee on Banking Supervision, Bank for Int'l Settlements, Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems (2011).

[106] Barr, et al., supra note 95; Basel Committee on Banking Supervision, Basel III: A Global Regulatory Framework, supra note 105.

[107] E.g., Malcolm Baker & Jeffrey Wurgler, Do Strict Capital Requirements Raise the Cost of Capital? Bank Regulation and the Low Risk Anomaly (Nat'l Bureau Econ. Research, Working Paper No. 19018, 2013).

[108] 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), http://escholarship.org/uc/item/6dj7p4dg.

Although credit ratings were the primary, although 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. Like the second model act promulgated by the NAIC for restricting insurance company investments, Basel II was designed to encourage firms to develop their own, more sophisticated portfolio-level risk management systems and to reduce reliance on ratings. The Crisis, however, revealed fundamental flaws in this regime as implemented. Banks' sophisticated 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 could at times be exceptionally poor prognosticators of risk and the way pervasive use of ratings for regulatory purposes can create problematic incentives.[109] In response to these concerns, the Dodd-Frank Act prohibits reliance on credit ratings for federal regulatory purposes.[110] The success of this effort at limiting the influence of credit ratings has been mixed. There is little indication that ratings have declined much in their importance.[111] Credit ratings remain a centerpiece of private monitoring efforts and many state and foreign regulatory regimes.[112] At the same time, 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 not necessarily more reliable than the credit rating agencies.[113] This is the most recent manifestation of the ongoing challenge posed by the fact that proxies serve a genuinely useful purpose in facilitating monitoring and oversight despite the associated challenges.

Taking a more global perspective, the broader trend is in the opposite direction—toward greater 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 in banking.[114] They are also expanding in the context of insurance companies. For example, Europe has recently revised its regulatory framework for insurance companies.[115] The centerpiece of the new regime are 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

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[109] E.g., John C. Coffee Jr., What Went Wrong? A Tragedy in Three Acts, 6 U. St. Thomas L.J. 403 (2009); John Soroushian, Credit Ratings in Financial Regulation: What's Changed Since the Dodd-Frank Act?, 16-04 Office of Fin. Services Brief Series (2016).

[110] [cite – DFA]

[111] Soroushian, supra note 109.

[112] Id.

[113] Id.

[114] E.g., Basel Committee on Banking Supervision, The Basel Committee's Response to the Financial Crisis: Report to the G20, at 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.")

[115] See generally Eur. Commission, Solvency II Overview (2015), http://europa.eu/rapid/press-release_MEMO-15-3120_en.htm.

individualize the metrics that they use to assess the riskiness of their assets, but many key aspects of the regime 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 aftercapital-charge returns, Solvency II will lead to a switch out of public and private equity, infrastructure bonds, property, and low-rated corporate bonds."[116] 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 go beyond increasing the demand for money and other 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 is subject to private or public constraints that are independent of the metrics used in classic asset-pricing models. Despite the brevity, the analysis shows that constrained capital is sufficiently pervasive to affect financial asset pricing and production, at least some of the time.

B. The role of regulation

The next challenge is parsing out the impact of regulation in creating constrained capital. This paper argues that in order to assess the extent to which a regulatory intervention affects aggregate demand for a particular type of financial instrument, one first must construct a baseline that takes into account the private ordering that would occur in the absence of the intervention. This subpart adds flesh to this claim. It complements the preceding examples by providing 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.

1. Law as 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 baking era," for example, banks had larger capital cushions than they do today and many also stockpiled cash as a way of assuring depositors of the sufficiency of their liquidity reserves.[117] As these patterns reflect, in absence of government supervision, the claimants who provide capital to these institutions would demand assurances that the institution would be well positioned to meet its obligations when they came due. 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 in each case serves

[116] Persaud, supra note 87, at 3 (citing Andre Thibeault and Mathias Wambeke, Vlerick Centre for Financial Services, Regulatory Impact on Banks' and Insurers' Investments (2014)); see also Stefan Mittnik, Solvency II Calibrations: Where Curiosity Meets Spuriosity (Ludwig Maximilians U. Munich Ctr. for Quantitative Risk Analysis, Working Paper No. 04, 2011.

[117] See infra, note 122 and sources cited therein.

aims that would be addressed through market-based mechanisms in the absence of regulation.[118]

To the extent that regulatory regimes and other legal interventions function as substitutes for private monitoring and discipline, their primary effect may be to alter the thresholds around which demands for constrained capital arise and the size of the demand around those thresholds. Particularly for regulations that affect significant swathes of capital, these effects can be significant. That the price of highly rated commercial MBS fell relative to corporate debt when the capital adequacy requirements applicable to such instruments were reduced illustrates how important regulatory effects can be even such spaces.[119] At the same time, as reflected in the mixed results of efforts to reduce regulatory reliance on credit ratings, monitoring risk taking is tricky business.[120] Particularly when a firm's structure gives its creditors and other senior claimants a reason to be concerned that the firm's shareholders, and managers accountable to those shareholders, want a firm to assume excessive risk, it is difficult to know whether a lack of regulation would necessarily result in less stringent constraints or less constrained capital. This suggests that many of the regulatory regimes that most obviously produce constrained capital may not be as transformative as they superficially appear.[121]

2. Other policy aims

Much financial regulation serves aims beyond coordinating the protections that stakeholders would otherwise demand. Bank regulation, for example, also seeks to reduce the negative spillover effects on the real economy that arise when banks fail and the banking system faces systemic distress. Although it would be challenging to map these distinctions onto existing regulatory arrangements, from a theoretical perspective, the distinction is important. To the extent that a regulatory intervention is designed 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 a system.

Banking is a classic example of a domain where regulatory interventions are serving multiple aims. The capital requirements imposed on banks, for example, function in part as a substitute for what the market would otherwise require, as reflected by the fact that banks tended to have even thicker equity cushions than those mandated today before they were heavily regulated.[122] Today's bank regulatory regime, however, also aims to reduce the negative externalities that can arise when a bank fails. As a result, capital requirements imposed by reference to the riskiness of a bank's assets are often

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[118] See generally, Mathias Dewatripont, and Jean Tirole, Macroeconomic Shocks and Banking Regulation, 44 J. Money, Credit and Banking 237 (2012).

[119] 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), http://escholarship.org/uc/item/6dj7p4dg.

[120] See supra Part II.A.2.

[121] For further discussion of implications and alternatives, see infra Part IV.

[122] E.g., Charles W. Calomiris, How to Regulate Bank Capital, 10 National Affairs 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 75, at 280 ("A century ago, the [capital] ratio for many banks was 25 per cent!").

more demanding than would be required if the sole function was to substitute for private oversight.

A recent example of the law intervening to replicate private protections while also going beyond those protections because of concerns about spillover effects are 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.[123] Of particular relevance here are a new requirement 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.[124] 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 in forms that the market had not otherwise embraced on a widespread basis, consistent with policymakers' belief that derivative exposures can be a mechanism of contagion during periods of financial distress and thus 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 most initial estimates suggest that the revised regime will require derivatives market participants to post and maintain significantly more collateral than market previously demanded.[125] A recent report by the Comptroller of the Currency, for example, estimates that U.S. banks will need approximately $644 billion in [additional] eligible collateral to satisfy the initial collateral requirements under the new regime. The nature of the collateral that may be used to satisfy these demands has also been the subject of heated debate, as industry participants have argued that the regulatory approach is unduly restrictive[126] and have expressed concerns that the overlap between the type of collateral the new regime

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[123] Whether derivatives played a significant role in contributing to the Crisis remains contested. See, e.g., Bruce Tuckman, In Defense of Derivatives: From Beer to the Financial Crisis, 781 Cato Institute (2015).

[124] 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 Skadden, Arps, Slate, Meagher & Flom, Regulation of Over-the-Counter Derivatives Under the Dodd-Frank Wall Street Reform and Consumer Protection Act, at 3, available at 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).

[125] E.g., J.P. Morgan, supra note 80.

[126] E.g., Letter from International Swaps and Derivatives Association to Elizabeth M. Murphy, Secretary, Securities and Exchange Commission (Jan. 23, 2013) (available at, https://www2.isda.org/attachment/NTI1MA==/ISDA%20Margin%20Response%20to%20the%20SEC.pdf) (arguing that "[t]he list of eligible collateral proposed by the Prudential Regulators is too limited" [t]he determination of what constitutes appropriate collateral" should instead be made by the centralized clearing body "based on conditions surrounding the relevant swap").

requires and the assets that banks and insurance companies are being incentivized to hold pursuant to other contemporaneous regulatory changes.[127]

3. Indirectly altering incentives

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 the ways the law affects the demand for money and other safe assets. One of the primary reasons that persons demand such assets is as a way of self insuring in anticipation future, and often uncertain, needs.[128] This demand is not determined in a vacuum, but rather is shaped by a person's expectations regarding its ability to access to external financing when needed and the terms of such financing.

One classic conception of the function of banking 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 often provided liquidity insurance prior to the Crisis was through lines of credit. Individuals, for example, frequently had home equity lines of credit.[129] This might provide one person the comfort of knowing that if she lost her job and needed to cover expenses for a couple of months, she could do so, while allowing someone else the joy of knowing he could buy his dream car or renovate whenever the time felt right. Companies, similarly, would often pay a regular fee to a bank in exchange for that bank precommitting that it would make a loan, up to a pre-established cap, at the company's demand. From the company's perspective, a line of credit from a trustworthy bank could serve as a rough substitute for cash in a deposit account, as both served to assure the company that it would have access to liquidity when it needed it in future periods.

State actors can also play an important role in providing liquidity insurance. One of the primary functions of the Federal Reserve when it was created in 1913 was to provide a form of liquidity insurance to banks by committing to make collateralized loans to banks facing excess withdrawals.[130] 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 day.[131] While less certain and far more conditioned, 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 it should hold to avert facing such a possibility.

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[127] E.g., J.P. Morgan, supra note 80 (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).

[128] See supra Part II.A.1.

[129] See generally [https://s3.amazonaws.com/files.consumerfinance.gov/f/201204_CFPB_HELOC-brochure.pdf]

[130] E.g., Allan H. Meltzer, A History of the Federal Reserve, Volume 1: 1913-1951 3 (2004).

[131] 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.

As these examples illustrate, the notion of an insurance policy need not be limited to settings where persons seek to reduce the loss they will incur upon an adverse event. Individuals may value access to liquidity to enable future consumption; firms may want to ensure they can take advantage of attractive investment opportunities when they arise; and countries may want access to IMF liquidity to help smooth out changes in their capacity to access private capital markets. These examples further 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 proposed and rejected time and again for more than a century, seemingly reflecting a consensus that the costs, such as limiting the growth of the money supply and precluding any deposit capital from being deployed in risky but productive undertakings, exceed the stability-enhancing benefits.[132] And 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 banking panics tend to be correlated with financial crises which result in adverse spillover effects on the real economy.[133] The analysis here by no means requires a conclusion regarding the optimal level of insurance, or self-insurance, for individuals, firms or countries, but it does bring the fore some of the ramifications of efforts to reduce moral hazard by reducing the safety net that are often overlooked.

The key take-away is the importance of taking a broad view in assessing the range of government actions that affect the amount of constrained capital in the financial system. As Bernanke explained, the global savings glut, which appears to have played a significant role 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.[134] 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.[135] 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 savings 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

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[132] Morgan Ricks, Safety First? The Deceptive Allure of Full Reserve Banking, U. Chi. L. Rev. Online (forthcoming).

[133] For a good overview of the U.S. history, see Gerald Dwyer and R. Alton Gilbert, Bank Runs and Private Remedies, Federal Reserve Bank of St. Louis Review 43 (1989).

[134] Ben S. Bernanke, Chair, Bd. Governors Fed. Reserve Sys., Remarks at the Homer Jones Lecture (April 14, 2005), available at http://www.federalreserve.gov/boarddocs/speeches/2005/20050414/.

[135] E.g., King, supra note 75.

particular types of assets 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.[136] It is individualized in the sense that it focuses on that bank's expected cash inflows and outflows, but it ignores a range of other ways that banks differ that would otherwise be material in assessing just how much liquidity a bank should hold.[137] The standardized nature of the requirement suggests it is almost inevitably distortive for some institutions, but whether this is more or less liquidity than banks would hold absent any type of government intervention in the banking market or relative to the optimal degree of bank self insurance in light of government support is far from clear. On one hand, the LCR does require virtually all affected banks to hold more safe assets than they held in the absence of the LCR.[138] On the other hand, a primary rationale for the LCR is that pre-Crisis banks held too few safe assets because of bank expectations that the government would step in to supply additional liquidity when needed, so the higher requirements may be appropriate in light of the externalities that arise from bank failures and the potential for expectations of government support to induce moral hazard.[139]

In sum, regulatory requirements and other interventions that produce constrained capital serve a number of socially useful aims. Particularly given the inherent information asymmetries between financial regulators and the firms they supervise, and similar asymmetries in the resources and sophistication, the use of rough proxies to facilitate oversight and restrain risk taking can make good sense. Moreover, as demonstrated by the failure of Basel II, there are significant drawbacks to allowing firms greater flexibility to develop individualized risk management programs and the trend seems to be moving in the opposite direction.[140] At the same time, there are few signs that regulators consider the aggregate natural supply of assets of a given class, the other sources of demand for those assets, and how both of these factors can vary over the business cycle in promulgating new rules. When making decisions about when and how to provide

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[136] See Basel III: The Liquidity Coverage Ratio, supra note 81 ("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% (ie the stock of HQLA should at least equal total net cash outflows")).

[137] See generally Treas. Reg. § 329 (2014) (describing the methodology).

[138] Mark Carlson, Burcu Duygan-Bump, and William Nelson, 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 Finance and Economics Discussion Series, at 2-3 (2015), available at 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).

[139] Id.

[140] E.g., Donna Borak, Regulators to Banks: We'll Size Up Your Risks, Wall St. J. (June 12, 2016), http://www.wsj.com/articles/regulators-to-banks-well-size-up-your-risks-146577042.

liquidity support, or to allow banks to provide such support, policymakers similarly seem to be giving relatively little heed to the way such decisions affect incentives to self insure, and thus impact the amount of constrained capital in the system and the demand for safe assets. The next Part addresses why policymakers may want to pay greater heed to these dynamics.

III. Investor-driven 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.[141] These effects can be quite 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.[142] Entities like banks that can readily issue money equivalents enjoy particularly notable benefits in this regard.[143] Nonetheless, demand for particular types of instruments often exceeds the natural supply, that is, the maximum amount of such instruments that can be created through primary issuances, and this is particularly true during economic booms.[144]

The point where demand exceeds supply is where the paper's claim gains traction. Excess demand can spur the development and spread of innovative financing techniques only if it is possible to manufacture assets that satiate this demand. This Part explores how this happens. It first considers the building blocks used to enable this financial engineering and some examples of financial innovations that arose or spread in response to investor demand. It then provides some of the context required to consider why regulators should care about demand-driven financial innovation and the ways their actions may contribute to it. The latter subparts thus address how these innovations can promote efficiency and lower capital costs and how the spread of these innovations also gives rise to new, and sometimes systemic, risks. Like Part II, the aim here is to illustrate rather than exhaust the phenomena at issue, and to provide an account that is more descriptive than normative.

A. Demand-Driven Financial Innovation

Although there is no limit to the types of financial innovations that might arise to help satiate excess investor demand for particular types of financial instruments, two techniques have been particularly influential in enabling the recent growth of investor-driven innovation. This subpart examines each and then provides examples of how they have been used to satiate excess demand.

1. The building blocks

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[141] E.g., Mark Carlson et al., The Demand for Short-Term, Safe Assets and Financial Stability: Some Evidence and Implications for Central Bank Policies, Federal Reserve Board Finance and Economic Discussion Series (2014); Caballero & Krishnamurthy, supra note 69, at 584-85 (noting that, "over the last decade, the US has experienced large and sustained capital inflows from foreigners seeking US assets to store value . . . [t]he external demand for US assets, from foreign central banks for example, is in particular a demand for high-grade debt.").

[142] E.g., Carlson et al., The Demand for Short-Term, Safe Assets and Financial Stability, supra note 141; Caballero & Krishnamurthy, supra note 69.

[143] E.g., Ricks, Safety First?, supra note 132.

[144] Perry Mehrling, The New Lombard Street: How the Fed Became the Dealer of Last Resort (2011).

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 during 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.[145]

The other two features that are critical to most securitization structures are diversification and tranching. Tranching entails the creation of multiple different classes of instruments, all of which have different sets of rights to the cash flows produced by the underlying assets.[146] 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 "waterfall," 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.[147]

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.[148] Another logistical challenge, usually resolved through the appointment of a trustee, entails the distribution of 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 sale.[149] 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

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[145] For a more detailed description of how securitization structures work, see, e.g., Kathryn Judge, Fragmentation Nodes: A Case Study in Financial Innovation, Complexity and Systemic Risk, 64 Stan. L. Rev. 657, 672 (2012).

[146] See id.

[147] E.g., Joshua D. Coval et al., Economic Catastrophe Bonds, 99 Am. Econ. Rev. 628 (2009).

[148] 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). These instructions are necessarily incomplete, see Part III.b., infra.

[149] Judge, Fragmentation Nodes, supra note 145.

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.[150] A simplified illustration of a credit default swap demonstrates how these transactions work. Imagine that 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.[151]

Far more than securitization, this is an innovation that serves a number of important socially valuable purposes having little to do with investor preferences. Derivatives, for example, are often used by parties seeking to hedge or to otherwise reallocate risks to parties better suited to bear those risks.[152] At the same time, 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.[153] And like securitization, derivatives can give rise to risks that did not previously exist by, for example, increasing interconnectedness.[154]

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. This

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[150] The term "derivatives" is sometimes used to encompass both ABS and synthetic derivatives and other terms refers exclusively to the latter. This paper adopts the second approach and uses the term 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., Tuckman, supra note 123, at 3 (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).

[151] Frank Partnoy & David A. Skeel, Jr., The Promise and Perils of Credit Derivatives, 75 Univ. of Cincinnati L. Rev. 1019, 1025-26 (2007) (describing the role that ISDA has played in facilitating these processes).

[152] See generally Tuckman, supra note 123.

[153] See infra Part III.A.2.

[154] See infra Part III.C.3.

structure also brings to the 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.[155] The volume of MBS transactions skyrocketed in the early 2000s.[156] Although a number of explanations have been given for this growth,[157] one of the most frequently cited is excess demand for AAA-rated instruments.[158] 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 innovations 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-savings 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. [159][160] [161], These acquisitions increased the aggregate demand for highly rated instruments and reduced the yields and availability of the safest of these 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.[162]

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 collateralized debt obligation (CDO) backed by MBS. CDOs, of the type here at issue, are second-level

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[155] 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 paper uses MBS as shorthand for RMBS.

[156] E.g., Miguel Segoviano et al., Securitization: Lessons Learned and the Road Ahead, at 9 and fig. 5 (IMF, Working Paper No. 13/255, 2013), https://www.imf.org/external/pubs/ft/wp/2013/wp13255.pdf ("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).").

[157] 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 Review of Financial Studies 1 (2005); Gary Gorton & George Pennacchi, Financial Intermediaries and Liquidity Creation, 45 J. Fin. 49 (1990). As discussed further below, this is not necessarily an efficient outcome, however, as it can result in their being too few informed investors and fragility-enhancing information gaps when the good times end. See, e.g., Judge, Information Gaps and Shadow Banking, 103 Va. L. Rev. __ (forthcoming 2017); Samuel G. Hanson & Adi Sunderam, Are There Too Many Safe Securities? Securitization and the Incentives for Information Production, 108 J. Fin. Econ. 565 (2013).

[158] E.g., Fin. Crisis Inquiry Comm'n, Financial Crisis Inquiry Report 119 (2011); Miguel Segoviano et al., supra note 156, at 30-35; Ben S. Bernanke et al., supra note 32, at fig. 5; see also infra, Part III.A.

[159] Bernanke et al., supra note 32.

[160] Id. at fig. 2 (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) (Bernanke's first discussion on the "global savings glut.").

[161] Bernanke et al., supra note 32, at fig. 4.

[162] Id.

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 could be consummated.[163]

The important role of CDOs along both dimensions is reflected in the dramatic growth of these transactions, which proliferated even more quickly than MBS, on a relative basis.[164] Between 2004 and 2006 alone, the height of the boom, the issuance of new CDOs increased by roughly 250%.[165] 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, plays a critical role explaining why and how insurance company AIG ended up so exposed to the mortgage market.[166]

c. Synthetic CDOs

Although MBSs and CDO transactions proliferated rapidly before the Crisis, the number of these transactions that could be consummated was constrained by the need for loans or other cash-producing assets. Synthetic CDOs are not so constrained. In contrast to traditional securitization structures that rely on underlying cash-producing assets, these instruments are "synthetic" because they are produced primarily through a mix of derivative transactions that create instruments with cash flows that are determined by reference to the actual performance of specified CDOs.[167] Like MBS and CDOs, this innovative financing technique spread pre-Crisis to satisfy the excess investor demand for highly rated financial instruments but, because counterparties were required in lieu of underlying credit instruments, they also arose to satisfy demand from other investors who

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[163] Judge, Fragmentation Nodes, supra note 145, at 694; Fin. Crisis Inquiry Comm'n, supra note 158, 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).

[164] Fin. Crisis Inquiry Comm'n, supra note 158, at 18 ("from 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 collateral"); Miguel Segoviano et al., supra note 156, 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.").

[165] Faten Sabry & Chudozie Okongwu, How Did We Get Here? The Story of the Credit Crisis, J. Structured Fin., Spring 2009 at 53, 61.

[166] Serena Ng and Carrick Mollenkamp, Goldman Fueled AIG Gambles, Wall St. J., (Dec. 12, 2009), http://www.wsj.com/articles/SB10001424052748704201404574590453176996032 (describing a report on the AIG bailout that explains the logistics of how this happened).

[167] E.g., Fin. Crisis Inquiry Comm'n, supra note 158, at 142-46 (explaining the structure of synthetic CDOs and providing examples).

wanted instruments that wanted to short the CDO market, i.e., instruments that would go up in value if the value of CDOs declined.[168] The complexity of these structures and the range of parties involved meant that the investment bank sponsoring the arrangement often remained party to it, and not infrequently even retained some exposure to the performance of the various instruments issued.[169] Thus, even more than with regular CDOs, synthetic CDOs created complex new interconnections and motivated the banks that structured the transactions to use swaps to hedge their exposures, primarily with AIG.[170]

d. Asset-backed commercial paper

Although much of 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 from 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 are asset-backed commercial paper (ABCP) programs.[171] At its height in 2007, total ABCP outstanding reached $1.2 trillion.[172] This amount exceeded the aggregate value of unsecured commercial paper outstanding, including that issued by financial and nonfinancial firms, and it also exceeded by a good margin the aggregate value of Treasury bills then outstanding.[173]

These structures allow MBS and CDOs, among other assets, to be used to issue money-like claims.[174] They do so through a complex set of arrangements that bear some similarities to securitization structures, in that underlying assets are packaged together in

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[168] E.g., id. at 144 (illustrating how both sets of investors are served, and required, for these transactions to work; Steven M. Davidoff Solomon, Alan D. Morrison William, & J. Wilhelm Jr., The SEC v. Goldman Sachs: Reputation, Trust, and Fiduciary Duties in Investment Banking, 37 J. Corp Law 529, 535 (describing how the now-famous Abacus synthetic CDO served both these purposes).

[169] Fin. Crisis Inquiry Comm'n, supra note 158, at 143.

[170] E.g., id. ("AIG was effectively the largest unfunded investor in the super-senior tranches of the Abacus deal.")

[171] For a more in-depth analysis of how these structures work, see, e.g., DBRS, Asset-Backed Commercial Paper Criteria Report: U.S. & European ABCP Conduits - Request for Comment (2013), available at http://www.dbrs.com/research/263140/asset-backed-commercial-paper-criteria-report-u-s-european-abcp-conduits-archived.pdf; Fitch Ratings, Asset-Backed Commercial Paper Explained (2001), available at http://people.stern.nyu.edu/igiddy/ABS/fitchabcp.pdf;
Basel Committee on Banking Supervision: The Joint Forum, Report on Special Purpose Entities (2009), available at http://www.bis.org/publ/joint23.pdf.

[172] Financial Conduct Authority, Market-Based Finance: Its Contributions and Emerging Issues, at 9 (2016), available at 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 Acharya & Schnabl, supra note 72, at 38 (explaining that the value of outstanding ABCP was roughly $260 billion more than the value of outstanding Treasury bills).

[173] Daniel Covitz et al., The Evolution of a Financial Crisis: Collapse of the Asset-Backed Commercial Paper Market, 68 J. Fin. 815, 815 (2013); for detailed information about the types and amounts of CP outstanding see Bd. Governors Fed. Reserve Sys., Commercial Paper Rates and Outstanding Summary (2016), available at http://www.federalreserve.gov/releases/cp/.

[174] Daniel M. Covitz et al., The Evolution of a Financial Crisis: Panic in the Asset-Backed Commercial Paper Market, Federal Reserve Board Finance and Economic Discussion Series, at 10 (2009) (noting that two Moody's reports suggested that between 25-27% of the assets underlying structured investment vehicles that 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.").

a new vehicle that issues effectively senior claims—in this case, claims with much shorter maturities—and lower priority instruments. These programs, however, also have a number of additional features, such as arrangements with the bank sponsoring the ABCP program that often enabled the vehicle to obtain liquidity support from the bank if needed.[175] These structures also varied in important ways, and benefited from implicit as well as explicit commitments from the sponsoring banks.[176] These details are beyond the scope of this paper, but they are relevant in that 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.[177]

As with most money-type claims, like demand deposits, ABCP holders often provide ongoing financing by rolling over their investments when they mature, but the instruments themselves are very short-term, often with maturities between 1 and 30 days.[178] One ramification is that the issuer of the ABCP does not need to convince a potential holder that the ABCP will continue to perform well in all states of the world to merit money-like status. Rather, the issuer only needs to convince the ABCP holder that the structure can withstand any adverse developments that might arise between the issuance of the ABCP and the maturity date, as the holder can walk away or demand substantially different terms each time the paper nominally matures.[179] Further reducing the need for ABCP to undertake individualized diligence is the fact that most ABCP programs also obtain ratings from a leading credit rating agency.[180] In conjunction with the highly rated nature of the collateral backing ABCP, overcollateralization requirements that ensured the face value of the collateral exceeded the value of the ABCP issued, and the liquidity and other support mechanisms provided by the sponsor, enable the ABCP to function as a money-like claim, these features led holders to treat ABCP as money-like.

The rapid growth of these structures in the years leading up to the Crisis is consistent with the broad patterns regarding investor demand for money-like instruments

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[175] 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 171 (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.

[176] For a description of the different types of programs, see DBRS, supra note 171.

[177] See infra Part ___.

[178] Covitz et al., The Evolution of a Financial Crisis: Panic in the Asset-Backed Commercial Paper Market, supra note 174, at 7 (stating that "[m]ore than half of ABCP daily issuance has maturities of 1 to 4 days, and the average maturity of outstanding paper is about 30 days."); DBRS, supra note 171, at 7.

[179] This feature is quite effective at minimizing the risks to which ABCP holders are exposed, but can also give rise to systemic risk, by allowing those holders to withdraw from the market or demand markedly different terms to continue to hold ABCP. See Covitz et al., The Evolution of a Financial Crisis: Panic in the Asset-Backed Commercial Paper Market, supra note 174 at 2.

[180] Id. at 8 (noting that, "[t]he U.S. asset-backed commercial paper (ABCP) market erupted in late summer of 2007 and played a pivotal role in the global financial crisis that would become increasingly severe. In the ABCP market, where investors expect to be able to access their funds on demand at par value, even limited concerns about risk can instigate flight from the market.").

documented above. Pozsar's findings regarding the growth of institutional cash pools during this period are particularly relevant. 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,"[181] that demand is usually best satisfied by non-M2 types of money, such as ABCP. In his view, "cash pools' demand for short-term AAA assets is the principal source of marginal demand for maturity transformation in the financial system."[182]

As these examples reflect, the financial technology now exists to repackage existing cash flows or to otherwise synthetically produce financial instruments with characteristics that satisfy the demands of investors. These examples also illustrate other dimensions of this paper's claims. For one, although the cost of using these technologies typically declines as the innovations spread, there is always some cost in utilization. This cost creates the friction underlying this paper's claim that such innovations spread only when investor demand exceeds supply. (Regulatory arbitrage is a different, albeit related, phenomenon.[183]) That the innovations described above all flourished pre-Crisis—a boom time when activity generally was in ascent, resulting in larger banks, more demand for cash and collateral—is also consistent with the notion that these types of innovations spread only when there is *excess* demand. Put differently, it is no coincidence and is instead supportive of this paper's claim that the examples here come largely from the pre-Crisis period and have since retreated substantially with some, like CDOs and synthetic CDOs, facing potentially permanent extinction.

B. Some benefits

The pre-Crisis spread of MBS, CDOs, synthetic CDOs, ABCP conduits and other investor-driven innovations yielded many of the same benefits long attributed to arbitrage—appearing to make the capital markets more efficient and reducing the cost of capital. For example, by expanding the types of investors who could provide capital to home loans, securitization should have reduced any premium mortgagees would otherwise have to pay relative to similarly risky corporate loans that such investors were already able to hold. As a result, the range of persons who could qualify for a home loan expanded and the terms of those loans often became less demanding.[184] This contributed to the overall rate of U.S. home ownership reaching a record-breaking high 69.2% in 2006.[185]

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[181] Pozsar, Institutional Cash Pools, supra note 51, at 284.

[182] Id.

[183] See infra Part IV__.

[184] E.g., Fin. Crisis Inquiry Comm'n, supra note 158, at 105 (noting that prior to the Crisis, "underwriting standards for nonprime and prime mortgages weakened," "[c]ombined loan-to-value ratios … rose" and "[d]ebt-to-income ratios climbed").

[185] Press Release, U.S. Department of Commerce, U.S. Census Bureau News: Residential Vacancies and Homeownership in the Second Quarter 2016 (July 28, 2016) (available at, http://www.census.gov/housing/hvs/files/currenthvspress.pdf) (showing homeownership rates from 1995-2016); See also Bd. of Governors of the Fed. Reserve, The 2014 Home Mortgage Disclosure Act Data, 101 The Federal Reserve Bulletin, at 4, available at http://www.federalreserve.gov/pubs/bulletin/2015/pdf/2014_HMDA.pdf (showing that the number of home loans originated in 2005 and 2006 far exceeded earlier or subsequent figures).

Some of this growth seems likely to be positive and to reflect the genuine welfare gains that can arise from the ability of investor-driven financial innovations to overcome frictions that may limit the capacity of certain pools of capital to fund particular types of undertakings. At the same time, there are reasons to be concerned that the complexity of these arrangements may have contributed to the mispricing of housing risk and the boom that preceded the Crisis.[186] Although in the abstract this is not inherent to investor-driven innovation, these innovations will almost introduce new complexities that can increase the cost of effective diligence and monitoring.[187] More generally, because of the effects of changing tides, innovations that spread during boom times may frequently have costs that are not immediately apparent. More closely examining the ramifications of the spread of investor-driven financial innovations can help shed light on whether and to what extent regulators should be concerned about their spread.

C. The changing risks

1. Identifiable risks borne by the parties involved

Virtually all investor-driven financial innovations create risks that would not otherwise exist.[188] 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.[189] Similarly, the structure of securitization transactions means that the value of the senior instruments issued depends not only on the quality of the underlying assets, but also on the use of appropriate assumptions regarding the degree of correlation among the underlying assets—making an issue that was once meaningful highly relevant.[190] These and other readily identifiable challenges with particular forms of investor-driven financial innovations could be mitigated through contractual and other means, and the incremental cost of using such devices tended to go down as an innovative structure spread. These tools always remained costly—and this is the assumption that animates this paper's claim that such innovations only arise and spread when investor demand exceeds the more ready sources of supply—but those costs often become less significant over time.

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 equally diligent when originating a loan for securitization as they were when they anticipated retaining a loan, for example, have been revealed in hindsight not to be up to the task. According to one study, loans that

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[186] See infra Part __.

[187] See, e.g., Ronald J. Gilson & Reinier Kraakman, Market Efficiency after the Financial Crisis: It's Still a Matter of Information Costs (Stanford Law and Economics, Olin Working Paper No. 458, 2014).

[188] See, e.g., Financial Conduct Authority, Market-Based Finance: Its Contributions and Emerging Issues, at 23-25 (2016), available at 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).

[189] Coffee, supra note 109, at 406.

[190] Frank Partnoy, Overdependence on Credit Ratings Was a Primary Cause of the Crisis, in The Panic of 2008 Causes, Consequences and Implications for Reform (Lawrence E. Mitchell, Arthur E., Jr. Wilmarth ed., 2010).

could more readily be securitized were 10-25% more likely to default than otherwise similar loans that were not as conducive to securitization.[191] Nonetheless, for the most part, risks that are readily identifiable and internalized by the parties involved, while notable, do not generally pose significant policy concerns.

2. 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 transaction or structure it creates and the environment in which the obligations subsequently arise. The risks associated with securitizing home loans illustrate these dynamics. Recall, when a 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. In recognition of the fact that some borrowers would default on their loans, servicers were authorized to address such defaults but the primary way servicing agreements assumed this would happen was by foreclosing. The best way to maximize the value of the cash flows from an underlying loan, however, changed when housing prices nationwide fell dramatically, and most servicing agreements failed to take into account that modifications might be a superior response than foreclosure and thus often failed to provide servicers the authority and incentives to take that approach.[192] According a study by Tomasz Piskorski and co-authors, even after controlling for a number of factors, securitized loans were foreclosed at significantly higher rates than comparable loans still held by the bank that originated the loan.[193] Because banks are incentivized to maximize the value of the loans they hold, these findings suggest that servicers have modified too few loans relative to number of modifications that would maximize the value of those loans.

This example illustrates two distinct reasons that private mechanisms will not always suffice to address the risks associated with investor-driven financial innovations. First, the inherent complexity and newness of many forms of preference arbitrage increase the probability that the parties will fail to identify and address even quite material risks that might arise in some states of the world.[194] Also notable from a consumer protection standpoint is that because these innovative financial structures often

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[191] E.g., Benjamin J. Keys et al., Did Securitization Lead to Lax Screening? Evidence from Subprime Loans, 125 Q. J. Econ. 307 (2010) (finding that loans that could more readily be securitized were 10-25% more likely to default than otherwise similar loans that were not as conducive to securitization.).

[192] See, e.g., National Consumer Law Center Inc., Why Servicers Foreclose When They Should Modify and Other Puzzles of Servicer Behavior: Servicer Compensation and its Consequences (2009), available at https://www.nclc.org/images/pdf/pr-reports/report-servicers-modify.pdf; Gelpern & Levitin, supra note 148.

[193] 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 ("find[ing] that the foreclosure rate of bank-held loan 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 No. 15159, 2009), http://www.nber.org/papers/w15159.

[194] For examples in other settings, see Frank Portnoy, Infectious Greed: How Deceit and Risk Corrupted the Financial Markets (2d ed. 2009).

entail multiple steps consummated at disparate points in time, affected borrowers are often not in a position to exercise any voice in those arrangements even though, in theory, they sit within the arrangement. For example, borrowers were often unaware that their home loan would be securitized and thus had little, if any, capacity to avoid or influence those sales, even though the sale of a home loan to a securitization vehicle appears to have materially altered the ability of borrowers to renegotiate the terms of their loan.

Second, risks may be inadequately identified and addressed because they 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.[195] 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.

3. Systemic risk

It is not a coincidence that 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. To manufacture financial claims with characteristics that do not otherwise correspond to the characteristics of persons seeking financing necessarily entails steps that increase the complexity and interconnectedness of the financial system, both factors that can increase systemic risk.

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."[196] The packaging of home loans into MBS and CDOs also may have accentuated the depths of the bust that followed that boom by creating inadvertent and inefficient rigidities that precluded securitized loans from being modified as often or in the ways that would have been socially optimal.[197]

Information dynamics also help to explain how MBS, CDOs and other financial innovations contributed to the Crisis. For example, given that CDO managers conducted relatively little 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 under-investment in the technology required to produce the information,[198] these information gaps increased the degree of market dysfunction once panic set in.[199] With the benefit of hindsight, Robert Jarrow has argued that in contrast to MBS and derivatives, which have genuinely socially useful functions,

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[195] See Judge, Fragmentation Nodes, supra note 145 and sources cited therein.
[196] Fin. Crisis Inquiry Comm'n, supra note 158, at 155.
[197] Piskorzi, supra note 193; Judge, Fragmentation Nodes, supra note 145.
[198] Hanson & Sunderam, supra note 157.
[199] Judge, Information Gaps, supra note 157.

CDOs don't and really never did.[200] Regardless of whether one buys this claim, Jarrow's position highlights the way that the tradeoffs posed by different forms of investor-driven innovation can vary significantly, and a richer understanding of the ways that constrained capital may be driving a particular form can be critical to enabling more timely insights into the tradeoffs posed by a particular innovation.[201]

Synthetic CDOs and the other transactions they motivated similarly contributed to the Crisis. For example, because of the important role of derivatives in these transactions and complexity of these transactions, they increased the interconnections among financial institutions and in ways that were often far from transparent. These interconnections were important, in part, because they served as a mechanism for contagion during the Crisis. These interconnections and the complexity they created also increased the market dysfunction by increasing the pool of potentially pertinent and yet unknown information, i.e., information gaps.[202] 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" but "when a surprise liquidity shock hits parts of the network, a domino effect of bankruptcies becomes possible, and banks become concerned that they might be indirectly hit."[203] 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.[204]

ABCP were also central to the Crisis.[205] 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.[206] 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.[207] 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.[208]

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[200] Robert A. Jarrow, The Role of ABS, CDS and CDOs in the Credit Crisis and the Economy (2011), available at http://www.russellsage.org/sites/all/files/RethinkingFinance/Jarrow%20ABS%20CDS%20CDO%202.pdf.

[201] For further discussion of the relationship between preference arbitrage and regulatory arbitrage, see infra Part IV.B.3.

[202] E.g., Ricardo Caballero & Alp Simsek, Fire Sales in a Model of Complexity, 68 J. Fin. 2549 (2013).

[203] Id. at 2550.

[204] Id.

[205] Judge, Information Gaps, supra note 157.

[206] Covitz et al., The Evolution of a Financial Crisis: Collapse of the Asset-Backed Commercial Paper Market, supra note 173, 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).

[207] Id. at 829; Judge, Information Gaps, supra note 157.

[208] Covitz et al., The Evolution of a Financial Crisis: Collapse of the Asset-Backed Commercial Paper Market, supra note 173, at 815-17 (2013) ("in the summer 2007 . . . yields soared and maturities shortened for new issues"); see id. at fig.1 and 824 ("the 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"); see id. ("overnight 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

Viral Acharya and Philipp Schnabl provide further evidence of the way the contraction of the ABCP market contributed to the spread of the Crisis.[209] Because of the credit enhancements that the banks sponsoring ABCP programs had provided to the conduits in those programs, the contraction in the ABCP quickly resulted in banks having to take many of the conduits they had sponsored onto their balance sheets or in other forms of support flowing out from the banks to those programs.[210] 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, including to countries that had not enjoyed capital surpluses prior to the Crisis.[211] In fact, as they point out in other work, the first two large banks that required and received significant government support were not U.S. institutions, but rather were banks based in the Netherlands and Germany, and the trend holds when examining the stock price declines for banks during the Crisis.[212] Their work provides yet further evidence of the important role that investor-driven innovations played in contributing to the Crisis.

Taking a step back suggests another way that excess constrained capital, by its nature, may contribute to systemic fragility. Fragility arises when "small shocks have disproportionately large effects."[213] If an investor is holding a AAA-rated credit instrument primarily because it is required or incentivized to hold such an instrument and that instrument is downgraded, the downgrade can motivate the investor to sell the instrument for reasons quite apart from the informational signal embedded in the downgrade. The potential for fragility goes up when the reclassification affects not only the debt of a single issuer, but a large swathe of outstanding financial instruments, such as the massive downgrades of subprime MBS in July 2007.[214] And it is even more severe, and more likely, when the instruments in question have been used to create money-like assets, as money claimants are particularly reliant on proxies and particularly quick to walk away in the face of any questions about the credit or liquidity risk posed by an instrument.[215]

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 process of transforming one type of financial

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monthly averages of between two and six basis points in the first 7 months of 2007."); Acharya & Schnabl, supra note 72, at fig. 2.

[209] Acharya & Schnabl, supra note 72.

[210] Id. at 64-65.

[211] Id. at 63 (see figure 8 and accompanying text).

[212] Id. at 40 (citing Viral Acharya & Philipp Schnabl, How Banks Played the Leverage "Game," in Restoring Financial Stability: How to Repair a Failed System, (Viral V. Acharya and Matthew Richardson eds., 2009).

[213] Franklin Allen & Douglas Gale, Financial Fragility, Liquidity, and Asset Prices, J. of the European Economic Association 1015 (2004).

[214] Permanent Subcomm. on Investigations, U.S. Senate Comm. On Homeland Sec. & Governmental Affairs, Wall Street and the Financial Crisis: Anatomy of a Financial Collapse 264 (2011), available at http://www.hsgac.senate.gov/download/report-psi-staff-report-wallstreet-and-the-financial-crisis-anatomy-of-afinancial-collapse; Gary Gorton, Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007, at 10 (May 9, 2009) (prepared for the Fed. Reserve Bank of Atlanta's 2009 Fin. Mkt. Conference); Gary Gorton & Andrew Metrick, Securitized Banking and the Run on Repo, 104 J. Fin. Econ. 425 (2012).

[215] Judge, Information Gaps, supra note 157.

instrument into another or manufacturing an instrument without extending credit to an actual borrower entails costs and usually gives rise to new risks. Many of these risks are ones that the parties can readily identify and, over time, learn to address in cost effective ways. 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. Securitization, like high-yield debt, is appropriately here to stay.

At the same time, as reflected in the carnage that followed the high-yield debt boom of the 1980s and the far greater recession that followed the boom in housing and mortgage-related securities in the mid-2000s, new financial innovations pose a range of challenges that are often inadequately addressed by the parties involved. Some of these failures can be attributed to the newness of the instrument and lack of information about how it will perform over the business cycle. They may also be disguised by the economic boom conditions in which these innovations often spread.

The more important challenge, and the one directly relevant to policymakers, is that the creation and spread of investor-driven financial innovations can increase systemic risk and give rise to other externalities. Investor-driven financial innovations increase the complexity and very often the interconnectedness and rigidity of the financial system—all changes that have been shown, at least in some environments, to increase systemic risk.

Whether and to what extent these risks justify greater regulation of financial innovation generally is a matter of ongoing debate.[216] This paper's insights contribute to, but by no means seek to resolve, that debate. The issue here is whether policymakers ought to consider these dynamics when taking actions that increase the amount of constrained capital in the system. In light of the relationship between excess constrained capital and investor-driven financial innovations and the costs that can arise from the spread of those innovations, the analysis here suggests that they should.

IV. Implications

This paper makes a relatively simple claim: Regulation leads to investor-driven financial innovation when an intervention causes the aggregate demand for a particular type of financial instrument to exceed the natural supply. Despite its simplicity, this claim provides a much-needed grounding for understanding when prudential and other legal interventions will spur financial innovation. The bulk of the analysis here has focused less on developing the claim than on providing the institutional context required to understand the magnitude of constrained capital in today's financial system and why the financial innovation that constrained capital often spurs should concern policymakers.

As reflected in Part II, this claim brings to the fore the importance of developing an appropriate baseline when seeking to assess the impact of a regulatory intervention. An intervention may appear to create massive demand for particular types of assets, but if it largely replicates the types of private constraints that would arise in the absence of regulation, its net effect may be modest. By contrast, government actions that do not explicitly require institutions to hold particular types of assets may nonetheless have powerful effects. For example, state actions that affect firm (or sovereign) incentives to self

[216] See, e.g., Saule Omarova, License To Deal: Mandatory Approval of Complex Financial Products, 90 Wash. U. L. Rev. 63 (2012); Eric A. Posner & E. Glen Weyl, An FDA for Financial Innovation: Applying the Insurable Interest Doctrine to 21st Century Financial Markets, 107 Nw. U. L. Rev. 1307 (2013).

insure against bad outcomes or the need for liquidity at an unspecified time in the future needs can significantly increase the demand for money substitutes and other safe assets. Part III shifted the focus to the mechanisms through which excess demand can prompt financial innovation. Information technology, modeling techniques, and other recent developments increasingly enable market participants to satiate excess demand and at ever-lower costs, increasing the probability that investor preferences will be satisfied through innovative financing techniques. Although there can be meaningful benefits that arise as market participants become increasingly creative in connecting pools of constrained capital with an increasing array of productive undertakings, there are also real costs. Of greatest importance in current environment are the ways that investor-driven financial innovations can contribute to fragility. With these considerations in mind, this Part explores some of the implications of this paper's central claim with respect to both policy and research gaps.

A. Research

1. A different starting point

There is a large and ever growing body of research on the sources of financial fragility and how best to promote financial stability. Much of the research that has been done on systemic stability focuses on identifying sources of fragility and weak points in the system, such as the reasons for bank runs and how banks failures contribute to recessions. This is valuable research and has produced powerful insights regarding mechanisms through which crises spread and hamper economic growth. Not surprisingly, however, research focused on identifying weak spots in a financial system tends to lead to policy recommendations aimed at shoring up those weaknesses. The heightened capital and liquidity requirements being imposed on banks are the byproduct of new understandings regarding bank fragility and the adverse spillovers that emanate from the failure of systemically important banking institutions. The recent efforts to impose liquidity requirements on mutual funds are similarly motivated by new insights regarding the fragility of these structures.[217] 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 than those that proliferated prior to the Crisis and contributed to the overall fragility of the financial system once the housing bubble burst.

More generally, this paper provides support for a different approach to studying financial stability. 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 whether and to what extent the magnitude of these ancillary risks. This paper shows how legal interventions can cause the design of the financial system to morph in ways that increase ancillary risks. These effects are not intentional. Although this can be

[217] U.S. Sec. Exch. Comm., Action Adopting Money Market Fund Reform Rules (2014), https://www.sec.gov/rules/final/2014/33-9616.pdf.

traced in part to a regulatory system that incentivizes regulators to focus on the health of the institutions they oversee rather than the health of the overall financial system, the origins of these policies can also be traced to research focused on identifying points of fragility. An alternative approach to studying financial stability might start with the recognition that extending credit and producing money-like assets 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 that could withstand 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.

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 providing insurance when the market does not or cannot? As reflected in the analysis regarding the types of legal interventions that produce constrained capital, access to external insurance, whether publicly or privately provided, and the costs of that insurance can be critical factors influencing demand for safe assets. Thus, in conjunction with identifying who should be first in line to bear particular risks, this line of research should also explore when and how risks should be reallocated. There is already some very valuable research in this vein, but the questions that remain dwarf the insights thus far provided.[218] This research is unlikely to yield simple answers. Issues of institutional competence, capacity, and other considerations may pull in different directions when trying to determine the optimal role for the state, financial firms and nonfinancial actors to each play in an interdependent financial system. At the same time, the analysis here highlights the importance of confronting these difficult tradeoffs head on and understanding what is at stake in making different decisions. One of the core lessons of this paper is that averting our gaze to and focusing only on minimizing the risks to which particular institutions are exposed cannot eliminate the risks inherent in credit creation and liquidity transformation, but it can increase other risks and thus the social costs of those activities.

2. Better data

A distinct vein of research that is critical to assessing the policy ramifications of the dynamics highlighted here is higher quality information about the nature and amount of constrained capital in the financial system and the sources of that constrained capital. Pozsar's work on institutional cash pools provides a nice example of the type of research that would be valuable and the paucity of data currently available even to motivated researchers and policymakers.[219] Given that legal interventions are likely to trigger the

[218] 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. Fin. 33 (2002); Paul Tucker, The Lender of Last Resort and Modern Central Banking: Principles and Reconstruction, BIS Papers No. 79 Rethinking the Lender of Last Resort 10, available at http://www.bis.org/publ/bppdf/bispap79.pdf.

[219] See supra Part II.A.1.

spread of investor-driven financial innovations only when the aggregate demand for a particular type of financial instrument approaches the aggregate natural supply, information about other sources of demand and the range of instruments that might satisfy this demand without innovative financing techniques is critical to allowing policymakers to assess the probable ramifications of current requirements or proposed changes. Moreover, given that both demand and supply can vary over the business cycle and in response to other developments, this research should not only seek to gather information as to a particular point in time, but should also entail historical analyses, ongoing monitoring, and possibly even forward-looking projections.

3. Who seeks substitutes and why

Other research issues raised but not resolved by the analysis here are the questions of who seeks substitutes, why, and when. In order to develop a workable framework for assessing the impact of regulation on investor-driven financial innovation, this paper has largely assumed that all demand is fungible. Working within this assumption allows a clear line to be drawn between investor-driven innovations, which arise only when demand for particular types of instrument exceed supply, and regulatory arbitrage. In this context, regulatory arbitrage entails efforts by regulated entities to minimize the cost of regulatory compliance by holding assets that comply with the letter of an applicable regulation while deviating in spirit, e.g., a bank seeking to lower its capital adequacy requirements by holding AAA-rated assets that offer higher return than other AAA-rated assets because they are actually risker and do not merit a true AAA rating.

In practice, the line between these two phenomena is less clearcut. As a starting point for further research, it might be useful to distinguish among types of constrained capital by looking at the source of the constraint. Some constraints are internally generated. For example, Firm A may be stockpiling cash equivalents because it has uncertain future capital investment opportunities and it wants to ensure it has the ability to pursue those opportunities when they arise. Other constraints are external to the entity. For example, Firm B may be acquiring cash equivalents because it faces a regulatory requirement to hold such assets.

The demand coming from Firms A and B differ in two ways that are relevant to the analysis here. On the one hand, Firm A has greater flexibility to accept innovative new instruments that are *true* substitutes for cash equivalents because it faces no rigid, external constraint. On the other hand, Firm B has more of an incentive to seek out substitutes that qualify as cash equivalents under the regulatory scheme even if they are not perfect substitutes. In both cases, the reward for accepting substitutes is likely to be greatest in environments where the yield on cash equivalents is artificially low because of excess demand.

These broad observations are consistent with the patterns observed in the period leading up to the Crisis. The data compiled by Bernanke and his co-authors, for example, suggests that the sovereigns that were seeking safe assets because they were internally motivated to self insure against capital flights by foreign investors and other adverse outcomes. These entities were the ones most willing to pay a premium for assets that were

not just highly rated, but genuinely quite safe, like Treasury instruments.[220] By contrast, Bernanke and his co-authors found that European banks facing regulatory requirements that rewarded banks for holding AAA-rated assets had the greatest propensity to acquire the AAA-rated MBS and CDOs that lost value during the Crisis.[221] Other studies similarly find that regulated entities are more inclined to hold more risky assets within a given credit rating. At the same time, banks were incentivized to hold AAA assets long before the pre-Crisis period.[222] It was only when excess demand caused yields on truly safe assets to drop that we saw a proliferation of ultimately low-quality AAA assets. This timing suggests that what was going on was not just regulatory arbitrage as commonly understood. As these findings reflect, there is already some very useful research in this vein, but more remains to be done.[223] Developing a more nuanced assessment of the institutional environments that produce constrained capital could enable more accurate forecasting regarding when constrained capital will lead to investor-driven financial innovations and the type of innovations most likely to flourish.

B. Regulatory reforms

1. Regulatory architecture

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 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.[224] This paper provides fresh support for the importance of taking a systemic perspective on financial regulation, but it also reveals just how far we are from achieving that vision.[225]

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[220] Bernanke et al., supra note 32, at 9 (noting that "the GSG countries['] …. net purchases of U.S. assets during the period consisted almost exclusively of Treasuries and Agencies").

[221] Id. at 9-12 and accompanying figures (explaining that "Europeans bought a much wider range of assets" than the GSG countries and providing more detailed information about those assets).

[222] E.g., Bo Becker & Victoria Ivashina, Reaching for Yield in the Bond Market, 70 J. Fin. 1863 (2015) (finding that insurance companies tended to hold bonds that provided higher rates of return and were more risky, based on CDS prices, than other similarly rated bonds).

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[224] 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), available at 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), available at 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").

[225] Cf., Bernanke, Implementing a Macroprudential Approach to Supervision and Regulation, supra note 224 (describing the ways the Dodd-Frank Act attempts to incorporate new insights about the importance of a macroprudential approach).

All of the policies identified here as contributing to constrained capital are designed to further important policy aims. Decisions to limit the provision of government-backed support, whether by reducing the Fed's ability to provide emergency lending or attaching conditions to IMF loans, are often also motivated by legitimate concerns about the moral hazard that state support can induce. Rules requiring banks, insurance companies and other financial institutions to maintain healthy levels of capital and liquidity are aimed at promoting the heath of institutions that serve socially useful functions and might assume excess risk relative to the socially optimal level in the abence of regulatory intervention. Yet the policymakers promulgating the regimes that produce constrained capital are not incentivized to consider the systemic consequences of their actions. They also regularly lack the information and competence required to design policies that take these dynamics into account.

This paper thus provides yet further evidence of the drawbacks inherent the disaggregated financial regulatory regime still in place in the United States. Today, the U.S. financial regulatory regime remains fractured, with myriad regulators, many of whom are competent at addressing the types of financial regulatory challenges they were formed to address, but not particularly competent outside that domain.[226] It correspondingly affirms the importance of some of the structural changes to that architecture that have emerged post-Crisis. The primary structural reform that mitigates both the competence and incentive concerns is the creation of the Financial Stability Oversight Council (FSOC). The FSOC includes the heads of all of the federal agencies active in financial regulation and an insurance expert and is specifically tasked with promoting systemic stability.[227] The structure aims to encourage regulators to be attuned to the systemic ramifications of the policies they promote in their agency-specific capacity and to provide a check on individual agencies should they fail to address systemic threats under their domain.[228] At the international level, the heightened role of the Financial Stability Board is meant to serve similar aims, and is important for similar reasons.[229]

A related post-Crisis insight for which this paper provides fresh support is the importance of mechanisms for identifying sources of fragility that are not within the domain of any single, existing financial regulator. Here too, there has been progress, as reflected in the creation of the Office of Financial Research (OFR). The OFR is charged with supporting the work of the FSOC and has broad authority to gather information from other regulators and market participants.[230] It is thus be well positioned to help assess some of the sources and effects of constrained capital. Each of these developments is helpful, but as reflected by the analysis thus far and the theoretical and information gaps identified below, these reforms remain incomplete.

1. Use of proxies in regulation

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[226] [E.g., Volcker Report]
[227] 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); Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 112, 124 Stat. 1394 (2010) (codified at 12 U.S.C.A. §§ 5322).
[228] 12 U.S.C.A. § 5322, supra note 227.
[229] Financial Stability Board, Our History, http://www.fsb.org/about/history/(last visited Aug. 4, 2016).
[230] Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 118, 124 Stat. 1408(2010) (codified at 12 U.S.C.A. § 5328).

What might seem like the most obvious policy implication of the analysis here—that regulators should reduce their reliance on proxies like credit ratings—may not prove all that productive. This analysis does support such changes, and there is certainly value in reducing reliance on ratings and encouraging private institutions to use multiple metrics when assessing the value and risks of a financial instrument. Efforts to diversify, rather than just reduce, the types of metrics used and the institutions authorized to produce those metrics could also prove beneficial.

Nonetheless, such efforts have been attempted in the past with mixed success.[231] The core challenge hindering these efforts is that despite the drawbacks of relying on proxies like credit ratings, the alternatives are often even more flawed. Particularly when regulatory competence and the cost of more nuanced oversight are factored in, history suggests that reliance on coarse metrics may be the best of a variety of imperfect means for monitoring and restraining risk taking.[232] Thus, while the analysis here supports these efforts and the ongoing experimentation in this vein prompted by Dodd-Frank's mandate to limit reliance on credit ratings, it is far from clear that the additional costs here identified necessarily justify further efforts to limit such reliance.

2. Allowing localized fragility

The most important lesson this paper holds for policymakers is the need to honor in practice what is already recognized in theory—(1) systemic stability requires a systemic perspective and (2) a healthy financial system capable of supporting robust growth is going to pose some systemic risk. Efforts to eliminate systemic risk or, as is more often the case today, NIMBY(not in my backyard)ism wherein regulators seek to promote the health of institutions they oversee without considering the systemic ramifications of those efforts, will inevitably lead to suboptimal policy outcomes. More research is needed, but this paper alone marks an important step forward in highlighting the type of analyses that regulators should undertake. The analysis here suggests that the current regulatory regime makes too great of an effort to eliminate fragility in each domain while paying too little head to the systemic ramifications of those efforts.

By recognizing the relationship between constrained capital and investor-driven financial innovation, and understanding the systemic risk that can emanate from the spread of those innovations, regulators will be better positioned to ensure that the benefits of a regulatory intervention exceed the associated costs. Given the current regulatory architecture, implementing this revised approach will require leadership by entities with a more macroprudential perspective. In concrete terms, this means that the FSOC will should encourage other federal regulators to take these dynamics into account and the OFR should take a lead role in coordinating the collection and production of the information regulators need to make more informed decisions.

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 finance literature and ignored by policymakers who rely on that literature. This paper

[231] See infra Part II.A.2.
[232] Id.

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 paper lays the groundwork for identifying the interventions most likely to have unintended, systemic consequences.