Finance and Economics Discussion Series

Federal Reserve Board, Washington, D.C.
ISSN 1936-2854 (Print)
ISSN 2767-3898 (Online)

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2025-054

Please cite this paper as:
Boyarchenko, Nina, Kinda Hachem, and Anya Kleymenova (2025). "The Theory of Financial Stability Meets Reality," Finance and Economics Discussion Series 2025-054. Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/FEDS.2025.054.

The Theory of Financial Stability Meets Reality*

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June 9, 2025

Abstract

A large literature at the intersection of economics and finance offers prescriptions for regulating banks to increase financial stability. This literature abstracts from the discretion that accounting standards give banks over financial reporting, creating a gap between the information assumed to be available to regulators in models of optimal regulation and the information available to regulators in reality. We bridge insights from the economics, finance, and accounting literatures to synthesize knowledge about the design and implementation of bank regulation and identify areas where more work is needed. We present a simple framework for organizing the relevant ideas, namely the externalities that motivate bank regulation, the rationales for allowing accounting discretion, and the use of discretion to circumvent regulation. Our takeaway from reviewing work in these areas is that academic studies of bank regulation and accounting discretion require a more unified approach to design optimal policy for the real world.

JEL Classifications: D62, E44, G21, G28, M41

*We thank David Romer and four anonymous referees for many insightful comments. We also thank William Bassett, Christopher Finger, João Santos, Cindy Vojtech, and especially Jim Naughton for helpful conversations. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Board, Federal Reserve Bank of New York, or Federal Reserve System.

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1. Introduction

Banking is a heavily regulated industry, yet it remains prone to large and costly disruptions. Over the past forty years, the U.S. has experienced two systemic banking crises: the savings and loan (S&L) crisis of the 1980s and the global financial crisis (GFC) that began in 2007. It has also experienced more localized disruptions such as the failure of Continental Illinois in May 1984 and the regional banking distress sparked by the collapse of Silicon Valley Bank (SVB) in March 2023, both resolved with interventions by the Federal Reserve before the problems had a chance to spread more widely into systemic concerns.

While these four episodes are not the only examples of financial turmoil in the U.S. since the end of World War II, they have in common an accumulation of risk exposures on both the asset and liability side of bank balance sheets that was not transparent to regulators at the time. In contrast, episodes such as the 1987 stock market crash, the 1994 bond market crisis, the 1997 failure of Long-Term Capital Management (LTCM), and even to some extent the market distress at the start of the COVID-19 pandemic were characterized by financial institutions' hedged positions not performing as ex ante expected—that is, by institutions taking hedged bets on financial market movements that ex post did not pay off.

Table 1 summarizes the accumulation of risks on the asset side of bank balance sheets as well as the heavy reliance on short-term, runnable, and often uninsured liabilities that preceded the failure of Continental Illinois, the S&L crisis, the GFC, and the March 2023 distress. These disruptions occurred despite the regulatory infrastructure that emerged from the Great Depression. In fact, the GFC occurred during the phase-in of the Basel II Accords for improved capital adequacy regulation, and the March 2023 distress occurred in the much more heavily regulated post-GFC environment.

Are regulators missing something? Is the academic literature missing something insofar as its ability to inform regulators? Does the banking industry need more regulation, less regulation, or just different regulation? An equally important but more focused question is whether existing regulations could be made more successful without changing the regulations

themselves. That is, has the effectiveness of regulation been hampered by outside factors, specifically factors outside the scope of most models of banking and bank regulation?

An active academic literature studies the theoretical underpinnings of bank decision-making, the externalities that those decisions impart on other banks and the macroeconomy more generally, and the policy interventions that may mitigate such externalities. While these theoretical models are necessarily simplified and stylized, they miss an important aspect of the environment faced by regulators in reality: the discretion that accounting standards afford banks and firms in financial reporting. Discretion is related to but distinct from a classic asymmetric information problem between banks and regulators. Consider a regulator who wants to set a risk-based capital requirement to correct an externality but is imperfectly informed about the relevant risks. The regulator could design a mechanism, for example, a stress test, to tease out this information from the bank and then set the appropriate capital requirement. In this way, other regulatory tools can support the design of corrective policy when the regulator is imperfectly informed. However, the key assumption in a classic information game is that the information structure is exogenously given. This is not the case when banks have discretion over what to report. Instead, not only are banking regulators differentially informed than the institutions they regulate and supervise, but those institutions can use the discretion allowed by the independent agencies that set accounting standards to endogenously affect the information available to their regulators.

Prominent examples of such discretion in the banking context include loan loss provisions for bank loans and credit loss measurement for securities, both of which affect regulatory capital, and the distinction between retail and wholesale deposits, which affects regulatory liquidity requirements. Accounting discretion may thus create "unknowable unknowns" from the perspective of regulators so that even regulators with the supervisory authority to collect additional information may struggle to overcome this informational disadvantage. Alternatively, regulators may use their authority to define regulatory reporting requirements that depart from accounting standards, but doing so without triggering unintended consequences

requires taking on board the rationales for discretion in the accounting literature that has informed the prevailing standards.

Designing optimal policy for the real world therefore requires a unified approach between the literatures on banking regulation and accounting discretion. Otherwise, well-intentioned interventions will be suboptimal with potentially large macroeconomic costs as financial stability remains inefficiently low in ways that were not foreseen. However, just as the theoretical banking literature largely ignores the difficulties that accounting discretion creates for banking regulation, the academic literature on accounting discretion has largely ignored the externalities that accounting standards impose on bank regulators.

This article pulls together insights from economics, finance, and accounting to provide a deeper understanding of the challenges in designing and implementing bank regulation as well as the opportunities for future research. Section 2 presents a unifying framework to help organize the relevant economic concepts, namely the presence of externalities that motivate regulation, the social value of accounting discretion independent of the regulatory problem, and the incentives of banks to use accounting discretion to circumvent regulation. It also draws some conclusions on the jointly optimal mix of discretion and regulation when the former introduces an implementation constraint on the latter, with the goal of stimulating further work on this question. We then proceed to synthesize the literature on each concept: Section 3 reviews the main externalities that theoretical models highlight as rationales for bank regulation as well as the empirical evidence in support of these rationales; Section 4 reviews how accounting discretion has complicated the design and implementation of regulation relative to these models; and Section 5 reviews why discretion is allowed in accounting rules. Section 6 summarizes the main takeaways for future research on optimal policy.

2. Conceptual Framework

Consider a simple bank balance sheet, with two types of assets and two types of funding. On the asset side are cash (C) and loans (L). Cash is liquid with zero return; loans are

illiquid but generate positive expected returns if held to maturity. On the funding side are deposits (D) and capital (K). Deposits are short-term debt contracts that promise fixed payments whenever withdrawn; capital is a loss-absorbing equity stake that profits if and only if the realized loan return is higher than expected. Since total assets ($C + L$) and total funding ($D + K$) must equal, the simple balance sheet boils down to three variables: the size of the bank ($A \equiv C + L$), the liquidity ratio ($\ell \equiv C/A$), and the capital ratio ($k \equiv K/A$).[1]

Banks create social value in two main ways. First, they make loans to informationally-opaque but productive firms that would otherwise struggle to produce (Bernanke, 1983). Second, they use the returns from those illiquid loans to create liquid deposit contracts for risk-averse investors (Diamond & Dybvig, 1983). There is a social value to the liquidity service such that the planner does not want the information service to be fully equity-funded. However, the business model of using loans to back deposits involves some risks, e.g., loan returns and depositor withdrawals are stochastic. Accordingly, the planner wants banks to have capital to absorb low loan returns. The planner also wants banks to hold cash to absorb high withdrawals without having to rely too heavily on frictional interbank markets or resort to deeply discounted loan sales.

There are tradeoffs when determining how much cash a bank should hold. To see this clearly, fix the funding side of the bank's balance sheet. Prescribing too little cash means an increased risk of not meeting depositor outflows which could lead to costly borrowing or even liquidation, while prescribing too much cash means the bank makes fewer loans and hence provides a lower information service. Similarly, there are tradeoffs when determining how much capital a bank should have. This can be seen clearly by fixing the asset side of the bank's balance sheet. Prescribing too little capital means insufficient loss-absorption and increased risk of insolvency, while prescribing too much capital means the bank offers fewer deposits and hence provides a lower liquidity service.[2]

[1] The capital ratio could be defined relative to only loans and/or the liquidity ratio relative to only deposits without changing the points that follow.

[2] The payoffs of the deposit contract can also change in both cases. When the asset side is fixed and capital

In practice, a bank will choose A, k, and ℓ. To streamline the exposition, we fix the asset side and consider a planner who faces a representative bank choosing only the capital ratio k. The planner introduces corrective regulation on k if (and only if) the bank's choice differs from what the planner would prescribe. The insights do not change if we fix the funding side and consider the choice of the liquidity ratio ℓ or if we expand the notation below and consider all variables chosen together.

2.1. Externalities and Optimal Bank Regulation

Let $S(k)$ denote the social value of bank capital, where $S''(\cdot) < 0$ and $S'(k^*) = 0$ for a unique $k^* > 0$. In words, there is a unique ratio k^* that maximizes social value (welfare). The assumed shape of $S(\cdot)$ captures the tradeoff between loss absorption and liquidity service discussed earlier: $S'(k) > 0$ if $k < k^*$ which means there is net positive value from having more loss-absorption at low capital, but $S'(k) < 0$ if $k > k^*$ which means there is net positive value from having more liquidity service at high capital.

The private value of bank capital is $V(k)$, where $V''(\cdot) < 0$ and $V'(k^p) = 0$ for a unique $k^p \in (0, k^*)$. That is, unconstrained, the bank will choose the ratio k^p because it maximizes its private value (profit). The private and social values differ due to externalities that we discuss in Section 3. In short, the bank undervalues the loss-absorbing properties of capital relative to a social planner (Admati et al., 2014).

The difference between $V(\cdot)$ and $S(\cdot)$ motivates the use of corrective regulation. In particular, the planner imposes a regulation of the form $k \geq \alpha$, where α is a regulatory parameter chosen by the planner. The bank's optimization problem is then

$$\max_k V(k) \;\; s.t. \; k \geq \alpha$$

increases, the same asset returns back a smaller number of deposits, so each depositor could be offered a higher payoff. This would be an improvement on the intensive margin for depositors, but it may not fully offset the deterioration on the extensive margin of fewer deposit contracts overall. When the funding side is fixed and cash increases, fewer return-generating assets back the same number of deposits, so each depositor could be offered a lower payoff, which is an additional cost of having banks hold too much cash.

The first-order condition for k is

$$V'(k) + \lambda = 0$$

where $\lambda \geq 0$ is the Lagrange multiplier on the regulatory constraint with complementary slackness condition

$$\lambda(k - \alpha) = 0,\ \lambda \geq 0,\ k \geq \alpha$$

For any $\alpha > k^p$, the solution to the bank's problem is $\widehat{k}^p = \alpha$ with $\widehat{\lambda}^p = -V'(\alpha) > 0$, where the Lagrange multiplier has the usual interpretation of the shadow price of the associated constraint. The higher is α, the more negative is $V'(\alpha)$ given the assumed shape of $V(\cdot)$ and hence the higher is $\widehat{\lambda}^p$.

The planner implements the first-best k^* as a regulated equilibrium by setting $\alpha = k^*$. The shadow price of the regulation is then $-V'(k^*)$. Note that this shadow price is equivalent to the Pigouvian tax that the planner could impose on insufficient levels of capital, i.e., instead of having to satisfy a regulatory constraint, the bank must pay $\tau(k^* - k)$ for any capital level $k < k^*$, where the Pigouvian tax rate is $\tau = -V'(k^*)$.

In this discussion, banking is like any other industry where firms that impart externalities (as captured by a difference in the private and social values of firm activity) are regulated by a government agency. Where industries differ is in the size of the externalities that their firms impart, which leads to some industries being more heavily regulated than others and therefore having higher shadow prices on their regulatory constraints.

2.2. Regulatory Evasion and Constrained Optimal Regulation

A growing literature reviewed in Section 4 suggests that circumvention of regulatory constraints is particularly pervasive in banking. The simplest explanation is that the regulatory constraints on banks are more binding because the externalities any one bank imparts—and hence the corrective regulations imposed—are larger than for a non-bank firm. Accordingly, banks have a higher marginal benefit of evasion, as captured by the shadow price λ, for a given marginal cost of engaging in evasive activities.

To formalize regulatory evasion, suppose the representative bank can take an action $\xi \geq 0$ at a private cost $c(\xi;\theta)$ to boost its reported capital ratio to $k+\xi$ and loosen the regulatory constraint to $k+\xi \geq \alpha$. The cost parameter θ will be discussed in Section 2.3. The cost function $c(\cdot)$ has the property $c(0;\theta)=0$ as well as $c_\xi(\xi;\theta)>0$ and $c_{\xi\xi}(\xi;\theta)>0$ for any $\xi>0$. We focus on variable costs so that $c(\cdot)$ is continuous at $\xi=0$. This is for algebraic convenience; none of the core insights change if there is also a fixed cost.

The bank's optimization problem is now

$$\max_{k,\xi}\left\{V(k)-c(\xi;\theta)\right\} \;\; s.t.\; k+\xi\geq\alpha,\;\xi\geq 0$$

The first order conditions for k and ξ are respectively

$$V'(k)+\lambda=0$$

$$-c_\xi(\xi;\theta)+\lambda+\mu=0$$

where $\lambda\geq 0$ and $\mu\geq 0$ are Lagrange multipliers with complementary slackness conditions

$$\lambda(k+\xi-\alpha)=0,\;\lambda\geq 0,\;k+\xi\geq\alpha$$

$$\mu\xi\geq 0,\;\mu\geq 0,\;\xi\geq 0$$

For any $\alpha>k^p$, the solution to this problem involves $\lambda>0$, i.e., a binding regulatory constraint.[3] Whether the bank engages in the evasive activity depends on the marginal cost and marginal benefit of doing so. Specifically, the bank chooses $\xi=0$ if and only if $c_\xi(0;\theta)\geq -V'(\alpha)$. Recall that $V'(k)<0$ for any $k>k^p$. Thus, starting from the regulatory

[3]The formal proof proceeds by contradiction. Suppose $\lambda=0$. Then the first order condition for k simplifies to $V'(k)=0$, which implies $k=k^p$. To satisfy the regulatory constraint, the bank must therefore choose $\xi\geq\alpha-k^p$. With $\alpha>k^p$, it follows that $\xi>0$ and hence $\mu=0$ by complementary slackness. The first order condition for ξ then simplifies to $c_\xi(\xi;\theta)=0$, which is inconsistent with $\xi>0$ by the property $c_\xi(\xi;\theta)>0$ for any $\xi>0$.

ratio $\alpha > k^p$, the bank's private value increases by $-V'(\alpha) > 0$ from engaging in evasion but it incurs a cost $c_\xi(0;\theta)$ to do so. If $c_\xi(0;\theta) < -V'(\alpha)$, then the marginal benefit exceeds the marginal cost and the bank chooses $\xi > 0$ solving

$$c_\xi(\xi;\theta) = -V'(\alpha - \xi) \tag{1}$$

Compared to Section 2.1, the bank's capital ratio is now $\widetilde{k}^p = \alpha - \xi < \alpha$ and the shadow price of its regulatory constraint is $\widetilde{\lambda}^p = -V'(\alpha - \xi) < -V'(\alpha) = \widehat{\lambda}^p$. Intuitively, the bank is taking an evasive action to reduce the burden of regulation, so for a given regulation α, both the true capital ratio of the bank and the shadow price of its regulatory constraint are lower than when there was no possibility of evasive action.

How does the planner set α understanding that regulation can trigger evasive action? The interesting case is $c_\xi(0;\theta) < -V'(k^*)$ as the planner cannot set the first-best regulation without triggering evasion. One option is to just set $\alpha > k^*$ so that the true capital ratio of the bank after evasive action is exactly k^*, i.e., set $\alpha = k^* + \xi$ where ξ solves Eq. (1). The viability of this option depends on the social cost of the evasive action ξ.

Suppose regulatory evasion wastes productive resources as captured by a social cost $C(\xi)$, where $C(0) = 0$ as well as $C'(\xi) > 0$ and $C''(\xi) > 0$ for any $\xi > 0$. The distinction between the social cost $C(\xi)$ and the private cost $c(\xi;\theta)$ can be understood with an example. Suppose a bank's evasive action involves moving some lending activities to an off-balance-sheet entity not subject to regulation and implicitly guaranteeing the entity so that it can be funded on similar terms as the bank itself. The bank has to pay someone (accountant, lawyer, analyst) a wage to structure this arrangement within the boundaries permitted by accounting rules. This wage represents the private cost $c(\xi;\theta)$ to the bank. A loosening of accounting rules, captured by a change in the parameter θ, can make it easier to structure the bank's entity and thus lower the wage rate for a given level of evasive activity ξ. The bank may then find it optimal to engage in more such activity, increasing the wage rate at the new θ. Wages,

however, are simply transfers of resources to other agents in the economy and net out in the calculation of social welfare. The social cost $C(\xi)$ instead captures the opportunity cost of diverting skilled labor away from more productive uses towards an evasive activity which has zero social value. Note that the social cost $C(\xi)$ is separate from whether or not the planner's desired ratio k^* is achieved as the latter is captured by the shape of $S(k)$. The examples discussed in Section 4 point to some additional sources of $C(\cdot)$.

Understanding the potential for evasive activity by banks, the planner chooses the regulation α to solve

$$\max_{\alpha} \left\{ S(\alpha - \xi) - C(\xi) \right\} \ \ s.t.\ c_{\xi}(\xi; \theta) = -V'(\alpha - \xi)$$

Notice that the bank's first order condition for evasive action in Eq. (1) is an implementation constraint on the planner's optimization problem. The planner's optimality condition for α is then

$$\underbrace{S'(\alpha - \xi)}_{\text{MB}} = \underbrace{\left(S'(\alpha - \xi) + C'(\xi)\right) \frac{d\xi}{d\alpha}}_{\text{MC}}$$

where the left-hand side is the marginal benefit of setting a stricter regulation (namely the increase in social value) and the right-hand side is the marginal cost triggered by the evasive activity (both the offset to the increased social value and the social cost of wasted resources). Differentiating Eq. (1) gives the response of ξ to α, i.e.,

$$\frac{d\xi}{d\alpha} = \frac{1}{1 + \frac{c_{\xi\xi}(\xi;\theta)}{-V''(\alpha - \xi)}} \in (0, 1)$$

so the evasive action by the bank increases less than one-for-one with the regulation.

Substituting the expression for $\frac{d\xi}{d\alpha}$ into the planner's optimality condition for α, the optimal regulation is characterized by

$$S'(\alpha - \xi) = \frac{-V''(\alpha - \xi)}{c_{\xi\xi}(\xi; \theta)} C'(\xi) \tag{2}$$

where ξ solves Eq. (1). The right-hand side of Eq. (2) is positive, in which case

$$S'(\alpha - \xi) > 0 = S'(k^*)$$

Given the shape of $S(\cdot)$, it follows that the optimal regulation now implements a capital ratio below k^*. Although it is possible that $\alpha > k^*$, the true capital ratio that is implemented, $\alpha - \xi$, is below what was optimal in the absence of an implementation constraint in Section 2.1. This is the second-best to the otherwise first-best regulation.

With $\frac{d\xi}{d\alpha} \in (0, 1)$, the planner increases the true capital ratio by increasing α. The planner does not want to go all the way to $\alpha - \xi = k^*$ because the cost $C(\xi)$ will be very high but is willing to tolerate some cost to achieve more than the unregulated capital ratio.

2.3. Accounting Discretion and the Implementation Constraint

The implementation constraint on the planner's problem would not exist if the cost of evasion could be made sufficiently high. This is where the parameter θ comes in. Accounting standards can make it easier or harder for a firm to make its balance sheet look more attractive to the regulator. Giving banks more leeway (discretion) makes it easier; giving them less makes it harder. This motivates $c_\theta(\xi; \theta) < 0$, where θ is the amount of discretion. More discretion also decreases the marginal cost of evasive action, motivating $c_{\xi\theta}(\xi; \theta) < 0$.

The obvious solution is for the planner to set θ so that $c_\xi(0; \theta) \geq -V'(k^*)$; as we saw in Section 2.2, that dissuades the bank from engaging in any evasive action and allows the first-best capital ratio to be achieved by setting $\alpha = k^*$. However, as we will review in Section 5, the accounting literature argues that there are independent rationales for allowing banks to have discretion which can motivate higher θ. Denote the social value of these rationales by $U(\theta)$, where $U''(\cdot) < 0$ and $U'(\theta^*) = 0$ for a unique $\theta^* > 0$. The existence of such rationales makes accounting discretion a unique source of regulatory imperfection.[4]

[4]The literature on discretion is rooted in models of imperfect information, so the regulatory imperfections introduced by accounting discretion are also rooted in information frictions. However, since the choice

A planner setting accounting standards in isolation would choose a level of discretion θ^*. Of course, this ignores the spillover to the regulatory problem illustrated in Section 2.2 if $c_\xi(0;\theta^*) < -V'(k^*)$. Understanding the spillover, the first case for the planner to consider is the optimal θ among all values where $c_\xi(0;\theta) < -V'(k^*)$. The second case is the optimal θ among all values where $c_\xi(0;\theta) \geq -V'(k^*)$.

In the first case, the planner chooses discretion θ to solve

$$\max_\theta \left\{ S(\alpha - \xi) - C(\xi) + U(\theta) \right\} \;\; s.t.\; c_\xi(\xi;\theta) = -V'(\alpha - \xi)$$

The planner's optimality condition for θ is then

$$\underbrace{U'(\theta)}_{\text{MB}} = \underbrace{\left(S'(\alpha - \xi) + C'(\xi)\right)\frac{d\xi}{d\theta}}_{\text{MC}}$$

where the left-hand side is the marginal benefit of allowing more discretion (namely the increase in social value) and the right-hand side is the marginal cost triggered by the evasive activity (both the decreased effectiveness of regulation and the resources wasted). Differentiating Eq. (1) gives the response of ξ to θ, i.e.,

$$\frac{d\xi}{d\theta} = \frac{-c_{\xi\theta}(\xi;\theta)}{c_{\xi\xi}(\xi;\theta) - V''(\alpha - \xi)} > 0$$

which is to say more discretion leads to more evasive action for a given level of regulation α.

The solution to the planner's joint problem of optimal regulation and optimal discretion under the implementation constraint is a pair $\{\alpha, \theta\}$ solving Eq. (2) and

$$U'(\theta) = \left(S'(\alpha - \xi) + C'(\xi)\right)\frac{-c_{\xi\theta}(\xi;\theta)}{c_{\xi\xi}(\xi;\theta) - V''(\alpha - \xi)} \tag{3}$$

of accounting standards changes the information frictions faced by the regulator for a given information structure, the social value of discretion introduces an endogeneity into the regulatory imperfection that would not exist in a model with a set information structure.

with ξ pinned down by Eq. (1). The right-hand side of Eq. (3) is positive, in which case

$$U'(\theta) > 0 = U'(\theta^*)$$

Thus, the planner chooses less discretion than would be socially optimal absent regulatory evasion.

Is the planner willing to choose less discretion to the point of $c_\xi(0;\theta) \geq -V'(k^*)$? In this second case, the planner could implement the first-best regulation. The answer depends on the value of $C'(0)$. To see this, suppose the planner chooses θ such that $c_\xi(0;\theta) = -V'(k^*)$. The implementation constraint is then satisfied at $\alpha = k^*$ and $\xi = 0$. Substituting these values into Eq. (3) and recalling $S'(k^*) = 0$, we see that $U'(\theta)$ now has the same sign as $C'(0)$ at the planner's choice of θ. If $C'(0) = 0$, then $U'(\theta) = 0$ and hence $\theta = \theta^*$. This is inconsistent with the assumption of $c_\xi(0;\theta^*) < -V'(k^*)$. Thus, the planner does not want to sacrifice more of the benefits of accounting discretion by setting θ low enough to implement the first-best regulation if the social cost of a bit of regulatory evasion is small.[5]

2.4. Taking Stock and Roadmap

The discussion in this illustrative model highlights the spillovers between bank regulation and accounting standards. Understanding that accounting discretion interferes with corrective regulation, the planner chooses less accounting discretion than the first-best, and understanding that corrective regulation triggers a social cost to accounting discretion (regulatory evasion), the planner chooses to implement a lower capital ratio than the first-best.[6] While we have exposited the results with capital regulation, the same conclusions would arise for liquidity regulation with $\widetilde{S}(\ell)$ and $\widetilde{V}(\ell)$ as the social and private values of liquid assets respectively.

[5]Recall that $C(0) = 0$ so $C'(0) = 0$ implies $C(\varepsilon) \approx 0$ for $\varepsilon > 0$ small.

[6]Recall that the regulation α may be higher or lower than k^*, but the true capital ratio in the regulated equilibrium of Section 2.2 is less than k^*.

There are two key assumptions behind the spillovers between bank regulation and accounting standards. First is $c_{\xi\theta}(\xi;\theta) < 0$, i.e., there is an interaction between discretion θ and the evasive action ξ in the private cost function $c(\cdot)$. If $c_{\xi\theta}(\xi;\theta) = 0$, then Eq. (3) reduces to $U'(\theta) = 0$, which returns θ^* as the optimal amount of discretion, i.e., accounting standards can be set without regard to bank regulation. For bank regulation to affect the choice of accounting standards, the standards must affect the marginal cost of engaging in regulatory evasion.

Second is $c_{\xi}(0;\theta^*) < -V'(k^*)$, i.e., the private marginal benefit of evading the first-best level of regulation k^* exceeds the private marginal cost of engaging in regulatory evasion at the first-best level of discretion θ^*. As noted above, the planner can implement $\xi = 0$ by setting bank regulation and accounting standards at their first-best levels if $c_{\xi}(0;\theta^*) \geq -V'(k^*)$. There is no tradeoff between bank regulation and accounting standards in this case, meaning they can be set independently. In contrast, if the first-best level of discretion is high enough that $c_{\xi}(0;\theta^*) < -V'(k^*)$, then there is a tradeoff and possibly some regulatory evasion ($\xi > 0$) in equilibrium.[7] Recall that the evasive activity is increasing in both the level of regulation and the level of discretion ($\frac{d\xi}{d\alpha} > 0$ and $\frac{d\xi}{d\theta} > 0$), so setting both to their first-best levels can lead to a very high social cost $C(\xi)$ from wasted resources. This cost is in addition to poor bank capitalization as captured by $S(k) << S(k^*)$, which could capture a higher probability of financial crisis.

In the rest of this article, we survey the literature as it maps into the main ingredients of the model above. Section 3 discusses the externalities that are argued to create a wedge between $V(\cdot)$ and $S(\cdot)$ and thus motivate the introduction of regulation as captured by α. Section 4 discusses how banks have used accounting discretion to lower the burden of regulation, capturing how θ enters into the cost function $c(\cdot)$ and affects the choice of ξ and providing evidence in favor of the assumptions $c_{\xi}(0;\theta^*) < -V'(k^*)$ and $c_{\xi\theta}(\xi;\theta) > 0$.

[7] With $C'(0) = 0$, there is indeed regulatory evasion in equilibrium. This follows from the fact that $\xi = 0$ cannot be part of a solution to Eqs. (1), (2), and (3) when both $C'(0) = 0$ and $c'_{\xi}(0;\theta^*) < -V'(k^*)$. The planner is willing to tolerate some evasive activity to get to a more desirable combination of α and θ.

Section 5 discusses the predominantly accounting literature that argues for the benefits of discretion, as captured by $U(\cdot)$. Section 6 concludes with suggestions for future research, focusing on how economics and accounting research can become better integrated; we return to the simple model presented here and outline some abstractions where detailed modeling would be particularly useful for both theoretical and quantitative work on bank regulation.

3. Externalities that Motivate Bank Regulation

There are many banking regulations. The one that has received the greatest attention, both in the academic literature and among practitioners, is capital requirements. Bankers are notoriously opposed to increases in capital requirements, suggesting that higher capital requirements decrease lending to productive firms. In a written statement to the Senate Committee on Banking, Housing, and Urban Affairs in December 2023, Jamie Dimon, Chairman and CEO of JPMorgan Chase, argued against proposed (Basel III endgame) rules which would require large banks to have an additional 2 percentage points of capital against risk-weighted assets, stating "[b]anks would be limited in their ability to deploy capital in the times [they]'re most needed" and the rules would "make services so uneconomical, you will likely see two outcomes: many banks will simply stop offering certain products and services, and those that do will have to charge more for them just to make it worth the service."[8] Admati et al. (2014), however, refute similar arguments on the basis that capital is not "held" nor is it increasingly expensive; in fact, they argue that the per-unit cost of equity declines as more equity is raised because each individual shareholder bears less risk.

One reading of Admati et al. (2014) consistent with their title of "fallacies and irrelevant facts" is that bankers' arguments against capital requirements are irrelevant to the policy debate precisely because bankers want $V'(k) = 0$ while society wants $S'(k) = 0$. The challenge then is figuring out what goes into $S(\cdot)$ that is not in $V(\cdot)$. The even bigger challenge is quantifying the distance between $S(\cdot)$ and $V(\cdot)$. In this light, a more charitable

[8] https://www.banking.senate.gov/imo/media/doc/dimon_testimony_12-6-23.pdf

interpretation of bankers' opposition to capital requirements is that $V(\cdot)$ is closer to $S(\cdot)$ than the Basel Committee thinks. In this section, we survey the academic literature on why $V(\cdot)$ differs from $S(\cdot)$, focusing on rationales where this difference is more pronounced for banks and bank-like institutions as compared to firms in other industries. These rationales are important for understanding why regulators believe $V(\cdot)$ and $S(\cdot)$ are so far apart and hence why banking is so heavily regulated.

Regulators frequently appeal to "systemic risk" when describing the need for corrective intervention in banking relative to other industries. Kaufman & Scott (2003) provide an interdisciplinary definition of systemic risk, namely that it refers to "the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components, and is evidenced by comovements (correlation) among most or all the parts." While there is no universally agreed upon definition of systemic risk in the financial stability context, the appeal of the above definition is that it flags correlation, which helps narrow down the channels through which systemic risk manifests.

We divide the discussion of what drives the correlation between banks into two parts: coordination failures which stem from the inherent fragility in banking and pecuniary externalities which stem from common asset holdings. Both coordination failures and pecuniary externalities have found support in the empirical literature. We then briefly discuss the role of limited liability in stopping this correlation from being internalized, sustaining the difference between $V(\cdot)$ and $S(\cdot)$. Finally, we discuss deposit insurance as a solution to inherent fragility and evidence that, due to pricing errors, it may also contribute to the difference between $V(\cdot)$ and $S(\cdot)$. While we often mention capital requirements, some of these rationales also motivate other regulations, which we survey at the end of the section.

3.1. Beliefs and Coordination Failures

Banking is fundamentally different from other industries because its business model is fragile by design. A system of inherently fragile components is ripe for systemic risk. The Nobel Prize-winning work of Diamond & Dybvig (1983) articulates why this fragility exists.

On one hand, the liquidity service achieved by transforming long-term assets into short-term claims ("maturity transformation") is valuable to risk-averse investors facing idiosyncratic liquidity shocks. On the other, this service has both a "good equilibrium" where depositors believe their bank will survive and hence their bank survives because no one runs and a "bad equilibrium" where depositors believe their bank will fail and hence their bank fails because everyone runs. This fundamental fragility in banking introduces an existential role for beliefs that does not exist in other industries. Demonstrating this role distinguishes Diamond & Dybvig (1983) from Bryant (1980) where a run is triggered by depositors who receive negative information about the bank's assets and there is no coordination failure.

In a model with multiple Diamond-Dybvig-type banks, the susceptibility of each bank to a run can foster two channels of contagion, distinguished by how directly one bank run causes another. The first channel operates through depositor confidence when banks are not directly interconnected. The second channel operates through direct counterparty links between banks. There is compelling evidence that these channels matter, as we discuss below. In both cases, a coordination failure increases the extent to which bank fortunes are correlated, beyond any fundamental correlation in balance sheet items.

The indirect confidence contagion channel is exposited by Chen (1999). In his model, a subset of depositors at each bank are uninformed, meaning they have no direct information about the bank but will respond to other sources of information. If banks have positively correlated returns, then the failures of other banks are one such source of information. Anticipating that uninformed depositors will act on this information and withdraw early, informed depositors run even if they would not have wanted to run based on their own information. The failures of some banks therefore trigger runs on other banks. This is a cascade of one failure—which need not be a run—to other banks through the susceptibility of banks to runs.

Using high-frequency interbank payments data, Cipriani et al. (2024) trace deposit flows in March 2023 to first identify bank runs separately from bank failures and second assess

the nature of the runs. They find that 22 banks experienced runs, which is much more than the few that failed. Fundamentals played a role; banks with more uninsured deposits and higher unrealized losses on held-to-maturity securities were more likely to experience a run. However, many banks with worse fundamentals did not experience runs, and deposit outflows from run banks were highly concentrated after the announcement of SVB's failure. This suggests a contagious element to bank runs that is distinct from fundamentals. In this particular episode, the runs did not translate into failures because the affected banks were able to borrow from other sources, including the Federal Home Loan Bank system and the Federal Reserve.[9]

Studying the Great Depression years, where the affected banks far outstripped the availability of funds to borrow, Saunders & Wilson (1996) also find evidence of contagion. The authors define a non-contagious run to be one where "informed depositors switch deposits (often locally) from banks they perceive as insolvent to those they perceive as solvent" whereas a contagious run is one where "uninformed depositors withdraw indiscriminately from both solvent and insolvent banks." Evidence of contagion is found from 1930 to 1932 but not for 1929 or 1933. Heitfield et al. (2017) also find that bank failures during the fall of 1930 were clustered in ways that cannot be fully explained by observable bank characteristics, suggesting a contagious element to the first banking panic of the Great Depression.

While there is substantial support for bank runs in the data, Correia et al. (2024) argue that runs are not the cause of most commercial bank failures in U.S. history. They do so by demonstrating the predictability of bank failures based on public information, including proxies for insolvency risk, funding vulnerabilities, and their interaction. Predictability is highest outside of the Great Depression. The paucity of purely panic-based failures among commercial banks after the introduction of deposit insurance may not be surprising; this is precisely what deposit insurance was supposed to accomplish. The paucity before is

[9]Comparing the Atlanta and St. Louis Fed discount window policies during the Great Depression, Richardson & Troost (2009) also find evidence for the role of a lender of last resort in reducing failure rates during panics.

more intriguing. However, other interventions may have eliminated many such failures. For example, the New York Clearinghouse deployed various preemptive tools during the panics of the National Banking Era, including loan certificates, information suppression, and suspensions of convertibility, which could have prevented the materialization of additional—and less predictable—failures (Sprague 1910, Gorton & Tallman 2018, Anderson et al. 2024). The positive role of clearinghouses in financial stability during panics is also demonstrated by Jaremski (2015) for other U.S. cities. Interestingly, he finds that clearinghouses had the opposite effect in normal times, concluding that they may have delayed bank failures until the potential for (confidence) contagion was removed.

The direct counterparty contagion channel is exposited by Allen & Gale (2000) with linkages through interbank deposits. Banks in Allen & Gale (2000) are subject to idiosyncratic liquidity shocks, creating scope for interbank insurance. Rather than investing only in cash and long-term assets, banks can also hold deposits at other banks. A bank that experiences a high liquidity shock can then withdraw its deposits from a bank that experiences a low liquidity shock. An incomplete claims structure, where each bank holds deposits with only a small subset of other banks, is shown to be susceptible to contagion. Consider specifically a ring structure where each bank deposits with only the bank to its right. If one bank were to experience an unexpected (aggregate) shock, it would seek to withdraw from the next bank, which would respond by withdrawing from the next one, and so on. Ultimately, the first bank is hit with withdrawals from another bank and fails to receive any net liquidity from the system to help cover the original shock. The first bank is thus forced into liquidation, which lowers the recovery value of its deposits. The bank that had deposited with it suffers a direct loss, triggering a run by its own depositors that forces it into liquidation as well, and so on. This is still a form of coordination failure because banks effectively run on each other when they all withdraw; for at least some aggregate shocks, allowing a net liquidity flow to the first bank would avoid triggering depositor runs and be collectively better.

Nier et al. (2007) expand on counterparty contagion by simulating the transmission of a

solvency shock through various network structures. They show that the ability of the banking system to absorb shocks is not monotone in the degree of interconnection. An increase in network connectivity from low levels decreases the network's resilience to shocks because there are more channels for shock transmission. An increase in network connectivity from sufficiently high levels, however, increases the network's resilience to shocks because shocks are absorbed by other banks' capital. They also show that the network is more resilient against contagious defaults when banks are better capitalized.[10]

Mitchener & Richardson (2019) provide empirical evidence of contagion through interbank deposit withdrawals during the Great Depression. They demonstrate that banks in the hinterland responded to large depositor withdrawals by draining balances at correspondent banks in reserve and central reserve cities, leading the correspondents to cut business lending. Carlson et al. (2011) also provide evidence from Florida in 1929, where a negative shock to citrus growing areas culminated in runs on banks in the financial center of Tampa. Anderson et al. (2019) parameterize the interbank deposit network in Pennsylvania and New York City during the 1860s to stress test the transmission of liquidity shocks after the National Banking Acts made the network more interconnected. They conclude that the new system was largely robust to bottom-to-top crises but susceptible to top-to-bottom crises for large shocks originating in New York City.

During the 2008 financial crisis, both channels of contagion discussed above—confidence and counterparty—were in effect. The first domino to fall was Lehman Brothers, which declared bankruptcy after its repo lenders "ran" by refusing to roll over their investments. The money market fund Reserve Primary, which had invested in Lehman commercial paper, then announced that it would likely break the buck after writing down this investment, triggering a run on Reserve Primary consistent with counterparty contagion. Runs on other money market funds soon followed, consistent with confidence contagion. While Reserve Primary was not a bank per se and money market fund regulation limits the average maturity

[10] See Glasserman & Young (2016) for a dedicated guide to the literature on contagion in financial networks.

of fund assets, money market funds share with banks the characteristic that they are maturity mismatched and thus vulnerable to coordination failure among investors. Schmidt et al. (2016) study the runs on money market funds during this episode, finding evidence consistent with the theoretical results of Chen (1999) that better-informed investors responded to the actions of less informed investors within the same fund.

3.2. Fire Sales and Other Pecuniary Externalities

A pecuniary externality occurs when one agent's choices affect another agent through market prices. Whether pecuniary externalities lead to inefficiency depends on whether markets are complete. With complete markets, every possible outcome is priced through a tradable financial instrument and price changes are purely redistributive across agents because marginal rates of substitution are equalized. Therefore, pecuniary externalities do not affect aggregate welfare when markets are complete. The same is not true with incomplete markets. As illustrated by Dávila & Korinek (2018), the source of the inefficiency is either classic market incompleteness where agents face an exogenously limited set of instruments that prevent price changes from being purely redistributive (e.g., Geanakoplos & Polemarchakis, 1986; Allen & Gale, 2005; Lorenzoni, 2008; Hachem, 2021) or the presence of a market price in a binding constraint on real activity when agents are price-takers (e.g., Greenwald & Stiglitz, 1986; Bernanke & Gertler, 1989; Jeanne & Korinek, 2019). The class of models with price-dependent constraints implicitly features market incompleteness as the constraint is associated with a shadow price for which there is no market.

Discussions of financial stability hone in on fire sales as the most damaging type of pecuniary externality. In its simplest form, a fire sale is the sale of an asset by an owner in distress at a time when many other natural buyers for the asset are also in distress. One consequence of a fire sale is that the asset is transferred from an agent with a high-productivity use to an agent with a lower-productivity use (Shleifer & Vishny, 1992; Kiyotaki & Moore, 1997). This results in a steeper price change and can lead to quantitatively larger effects than a pecuniary externality that does not involve a fire sale.

Coordination failure is not necessary to generate a fire sale, nor is it necessary to make fire sales a source of systemic risk. In Kiyotaki & Moore (1997), for example, the bank-like agents are highly leveraged but do not engage in maturity transformation. Instead, they borrow each period against the market value of their assets, with this borrowing constraint imposed by creditors to ensure repayment in the absence of commitment. Fire sales occur when the borrowing constraints tighten and force banks to deleverage, not because creditors are concerned with what other creditors may or may not do. Contagion then arises because borrowing constraints depend on a common asset price. Specifically, a fire sale by one bank lowers the price of the asset, tightening the constraint on other banks and forcing additional deleveraging. For this reason, we categorize fire sale contagion separately from the fundamental fragility described earlier that generates confidence and counterparty contagion. However, allowing for fire sales in a model where banks do engage in maturity transformation and are hence susceptible to runs can produce more correlation than fire sales alone.

Duarte & Eisenbach (2021) document substantial interconnectedness through correlated asset holdings, exposing financial institutions to mark-to-market losses through fire sales. Indeed, the fire-sale-specific factors of the aggregate vulnerability index they construct—leverage adjustment speed and the cross-sectional distribution of illiquid assets across banks—increased rapidly from 2004 to 2008 and subsided following the GFC. Leverage adjustment speed is affected by depositor runs. It can also be affected by banks' own uncertainty. To this point, Caballero & Simsek (2013) connect fire sales and interbank networks in a model where banks have incomplete information about the full network of exposures (e.g., the counterparties of their counterparties). They show theoretically that fire sales trigger a precautionary response by potential asset buyers in the network, exacerbating the price declines. In this way, banks' uncertainty about cross exposures can contribute to higher adjustment speed.

Overly optimistic or pessimistic beliefs can also contribute to the speed and severity of fire sales. Dávila & Walther (2023) demonstrate the optimality of leverage regulation on banks when creditors are more optimistic than the planner about the returns to investment,

both in a model with reduced-form externalities and in one with a microfounded pecuniary externality. Relatedly, Krishnamurthy & Li (2024) show the quantitative importance of beliefs about liquidity risk in matching crisis patterns, with non-rational diagnostic beliefs generating pre-GFC froth in asset valuations closer to observed levels. Likewise, Paul (2020) shows how banking crises can stem from mismatches in patience between borrowers, lenders, and the banks that intermediate between them.

3.3. The Relevance of Limited Liability

Why do banks not take the cascades described so far into account when making decisions? While it is common for an individual agent to fail to internalize the externalities imposed on others, the externalities that an individual bank imparts increase correlation in the financial system. With correlation, what happens to the system could come back around to the bank if there were no floor on its exposure to losses, giving the bank at least some incentive to think about how its choices affect the system. The problem is then limited liability. With limited liability, a firm gets the upside of the risks it takes but not the downside, so all else constant, limited liability increases the incentive to take risk. The link between limited liability and risk-taking exists for all firms (e.g., Jensen & Meckling, 1976), but as discussed above, the banking system is more susceptible to systemic risk, making limited liability among banks of particular concern.

Because of limited liability, an individual bank (or bank-like institution such as a money market fund or repo-funded primary dealer) does not take into account the effect of its solvency on the stability of the financial system through the above channels. That is, the bank does not take into account that its actions to remain afloat (e.g., fire sales) affect the solvency of other banks through market prices, nor does it take into account that its failure if these actions are unsuccessful affects the liquidity and possibly solvency of other banks through confidence and counterparty contagion. Accordingly, the bank takes too much risk and/or does not have sufficient capital to buffer against those risks. One manifestation of excess risk-taking is excess correlation in the risks taken by banks (e.g., Acharya, 2009;

Elliott et al., 2021). That is, not only do banks not internalize that their failure will affect other banks, but they may also strategically become more correlated, which can reinforce the presence of systemic risk in the financial system.

3.4. Moral Hazard from Pricing of the Government Safety Net

The fundamental fragility of banks motivated federal deposit insurance and other government safety nets for the banking industry after the Great Depression. Deposit insurance can eliminate the bad equilibrium in Diamond & Dybvig (1983) by eliminating the sensitivity of a depositor's payoff to the beliefs (and hence actions) of other depositors. In the U.S., the Federal Deposit Insurance Corporation (FDIC) has a line of credit with the U.S. Treasury, which distinguishes it from a private insurance arrangement. While the FDIC has several tools to replenish its insurance fund from the banking industry through regular and special assessments before drawing on this line, the backing of FDIC insurance by the full faith and credit of the U.S. government makes deposit insurance a part of the government safety net.

Deposit insurance in effect gives a bank the right to sell its assets to the insurer at a value equal to its deposits. Accordingly, deposit insurance is a put option, and option pricing models can be used to estimate an actuarially fair insurance premium (Merton, 1977; Flannery, 1991). A standard result is that banks with more leverage (higher debt-to-equity ratios) should be charged higher premiums. Banks with more risk (higher volatility in asset values) should also be charged higher premiums. However, even if all of a bank's positions are documented on its balance sheet, estimating asset volatility is challenging, opening the door to insurance pricing errors which have consequences for the real economy. Too high an estimate of asset volatility leads to too high a premium which can unnecessarily reduce deposit-taking (and the associated liquidity service) and/or choke lending activity, while too low an estimate leads to too low a premium which encourages moral hazard and specifically excessive risk-taking among under-capitalized banks with little to lose if their risks fail. Furthermore, asset volatility changes over time, rising in the run-up to financial crises and thus leading to the possibility of deposit insurance being particularly mispriced

around crisis episodes.

Many empirical studies link deposit insurance to moral hazard. Demirgüç-Kunt & Detragiache (2002) provide the first comprehensive empirical study based on 61 countries from 1980 to 1997. They find that explicit deposit insurance increases the likelihood of banking crises. Their sample includes both government-run insurance schemes as well as private insurance arrangements, and they show that the effects are stronger for government-run schemes. In terms of mechanism, they argue that banks are encouraged to take higher-risk, higher-return projects because their ability to attract deposits is no longer tied to the riskiness of their assets. Demirgüç-Kunt & Huizinga (2004) find support in subsequent work, establishing that deposit insurance leads to lower deposit rates and less market discipline. These results apply in good times. Anginer et al. (2014) look across the cycle and find that deposit insurance has a stabilizing effect in bad times. Thus, deposit insurance appears to increase the probability of banks needing the stabilizing effect that it provides.

Implicit in these empirical studies is the idea that deposit insurance premiums are not accurately pricing the stabilizing effect, leading to a distortion in the decisions made by banks. That is, part of the reason $V(\cdot)$ differs from $S(\cdot)$ stems from pricing errors in deposit insurance. There has been less formal modeling of deposit insurance premiums as option prices leading to moral hazard and the accumulation of systemic risks. Notable exceptions are Pennacchi (2006) and Lee et al. (2015), who show that actuarially fair insurance premiums based on only individual bank risks are under-priced and lead to socially excessive risk-taking, e.g., the granting of loans that are excessively pro-cyclical for a given unconditional probability of default. Lucas (2019) likewise develops a theoretical model of the overall costs and benefits of government bailouts and applies the framework to measure the direct costs of the bailouts during the GFC, arguing that more direct measures based on realized losses to such bailout programs significantly understate the true costs.

In Diamond & Dybvig (1983), deposit insurance eliminates bank runs and improves welfare. A key assumption of their model is that banks do not choose among different

projects, ruling out the possibility of the moral hazard considered here. Cooper & Ross (2002) extend the model to include moral hazard and depositor monitoring and show that complete deposit insurance without capital requirements cannot achieve the first-best outcome. Their extended model abstracts from risk-based pricing so can be interpreted as an extreme case of the benefit of capital requirements in the presence of pricing errors.

Moral hazard can also arise more generally because of a time inconsistency problem in the government's provision of ex post bailouts. The social costs of being in the bad equilibrium at a system-wide level (where the line of credit with the government would have to be used) or in the shadow banking sector (which deposit insurance does not cover) may be so severe that the government, despite ex ante statements to the contrary, may intervene ex post and provide additional resources to rescue the financial system and stabilize the economy. The anticipation of such intervention also distorts bank behavior and necessitates corrective regulation (e.g., Farhi & Tirole, 2012; Keister, 2016; Stavrakeva, 2020).

3.5. Other Regulations

The discussion above has highlighted three channels of contagion in banking: depositor confidence, counterparty exposure, and fire sales. In all three channels, problems at one bank trigger problems at others, and as far as the real economy is concerned, what could have been an isolated loan supply shock becomes an aggregate loan supply shock.[11] The discussion has also highlighted how banks' private incentives to take into account these channels when making portfolio decisions are distorted by limited liability and by the difficulty of accurately pricing implicit and explicit government safety nets.

It is important to remember that safety nets exist largely because of the first contagion channel (depositor confidence and the inherently fragile business model of banks). To this point, limited liability, counterparty risk, and even fire sales exist outside of banking and yet

[11] In other words, these channels have in common that one loan supply shock leads to other loan supply shocks, in contrast to other potential channels of contagion, for example, macroeconomic contagion, where a loan supply shock hurts economic activity which in turn hurts other banks through lower loan demand.

only banking has an explicit government-run insurance system. Thus, the lynchpin of why banking is so heavily regulated comes from its business model. Put differently, there are several reasons why $V(\cdot)$ and $S(\cdot)$ differ, but the interaction between them and depositor confidence is what amplifies the distance.

Returning to the model in Section 2, the goal of regulation is not to drive the probability of runs down to zero. It is to implement a degree of maturity transformation that equates the social marginal benefit of banking to its social marginal cost, where the latter accounts for systemic rather than just individual risk. At the risk of oversimplifying, this means the planner wants less maturity transformation than banks will find privately optimal.

One way to implement this is capital requirements. Fixing the asset side, more funding must come from loss-absorbing equity, reducing the fraction of runnable liabilities that a bank has. In the extreme case (fully equity funded), there is nothing to run on. Another way is liquidity requirements. Fixing the funding side, a pure reserve requirement would mandate that more assets be held as cash, increasing the fraction of withdrawals that can be met without liquidating assets or borrowing from other sources. In the extreme case (fully cash invested), there is no incentive to run.[12]

The extreme cases are of course not optimal, so the question is how interior should the solutions be. Among quantitative models, estimates of optimal capital requirements range from 6% (Elenev et al., 2021) to 12% (Begenau, 2020) of risky assets due largely to differences in the modeling of bank equity risk premia. A higher range of estimates, from 9% to 22%, is obtained among papers that add firm deposits (Pancost & Robatto, 2023), firm defaults (Mendicino et al., 2024), or leakage to the shadow sector (Dempsey, 2024; Begenau & Landvoigt, 2022).[13] In 2024, large bank holding companies in the U.S. had total risk-based capital requirements in the range of 7% to 18.4%, with an average asset-weighted capital

[12] A more general liquidity requirement would mandate that more assets be held as cash and liquid securities (i.e., securities that can typically be sold with no impact on their price, such as U.S. Treasuries), although ex ante liquidity is by no means a guarantee of ex post liquidity.

[13] Other studies argue that a static capital requirement is suboptimal, finding welfare improvements from countercyclical requirements (e.g., Davydiuk, 2019; Malherbe, 2020; Gertler et al., 2020).

requirement of 10.25% across these firms. At face value then, there is no clear consensus on whether current capital requirements are too low or too high, although the 10.25% figure is below the optimal requirement in three of the five quantitative models noted above that are specifically calibrated to the U.S.

In contrast, work on optimal liquidity requirements remains largely theoretical; see Farhi et al. (2009), Perotti & Suarez (2011), Calomiris et al. (2015), and Cheng & Robatto (2024) for studies of optimal liquidity regulation and Walther (2016), Adrian & Boyarchenko (2018), Van den Heuvel (2022), and Kashyap et al. (2024) for studies of the joint effect of capital and liquidity regulation on welfare. One exception is Pandolfo (2021) whose quantitative model finds that the optimal policy sets capital requirements slightly higher than the Dodd-Frank Act but liquidity requirements slightly lower. Kashyap et al. (2024) articulate the most general argument for the complementarity of capital and liquidity regulation, namely that more than one intervention is required when more than one margin is distorted, even if the same externality drives all the distortions. In their model, either capital or liquidity regulation would suffice if the planner's objective is to minimize run risk, but to maximize welfare when agents' utilities are affected by both the asset and liability mix of the bank, both capital and liquidity regulation are necessary. Indeed, if utilities are also affected by the level of lending or more generally the size of the bank, then a third instrument is needed to achieve the constrained efficient outcome.

Another rationale for imposing multiple regulations is the difficulty associated with measuring risk. For example, in Cifuentes et al. (2005), capital requirements introduce a price-dependent constraint into bank optimization problems when assets are marked-to-market. This can generate fire-sale externalities among banks that hold correlated assets. If the dynamics of the fire sale are too difficult to anticipate, then the regulator cannot design a time-varying capital requirement that eliminates the problem. A liquidity requirement may instead deliver a more effective buffer against contagion during these times. Even within the category of capital requirements, Wu & Zhao (2016) argue for multiple approaches. They

illustrate that the optimal policy involves mandating minimum levels of capital against both risk-weighted assets and total unweighted assets—that is, mandating both risk-based capital requirements and a simple leverage limit—to protect against misreporting of risk profiles. Other regulations also exist to more directly help regulators with measurement under imperfect information. A regulator can elicit private information from banks about the riskiness of their assets by subjecting them to appropriately designed stress tests (e.g., Orlov et al., 2023; Parlatore & Philippon, 2024). This information can then be used to set capital requirements, as many countries have done since the GFC. In a stress test, the regulator presents each covered bank with hypothetical shocks and gets back a report on how the bank's balance sheet would respond. A stress test is therefore only as good as its reporting guidelines, suggesting that accounting discretion will matter not only for the effectiveness of capital regulation as in Section 2 but also for the effectiveness of tools designed to inform the regulation in the presence of asymmetric information.

The use of stress tests to inform risk-based capital requirements can be interpreted as an intensive margin exercise; for any activity that banks engage in, the regulator seeks to learn about the risks involved and mandate sufficient capital against them. The prohibition of certain activities—for example, prohibition of proprietary trading by the Volcker Rule—can instead be considered an extensive margin exercise, limiting the risks that banks can take and thus the risks that need to be measured (e.g., Falato et al., 2019).[14] The mix of intensive and extensive margin tools can also be influenced by accounting discretion; all else constant, expanding activity limits becomes more attractive as stress testing becomes less reliable.

4. Regulatory Arbitrage in Practice

The discussion so far has focused on how bank regulation works in theoretical models and the types of externalities that it tries to address. We now turn to the practical

[14] A less explicit example is the historical imposition of deposit rate ceilings to limit competition for funding, which some argued would also limit the incentives of banks to invest in risky assets (e.g., Silverberg, 1973).

implementation of regulation, with a focus on how accounting discretion complicates the design and implementation of bank regulation despite providing otherwise desirable flexibility. In this section, we concentrate on one of the negative consequences of accounting discretion—regulatory evasion, or more broadly, regulatory arbitrage—and review examples of this behavior from studies of each of the episodes listed in Table 1.

As conventionally used, "arbitrage" involves a trader profiting from price differences for the same asset in different markets. Regulatory arbitrage has a similar flavor: the bank capitalizes on gaps across the regulatory landscape to reduce the shadow price of regulation with little corresponding reduction in overall economic risks (Jones, 2000), potentially lowering its true level of capital below the regulatory minimum. Such arbitrage is possible in part because of the reporting discretion allowed by accounting rules which, together with regulation, govern how bank risk is evaluated. Since banks engage in regulatory arbitrage to avoid a regulatory tax that shifts their decisions from privately optimal to socially optimal ones, only banks constrained by a regulation should be expected to engage in its arbitrage (Boyson et al., 2016). In the context of the model in Section 2, engaging in regulatory arbitrage corresponds to a bank taking the action $\xi > 0$ to maximize the private value of capital subject to regulatory constraints.

Regulatory arbitrage can take many forms, through changing the amount and shifting the composition of the assets, liabilities, or capital recognized in regulatory filings. The literature on the evolution of the financial sector after the GFC has highlighted that improvements in fintech and tighter post-crisis bank regulation have allowed a number of activities—such as mortgage lending—to migrate to shadow banks (e.g., Buchak et al., 2018; Fuster et al., 2019; Buchak et al., 2024). To the extent that regulated banks provide financing for shadow banks to pursue these activities (see e.g., Buchak et al., 2024; Acharya et al., 2024), such shifts can also be interpreted as regulatory arbitrage. However, we focus here on forms of regulatory arbitrage that keep control over the risky activities within the regulated banking sector. For example, shifting loan origination from more regulated to less regulated subsidiaries within

the same bank holding company to conserve capital (e.g., Demyanyk & Loutskina, 2016) keeps the control rights within the regulated bank holding company, while the migration of loan origination to stand-alone fintech originators (e.g., Fuster et al., 2019) does not. Similarly, special purpose vehicles, which were widely used in the run-up to the GFC and are discussed in more detail below, appear to move activity outside of the regulated banking sector but in practice were sponsored by regulated banks that provided a backstop and assumed their liabilities during the GFC.

Put differently, it is useful to keep in mind the distinction between activities and institutions when discussing regulatory arbitrage. Just as institutions can be more or less regulated, activities may be more or less risky and more or less opaque to the regulator. Shifts from less to more opaque activities within the same institution are more closely associated with the use of accounting discretion to reduce the shadow price of regulation. If such shifts happen within regulated institutions with access to government insurance, such as FDIC deposit insurance, shifts to more opaque, risky activities also impose more direct costs on the government safety net. Shifts of risky activities to less regulated institutions, instead, do not directly increase claims on government insurance but may still decrease financial stability and lead to greater use of the Federal Reserve's 13(3) liquidity facilities.[15]

4.1. Regulatory arbitrage through asset valuation

The concept of regulatory arbitrage is not unique to the current regulatory environment. Caprio & Klingebiel (1996) argue that banks with reported capital levels well above regulatory minima regularly fail, so that with bank capital "what you see is not what you get." A key source of ambiguity is accounting discretion in the valuation of the assets held by banks. In the traditional model of banking, loans are the biggest part of bank assets. Loans pose

[15]Section 13(3) of the Federal Reserve Act (added through the Emergency Relief and Construction Act of 1932) allows the Federal Reserve "in unusual and exigent" circumstances to lend to individuals, partnerships, and corporations, provided that the participants in such programs are "unable to secure adequate credit accommodations from other banking institutions." Liquidity facilities created under this authority have been colloquially called 13(3) liquidity facilities.

unique difficulties from the perspective of fair value accounting. Formally, fair value is the price that a buyer is willing to pay for an asset in an arms-length transaction. Because of the inherent information asymmetry between the bank originating a loan and all other lenders, most loans originated cannot be sold in secondary markets. Accordingly, the valuation of loans is by definition subject to a large degree of discretion on the part of the originating bank. Generally, the majority of loans are reported at amortized historical cost net of allowance for incurred loan losses. Because banks have some discretion in when to recognize realized losses as well as expected but not incurred losses, loan loss provision has historically been seen as a fungible part of bank assets and, thus, of bank capital. Indeed, part of the narrative of the evolution of the banking sector during the GFC is an under-recognition of losses at U.S. banks (e.g., Huizinga & Laeven, 2012; Goh et al., 2015; Kolev, 2019; Plantin et al., 2008; Bischof et al., 2021; Beatty & Liao, 2011; Acharya & Ryan, 2016).[16]

Banks that hold securities on their balance sheets can also choose how to recognize those securities: as held-to-maturity (HTM) or as available-for-sale (AFS). Until recently, HTM securities were valued at historical amortized cost net of other-than-temporary impairment, similar to loans.[17] AFS securities are instead recognized at their fair value. Huizinga & Laeven (2012) show that the share of nonguaranteed mortgage-backed securities (MBS) reported as HTM increased substantially in 2008, with banks with high exposures to real estate loans or large mark-to-market losses on their MBS portfolios reporting larger HTM positions. Corona et al. (2019) discuss a bank's reporting choice between fair value and historical cost accounting when the reported accounting information is used to determine capital requirements. Their model suggests that the fraction of banks electing fair value

[16] Calomiris & Nissim (2014) challenge this view and argue that declines in the value of intangibles as well as unrecognized contingent obligations explain the decreases in market-to-book values of banks during this period that have been attributed to under-recognition of losses.

[17] In 2020, the U.S. implemented a new accounting standard for provisioning for expected credit losses for financial assets (CECL). The new standard requires that a firm using amortized historical cost for its financial assets provisions for expected future losses over the asset's lifetime, in which case other-than-temporary impairment is no longer used. CECL introduces an alternative source of discretion in loss provisioning, with regulated institutions having flexibility in how to forecast future losses. We survey the rationale for CECL in Section 5.

accounting decreases as banks become less profitable. Exploiting cross-country variation in the pass-through of AFS losses into regulatory capital calculations, Bischof et al. (2021) also find that higher AFS losses lead to less corrective action by banks (e.g., dividend cuts or leverage cuts) when fair value losses are filtered out of regulatory capital.

Post-GFC regulation in the U.S. has removed such filters, making AFS securities essentially marked-to-market for the largest U.S. banking organizations. Fuster & Vickery (2018) show that this makes securities with higher interest rate risks more likely to be classified as HTM, a type of regulatory arbitrage that ultimately was a significant contributor to the regional banking crisis in the U.S. in March 2023 (e.g., Jiang et al., 2024). More generally, the classification of securities as HTM or AFS is driven by financial accounting and regulatory treatments (Granja, 2023; Kim et al., 2024) and overall declining balance sheet health, such as lower capital ratios, higher shares of run-prone uninsured depositors, and greater exposure to interest rate risks (Granja, 2023; Granja et al., 2024).

Overall, these papers show that banks chose to classify more securities as HTM in response to regulatory changes that mandated the recognition of unrealized gains and losses in the value of AFS securities. While these changes were meant to reduce unrecognized losses in investment portfolios, they instead led banks to shift the unrecognized losses to a different part of the securities portfolio by exploiting discretion in the classification of securities as HTM or AFS. This highlights one of the difficulties in adequately measuring capital or other regulatory ratios: accounting rules and regulations are necessarily retrospective, putting capital measurement at a disadvantage relative to the evolving banking landscape. The difficulty is well noted in Haldane & Madouros (2012), who write "[t]o ask today's regulators to save us from tomorrow's crisis using yesterday's toolbox is to ask a border collie to catch a Frisbee by first applying Newton's Law of Gravity."

4.2. Regulatory arbitrage through asset composition

While discretion in loan loss recognition and the classification of securities creates leeway for banks to adopt more favorable value measurement of assets, other forms of regulatory

arbitrage can also create incentives to change the composition of assets. When banks are subject to capital requirements that do not vary with risk—that is, when the regulatory calculation of the value of assets does not adjust for the risk of the assets held—banks may shift into riskier assets (e.g., Choi et al., 2020; Duchin & Sosyura, 2014). One of the causes of the failure of Continental Illinois in 1984 was such risk-shifting (Wall & Peterson, 1990). Continental Illinois rapidly expanded in the late 1970s by competing for loans to oil and gas companies, culminating in the 1981 purchase of a substantial number of loans from Penn Square Bank, inheriting the consequences of the lax underwriting standards at Penn Square.[18] The risky, concentrated composition of Continental Illinois' assets was also coupled with a reliance on foreign wholesale deposits, so that by the first quarter of 1984 only around 15% of the bank's deposits were FDIC-insured (Wall & Peterson, 1990), creating the perfect setting for a bank run.

The initial run on Continental Illinois was halted only after the announcement of government support on May 17, 1984. This support included FDIC commitment to guaranteeing all of the bank's creditors, an FDIC loan of $2 billion, and a commitment by the Federal Reserve to "meet any extraordinary liquidity requirements" of Continental. As such, Continental Illinois was the first modern bank deemed "too big to fail" due to its role as a correspondent bank in the Midwest and the exposure of at least 180 other banks to its failure.

The pursuit of risky lending simultaneous with unstable funding structures also helps explain the S&L crisis of the late 1980s. The Garn-St. Germain Depository Institutions Act of 1982 allowed S&L institutions (sometimes called thrifts) to depart from their traditional model of providing funding for residential mortgages and granted federally-chartered thrifts the ability to make nonresidential and variable rate mortgages without risk-adjusting the premiums paid for deposit insurance. Furthermore, thrift regulators exercised substantial forbearance, allowing insolvent thrifts to stay open. Coupled with an increase of the deposit

[18] See e.g., Rose (2023). One client of Penn Square Bank said "I could hardly believe it—they loaned me $2.5 million hardly asking any questions and then sold the loan to Continental" (Bennett, 1982).

insurance limit from $40,000 to $100,000 and a twenty-year phase-in for capital requirements for newly created thrifts, this allowed troubled thrifts to attract depositors with ever-higher deposit rates and invest in riskier and riskier projects.

Thrifts also utilized accounting discretion to mask their true earnings and intertemporally smooth profits after changing the composition of their assets. In particular, profitable thrifts recorded higher loan loss provisions to recognize low earnings in good times and higher earnings in worse times, and struggling thrifts reported lower provisions to appear more profitable (Liu & Ryan, 2006). While the legality of some of the accounting maneuvers used by thrifts has been debated, such debates always occur after the fact and seem insufficient to prevent other maneuvers later on; accounting discretion allowed thrifts to obfuscate the true state of their balance sheets in the 1980s and 1990s and then, in different forms, played an obfuscating role leading into the GFC and the March 2023 distress.

4.3. Regulatory arbitrage of bank liabilities

The examples above focus on regulatory arbitrage on the asset side of banks' balance sheets. The literature dissecting the causes of the GFC has also highlighted regulatory arbitrage of bank capital and bank liabilities. Perhaps one of the most well-known features of financing structures in the run-up to the GFC was special purpose vehicles (SPVs). Though SPVs were first created in the 1970s, the rise of securitization in the early 2000s made SPVs particularly popular. In an SPV, the sponsor (a bank in our case) sets up a bankruptcy-remote entity (the SPV) to which it sells receivables (e.g., mortgages). The SPV then securitizes those receivables (issuing MBS), with the senior tranches sold to the market. SPVs were financed with the proceeds from the sale of the senior tranches, with the commercial paper market providing day-to-day liquidity. SPVs thus provided a way for the sponsors to reduce leverage in regulatory reporting by shifting activity to off-balance-sheet entities. The GFC experience showed that SPVs were not truly bankruptcy remote, as sponsoring banks extended liquidity guarantees to SPVs to make the latter's commercial paper attractive to institutional investors such as money market funds (Acharya & Richardson, 2009; Plantin,

2015). If the relationships to SPVs are not easily observed by market participants, then shifting activity to SPVs also lowers the market cost of capital (Gorton & Souleles, 2007). The shifting of activity to off-balance-sheet vehicles with recourse to banks to lower capital requirements was a major contributor to the GFC (Acharya et al., 2013).

Banks also reduced regulatory leverage in the run-up to the GFC by shifting to less reliable forms of capital, including hybrid securities and subordinated debt. This form of regulatory arbitrage masked the levels of true capital available to banks. As the crisis unfolded, market participants moved from perceiving different types of capital ratios as equivalent to discounting banks using hybrid securities (in particular, trust preferred securities; see e.g., Demirgüç-Kunt et al., 2013; Berger & Bouwman, 2013). Deteriorations in bank capital in the run-up to the GFC have also been documented in Boyson et al. (2016) for the U.S. and in Acharya et al. (2022) in a global context. European regulators have since embraced contingent convertible bonds as a form of capital, provided the bonds are structured to automatically absorb losses if a pre-specified negative event occurs. However, even these instruments are susceptible to regulatory arbitrage to weaken the extent to which losses are passed through, and evasive activity to reduce the degree of state-contingency in the bonds can reduce social welfare by more than activities aimed at loosening non-contingent requirements (Hachem & Kuncl, 2025).

Another form of regulatory arbitrage is window-dressing, where a bank adjusts its activity ahead of a reporting date to appear safer, distorting the signal that outsiders observe about the true health of the bank. Lehman's use of "Repo 105" transactions in 2008 served to reduce reported leverage on its balance sheet by booking a short-term repo as an outright sale, using the cash to pay down debt, then borrowing cash and repurchasing the original assets after the publication of its financial statements (Owens & Wu, 2015). Furthermore, in the post-GFC period, Munyan (2017) documents systematic deleveraging in repo markets before quarter-end by non-U.S. banks with low capital ratios.[19] Regulation in the U.S. has

[19]Window-dressing can also be aimed at improving the asset side of a bank's balance sheet; see, for

moved toward within-quarter average measures of bank balance sheets, decreasing the scope for window-dressing. However, such higher frequency reporting can itself lead to a shift in activity to off-balance-sheet vehicles that are not consolidated into bank financial statements but that have backstops from sponsoring banks. Such a shift occurred in China after the GFC in response to more frequent enforcement of a loan-to-deposit cap (Hachem, 2018) and undermined the intended effect of the cap, so much so that China's banking system became less liquid and lending to the real economy actually grew (Hachem & Song, 2021).

The evidence of regulatory arbitrage discussed in this section points to some examples of the social cost $C(\cdot)$ of evasive activity, including—but not limited to—wasted productive resources at banks that divert human capital towards creatively relaxing corrective regulatory constraints. First, the resolution of institutions that fail as a consequence of regulatory arbitrage has costs beyond the standard deadweight losses in bankruptcy. Such costs can include the operational costs of the 13(3) liquidity facilities set up in response to widespread bank failures, post-failure review of regulatory and supervisory practices (such as the Barr Review in the wake of the SVB failure[20]), and costs associated with the evaluation of assets of complex failed institutions (such as in the Bear Stearns resolution during the GFC). Second, central bank interventions in response to bank failures or distress at regulated institutions can create political economy risks for the central bank, through either the risk of losses on emergency lending or through the erosion of the public's perception of central bank impartiality. Third, any interventions undertaken can create moral hazard through the perception of future interventions in similar circumstances. For example, the resolution of Continental Illinois created the perception of "too big to fail" which has been argued to have contributed to the GFC.

example, Allen & Saunders (1992) who document such activity by U.S. banks in the 1970s and 1980s.

[20]Review of the Federal Reserve's Supervision and Regulation of Silicon Valley Bank, April 28, 2023, https://www.federalreserve.gov/publications/files/svb-review-20230428.pdf.

5. Rationales for Discretion in Accounting

The previous section highlighted the facilitation of regulatory arbitrage as an important cost of accounting discretion. We now discuss the main rationales for offering accounting discretion at all. Theoretical literature in accounting provides frameworks for understanding why discretion might be beneficial, focusing on when and how discretion improves the informativeness of a disclosure of private information. In settings specific to banks, accounting researchers have also argued that allowing discretion in the reporting of information about underlying fundamentals mitigates panic-induced bank runs for solvent institutions that might have temporarily poor earnings. We first discuss the benefits of accounting discretion in financial reporting in general and then follow with bank-specific applications.

5.1. General Benefits of Accounting Discretion

Financial reporting follows a set of principles and guidelines based on accounting standards, which allow for some discretion in the measurement and reporting of firms' fundamentals. To understand the general rationale for discretion, we begin by reviewing some of the tradeoffs that arise in the design of a reporting system.

When creating accounting standards, standard setters focus on the usefulness of financial information for a firm's external users of information (e.g., shareholders, debtholders, suppliers, or regulators). For example, information about a firm's earnings is useful for shareholders deciding whether to continue investing in the firm, as well as debtholders deciding whether to continue providing credit. However, the relevant measure of earnings differs for these stakeholders. Shareholders are more concerned about the option value of the firm, which is linked to future cash flows, while debtholders are more concerned about default risk, which is linked to current cash flows. Consider a firm that has already provided services to a customer but has not yet received payment. How should this transaction be reported? One option is not to record anything until cash payment has been received from the customer, meaning there will be no impact on the firm's balance sheet or income statement until then.

This constitutes cash accounting. Another option is to record earnings on the firm's income statement and an asset as accounts receivable on its balance sheet at the time the service is provided to the customer. This constitutes accrual accounting. Cash accounting better represents the ability of the firm to repay debt right now, which is valuable information to the firm's debtholders. In contrast, accrual accounting better represents the economics of the firm, which is valuable information to the firm's shareholders.

Understanding these tradeoffs, standard setters choose a reporting regime to maximize the expected decision value of reported information for all users of information at all firms based on information relevance and faithful representation (Chen et al., 2017). U.S. accounting standard setters (the Financial Accounting Standards Board, FASB)[21] and the international accounting standard setters (the International Accounting Standards Board, IASB)[22] state in their respective conceptual frameworks that accounting standards seek to provide the information set that will meet the needs of the maximum number of primary users. To achieve this goal, accounting standards restrict how firms report information by standardizing the format in which information is presented and providing a structure of permissible line items and measurement rules. At the most basic level, accounting standards provide guidance on what constitutes an asset or a liability and how a balance sheet or an income statement should be arranged so that financial statements are comparable across firms. While the structure and definitions are set, a fair amount of discretion exists in measuring various elements of financial reporting. For example, as discussed in Section 4, banks can choose whether to report a debt security at fair value or amortized cost by designating

[21]FASB is the independent, private-sector, not-for-profit organization that establishes financial accounting and reporting standards for public and private companies and not-for-profit organizations that follow Generally Accepted Accounting Principles (GAAP) in the U.S. It is recognized by the U.S. Securities and Exchange Commission (SEC) as the designated accounting standard setter for public companies. For more detail, see https://www.fasb.org/about-us/about-the-fasb.

[22]IASB is an independent, private-sector body that develops and approves International Financial Reporting Standards (IFRSs). The IASB operates under the oversight of the IFRS Foundation. The IASB was formed in 2001 to replace the International Accounting Standards Committee (IASC) and has 14 members. Under the IFRS Foundation Constitution, the IASB is responsible for all financial reporting-related technical matters of the IFRS Foundation. For more detail, see https://www.iasplus.com/en/resources/ifrsf/iasb-ifrs-ic/iasb.

it as HTM (which can be reported at amortized historical cost or fair value if a firm chooses a fair value option) or AFS (which requires reporting at fair value).

Chen et al. (2017) present a framework to study some of the tradeoffs faced by a standard setter deciding between a uniform reporting regime that allows no discretion and a discretionary regime that permits firms to choose their reporting method (e.g., fair value or amortized cost) based on the precision of their information. On one hand, the uniform regime creates a comparable reporting environment across firms, which makes a given piece of information more useful to a greater number of investors. On the other hand, in the discretionary regime, a firm can use its choice of reporting method to convey the precision of its information about a stochastic determinant of firm value. For example, a firm might choose the fair value option for an asset that is being held to maturity, even though amortized cost reporting is permitted.

Fang et al. (2022) relax the strict uniformity in Chen et al. (2017) and analyze the tradeoff between consistent reporting as required by accounting standards for comparability and a discretionary reporting regime. Consider two firms that are imperfectly correlated in their fundamentals. All else constant, information reported by one firm is informative about the condition of the other firm. This gives the standard setter an incentive to implement "all else constant" by mandating a uniform reporting framework. At the same time, a uniform reporting framework may not be flexible enough to allow firms to signal the idiosyncratic components of their fundamentals, presenting a tradeoff for the standard setter between uniformity and discretion. Fang et al. (2022) demonstrate that the optimal level of discretion occurs when the increased informativeness of each firm's report about its idiosyncratic shocks exactly offsets the reduction in positive information spillovers across firms.

In both Chen et al. (2017) and Fang et al. (2022), giving firms discretion over their reporting methods can improve the information available to the public about the firm's fundamentals. The same rationale also motivates discretion over the measurement of assets and liabilities within a chosen reporting method. Consider fair value accounting. Mark-

to-market is one way to determine fair value using either the existing market for the asset or the market for comparable assets. If no such market exists, a mark-to-model approach, where the firm uses and discloses its own valuation model, can be used to determine the fair value of the asset. Thus, conditional on having chosen fair value accounting, a firm still has discretion over how to measure fair value if active markets do not exist. Relying on inactive or dislocated markets to measure fair value can introduce unnecessary volatility and artificial risk (Allen & Carletti, 2008; Plantin et al., 2008), so the ability to resort to the more discretionary mark-to-model approach can be stabilizing, as discussed in more detail below. The existence of discretion within a reporting method is not unique to fair value accounting; a firm that chooses amortized cost accounting also has some discretion on how to measure the allowance for credit losses. Intuitively, the argument for discretion within either reporting method is that the firm has superior information about the true quality of its assets (Chen et al., 2017; Fang et al., 2022; Sankar & Subramanyam, 2001).

Discretion has also been shown to alleviate agency problems (Dye & Verrecchia, 1995) and improve trade (Fishman & Hagerty, 1990) in some settings. Dye & Verrecchia (1995) present a model where the current shareholders of a firm want a manager to exert costly effort to reduce expenses. Such effort cannot be incentivized under a rigid reporting system that dictates the rate at which gross earnings must be discounted to account for future expenses. Instead, giving the manager flexibility in how expenses are reported—formally, allowing the manager to choose from a larger set of discount factors—introduces another dimension on which the manager's performance can be judged, facilitating the design of an incentive-compatible contract. This benefit of discretion is curtailed if there also exists an agency problem between current and future shareholders; by making it easier for current shareholders to implement the behavior they want from the manager, discretion can worsen the outcomes of future shareholders.

In Fishman & Hagerty (1990), a firm privately observes noisy signals about the quality of an asset and must choose which signal to disclose to investors who may buy the asset. A

similar choice arises in product testing or in clinical drug trials. The standard setter dictates the set of signals from which the firm can choose its disclosure. With zero discretion, the firm must disclose the first signal it observes. With full discretion, the firm is allowed to choose from all the signals it observes. The probability of observing at least one positive signal about the asset is increasing in the number of signals available to the firm. Therefore, allowing the firm to choose from more signals increases the probability of a bad asset being sold (type 1 error) but decreases the probability of a good asset not being sold (type 2 error). If both types of errors occur, then the optimal level of discretion is weakly increasing in the value of the good asset. Intuitively, the standard setter allows more discretion when a type 2 error is relatively more costly. Allowing more discretion also makes the disclosure of a negative signal more informative when buyers are positively predisposed to the asset because it has a high expected value.

In the models discussed so far, the firm (or manager) makes a disclosure decision conditional on having some private information. Other models consider how accounting standards affect the acquisition of information to be disclosed. For example, Friedman et al. (2022) study a setting where firm value depends on two components: one that is amenable to mandatory reporting (e.g., revenues) and one that is not (e.g., growth opportunities). The authors show that the standard setter finds it optimal to design an imperfectly informative mandatory reporting system to give the firm incentives to acquire information about the non-mandatory component. If the firm has invested in acquiring information, non-disclosure is a bad signal to investors, especially if the mandatory component is revealed to be negative. Hence, allowing some noise in the mandatory component elicits more investment in information acquisition by the firm. While not about discretion per se, this model echoes the insight from the rationales above that properties which may seem desirable for an accounting system at first glance (e.g., uniformity, limited discretion, or perfectly informative reports) may not be optimal for a standard setter seeking to maximize total available information.

Overall, the theoretical literature in accounting suggests that the optimal level of discre-

tion will not be zero in most settings. Attempts to quantify this level, however, are difficult to find. Thus, there is no consensus on whether accounting discretion is too high or too low, just as there is no consensus on whether capital requirements are too high or too low, but unlike with capital requirements, the lack of consensus on accounting discretion stems from a lack of quantitative models rather than a wide distribution of estimates from such models.

Empirical work in accounting has indirectly tackled the question of whether discretion is too high or too low by studying whether more discretion improves the informativeness of disclosed information as measured by its ability to predict future stock returns. This work is generally concerned with whether managers use discretion opportunistically to mislead stakeholders, which is why the outcome of interest is future stock returns. The aim of the work is not normative, but one can interpret the results discussed next in the absence of more formal statements about optimality.[23]

A well-documented empirical finding is that the use of accounting discretion is positively associated with proxies for weak firm governance (e.g., Klein, 2002). Bowen et al. (2008) confirm this among non-financial Compustat Execucomp firms, showing that earnings management is more likely in firms with closer connections between executives and board members and/or greater short-term executive compensation. However, in a second stage regression, Bowen et al. (2008) find no negative association between the use of accounting discretion due to governance structure and subsequent firm performance, suggesting that, on average, managers do not use discretion opportunistically to the detriment of shareholders. In fact, for some measures, the association is positive. Therefore, overall accounting discretion does not appear to be too high, in a narrow sense, for the firms covered by Bowen et al. (2008).

[23]The interpretation we have in mind is as follows. At the optimal level of discretion, the net marginal benefit from more discretion should be zero. Finding that an increase in discretion has no statistically significant effect on an outcome of interest is therefore consistent with the original level of discretion having been optimal, at least from the narrow perspective of that outcome, while finding an improvement in the outcome would be consistent with too little initial discretion. Finding a deterioration would be consistent with too much initial discretion, or perhaps too large an increase in discretion. While some studies consider an increase in discretion via a rule change, others examine differences in the use of discretion across firms, in which case an increase is interpreted as discretion above the cross-sectional average.

Of course, the absence of systematic opportunism across non-financial firms does not preclude the possibility that discretion is too high for some activities performed by these firms. For example, firms sponsoring defined benefit pension plans have been found to use accounting discretion opportunistically when characterizing pension assets (Bergstresser et al., 2006), suggesting too much discretion for this activity. In contrast, the use of discretion by firms engaged in research and development (R&D) activities when characterizing R&D expenses has been found to make earnings more informative for investors (Baik et al., 2022). Pension plans and R&D activities differ considerably in the idiosyncratic properties of their fundamentals. Within the theoretical framework of Fang et al. (2022) discussed earlier, it would indeed be reasonable for the optimal level of discretion to be lower for reporting pension assets than R&D expenses.

Other empirical papers study the effect of specific accounting rule changes on the relevance and reliability of disclosed information, approximating relevance by the predictive ability of the information for stock returns and reliability by the probability of future restatements or the probability of just meeting or beating analyst forecasts, with lower such probabilities indicating higher reliability. Myers et al. (2022) find that a change in accounting standards to allow increased discretion in revenue recognition by firms engaged in multiple-deliverable sales arrangements (e.g., software firms) improved relevance without decreasing reliability. This is in contrast to studies such as Zhang (2005) and Srivastava (2014), which find that a prior change to restrict revenue recognition practices at software firms increased reliability but decreased relevance. Importantly, the change studied by Myers et al. (2022) internalized the complexities of the sales arrangements in question and provided guidance to managers on the principles to be used when exercising discretion. Therefore, a consistent conclusion from these papers is that, when done right, discretion increases overall informativeness without a tradeoff between relevance and reliability.[24]

[24]Other empirical work supporting the benefits of discretion includes Tucker & Zarowin (2006) who find that income smoothing makes current earnings more informative about future earnings, Linck et al. (2013) who find that firms use discretionary accruals to relax financial constraints and invest in projects that

5.2. Accounting Discretion Usefulness for Banks and Bank Regulators

As discussed in Section 3, the banking business model introduces an existential role for beliefs relative to other industries. Noisier signals about banks' liquidity or solvency—both of which can be gleaned from financial disclosures—could therefore increase bank runs and lower financial stability (Morris & Shin, 2000; Goldstein & Pauzner, 2005; Goldstein & Sapra, 2014; He & Manela, 2016). Against this backdrop, Gao & Jiang (2018) present a theoretical model to show that discretion in reporting can reduce the likelihood of panic-based runs for solvent banks with temporarily poor earnings. In particular, the authors show that the optimal amount of reporting discretion increases with a bank's vulnerability to a panic-based run. However, the authors also show that the use of reporting discretion by some banks to send more favorable signals to depositors leads to a ratchet effect where all banks use discretion in this way. The optimal amount of discretion balances the deadweight loss from this ratchet effect with the reduction in the likelihood of panic-based runs.[25]

Liang & Zhang (2019) also study the effect of accounting systems on financial stability when investors obtain noisy signals about bank fundamentals. In their model, the noise is separated into an idiosyncratic component for each investor and a common component across all investors, whereas in Gao & Jiang (2018) all investors receive the same signal designed by the bank based on its fundamentals and the amount of discretion available. Liang & Zhang (2019) distinguish between a more objective accounting system, which decreases the idiosyncratic noise, and a more accurate accounting system, which decreases the common noise. They show that improving objectivity mitigates inefficient panic-based runs whereas

increase firm value, Windisch (2020) who finds that accruals became less predictive of future earnings after the adoption of rules that decreased managerial discretion in Germany, and Cheng et al. (2022) who find that lenders make more modifications to firm performance measures reported under stricter accounting standards.

[25] A crucial feature of this model is that the signal-jamming permitted by discretion is not equally valuable to all banks. A similar feature exists in models of costly signaling (e.g., Spence, 1973), where signaling is not equally valuable to all workers. The nature of the resulting equilibrium differs, however. In models of costly signaling, productive and unproductive workers can be separated when productive workers have a higher net benefit to signaling. In Gao & Jiang (2018), runs are reduced because partial pooling occurs among banks with intermediate fundamentals, which are the banks for which signal-jamming has the highest net benefit.

improving accuracy may actually encourage runs. This result is consistent with Gao & Jiang (2018) but highlights that discretion must not lead to disagreements among investors for the run-reducing benefit to be obtained.

While the models of Gao & Jiang (2018) and Liang & Zhang (2019) involve a standard setter choosing the properties of an accounting system ex ante—that is, before the realization of any panics—the authors also highlight accounting guidance introduced by the FASB during the GFC which allowed banks greater discretion in implementing fair value accounting standards for financial instruments. Both Gao & Jiang (2018) and Zhang (2023) suggest that this discretion in determining market values when financial markets were unstable helped prevent panic-induced bank runs by allowing banks to rely on their models to determine market values of illiquid financial instruments. Similarly, Ryan (2012) highlights the volatility in financial statements introduced by fair value accounting when market values are experiencing large dislocations. Cheng (2012) provides empirical evidence that banks used the discretion allowed by the FASB during the GFC to improve the quality of financial reporting, leading to fair values consistent with the economic factors driving MBS valuations.

Another important aspect of accounting discretion and disclosure is that accounting numbers are used by prudential regulators as inputs into measures of regulatory oversight, such as capital requirements (Bushman, 2014) or stress tests (Goldstein & Sapra, 2014). Often, a bank has more information than its regulator, and the regulator would like to use this information if it can be elicited from the bank. We discussed earlier the optimality of imperfectly informative reporting systems in the model of Friedman et al. (2022). A similar result arises in papers where features of the reporting system are chosen jointly with capital requirements. In Lu et al. (2019), a regulator chooses capital requirements to discipline risk-taking and must decide whether to make the capital requirement conditional on the information reported by the bank. The capital requirement must make it incentive-compatible for the bank to truthfully report its private information about the performance of its assets. The authors show that it is not always optimal to make the capital requirement

conditional on the bank's report; in some cases, the incentive to misreport is too high, and the regulator accepts that accounting reports cannot inform state-dependent requirements (i.e., the regulator accepts pooling).

Bertomeu et al. (2023) present another setting where uninformative accounting disclosures emerge endogenously from a regulatory problem. In their model, a regulator seeks to discipline excess risk-taking due to moral hazard from (unpriced) deposit insurance using both capital requirements and the precision of the reporting system. An imprecise reporting system has a low probability of revealing the true quality of the bank's assets and leads to excessive restructuring by the regulator, which is costly to the bank and therefore disciplines its ex ante risk-taking. The more imprecise the reporting system, the less stringent the capital requirements need to be, which can be beneficial when the moral hazard problem is not too severe and the regulator does not want to restrict loan origination.[26]

Mahieux et al. (2023) model some of the interactions between prudential regulation and discretionary measurement in the context of recent changes in accounting standards that require banks to switch from an incurred loss methodology (ILM), which relies on realized losses to provision for future losses, to an expected credit loss (ECL or CECL) methodology, which requires provisioning for losses over the life of a financial asset based on a set of expectations and assumptions. The latter model requires banks to incorporate more information about their expectations of the future states of the world and also provides more discretion. Mahieux et al. (2023) find that regulatory capital and the effectiveness of regulatory intervention (as opposed to regulatory forbearance) play an important role in determining which accounting standard leads to more efficient economic outcomes. The authors model a representative bank that has shareholder-debtholder conflicts and whose shareholders have incentives to take excessive risk by either increasing the ex ante risk of the loan portfolio or engaging in ex post asset substitution. In this model, a bank regulator disciplines banks by

[26]The idea that imperfect ex post disclosure can partially substitute for prudential ex ante regulation also arises in Fuchs et al. (2024) in the context of a regulator who wants to increase trade in asset markets hampered by adverse selection.

imposing capital requirements, and the bank's capital depends on the provisioning model used to measure credit losses (i.e., CECL or ILM). The authors find that CECL, which incorporates more discretion and results in timelier provisions, prompts earlier corrective actions in bad times. Reporting more timely information under CECL in this setting enhances efficiency when banks are insufficiently capitalized or when a regulatory intervention is likely to be effective. However, if banks are moderately capitalized or regulatory intervention is ineffective (or costly), using CECL reduces efficiency. Empirical work on CECL has generally found that discretion can improve banks' information collection, monitoring, and performance, which reduces future default risk (Kim et al., 2023; Gee et al., 2023; Bonaldi et al., 2023). Banks achieve these improvements through investment in technology and human capital, which allows them to incorporate more information into CECL models when determining provisions or making new loans (Kim et al., 2023).

Overall, the discussion in this section has highlighted tradeoffs in the optimal amount of discretion allowed in accounting rules. Connecting back to Section 2, these tradeoffs elucidate the shape of $U(\cdot)$ and specifically why θ^* is an interior solution. On the benefit side, discretion allows firms to use their private information to give stakeholders timely signals about their fundamentals, mitigate internal agency problems, and reduce the incidence of bank runs. On the cost side, discretion could reduce comparability, positive information spillovers, and lead to ratchet effects. Importantly, however, the costs in these tradeoffs are distinct from the cost evidenced in Section 4: the use of accounting discretion to engage in regulatory arbitrage.

To be sure, severe cases of regulatory arbitrage eventually lead to changes in accounting standards. Consider the accounting treatment of SPVs and liquidity guarantees, which were central to the GFC experience. Liquidity guarantees are accounted for as contingent liabilities, similar to undrawn lines of credit extended to firms or households. A contingency implies future assets or liabilities for a bank if certain events occur, but as long as there is no "reasonably probable" likelihood of those events occurring, the bank will not record the

contingent assets or liabilities on its financial statements. The rationale goes back to the goal of maximizing the expected decision value of reported information (Chen et al., 2017). Treating contingencies without regard to their likelihood of materializing would obscure the true economic condition of the bank. Accordingly, standard setters mandate a threshold approach where low-probability contingencies are not reported, moderate-probability contingencies are disclosed in the notes to a bank's financial statements, and high-probability contingencies are recorded in the financial statements. The exact thresholds are defined by the FASB and IASB, but the measurement of probabilities is left to banks, their auditors, and legal teams on the basis that they have superior information about their exposures.

The accounting for SPVs before the GFC was based on the same decision-value principle, namely that consolidating an SPV into its sponsor's financial statements obscures the true condition of the sponsor because SPVs are independent under bankruptcy law. As noted in Section 4, the problem during the GFC was neither liquidity guarantees nor SPVs in isolation but rather their combination. Accounting standards for the securitization of financial assets have since been clarified to remove any gray areas in what constitutes a risk transfer to an SPV (Dou et al., 2018). In particular, SPVs are no longer automatically considered independent of their sponsors; the sponsoring bank must instead assess its economic exposure to the SPV and consolidate it if material, with discretion over what constitutes a sufficiently material exposure, similar to the discretion allowed in the measurement of contingency probabilities. The required assessments imply more structure, and hence less discretion, in the accounting treatment of SPVs relative to the pre-GFC period. This illustrates how the optimal θ changes when incentives for regulatory arbitrage are taken into account; absent binding capital regulation, the prior accounting treatment of SPVs worked just fine as banks gained little from combining securitization and liquidity guarantees.

6. Conclusion

This article has sought to take stock of the academic literature on bank regulation, focusing on the externalities that motivate the regulation of banks relative to other firms and the complications that bank regulators have encountered in designing and implementing regulations to correct those externalities. Our reading of the literature is that there is a gap between where academic models are and where policy-makers need them to be in order to design effective regulation. Arguably the biggest challenge faced by bank regulators is that accounting rules give banks discretion over what to report in financial statements. Regulators can request additional information, but with finite supervisory resources, they need to know what to look for, and often the accounting maneuvers used by banks to lower the shadow price of regulation only become known after something goes wrong. The empirical evidence on regulatory arbitrage provides various examples where accounting discretion was used to lessen the burden of bank regulation without changing the true nature of the activity being regulated. This is clearly problematic when the regulation exists to push banks away from what is privately optimal to what is socially optimal. At the same time, discretion is rooted in a long accounting literature that demonstrates its benefits relative to a world with no discretion, so blindly reducing discretion is not a solution. Solving the social planner's problem with respect to the optimal mix of discretion and regulation is a complicated task, but there are opportunities for progress through additional research.

First, models of optimal bank regulation need to take into account accounting standards, and accounting standards need to internalize the constraints they impose on bank regulators. Recently, there have been a few studies of optimal regulation that explicitly recognize the imperfect nature of regulatory instruments. Bengui & Bianchi (2022) conclude that regulated agents should be squeezed further to offset partial leakage of activity to the unregulated sphere. However, their results depend on the specific modeling of the externality (fire sales only) and the modeling of the leakages (e.g., that regulated agents are not directly connected to unregulated ones). Studying a larger class of environments, Dávila & Walther (2022) can

deliver the opposite result when regulated and unregulated activities are gross substitutes. Jeanne & Korinek (2020) further show that if leakages reduce the effectiveness of regulation ex ante, then the planner should commit to less generous bailouts ex post. While these studies make progress in modeling the implementation constraints of the regulatory problem, they abstract from the optimal design of accounting standards and thus only consider one of the planner's choices. A notable exception is Begenau et al. (2024) who study the interaction between delayed loss recognition and bank capital requirements. Their quantitative model points to a slight relaxation of capital requirements and much faster recognition of loan losses as the optimal mix of regulation and discretion, although they do not consider leakages into unregulated territory or the social costs of evasive activity.

Our conceptual framework can hopefully encourage additional research using this more unified approach by illustrating from first principles the necessary ingredients. However, we too made some important simplifications that should be relaxed in future work. For example, we assumed that discretion can be summarized by a single object θ when, in reality, there can be multiple dimensions of discretion, e.g., allowing discretion on some parts of the balance sheet but not others. We also assumed a single regulated quantity k and a single evasive activity ξ; in reality, multiple quantities can be regulated and banks may be able to take multiple evasive actions. The social planner would then choose a vector of discretionary attributes and a vector of regulations subject to multiple implementation constraints. While this obviously complicates the problem, it allows for richer solutions. In particular, the planner may find combinations of discretion and regulation that do not conflict, as captured mathematically by the conditions $c_{\xi\theta}(\xi;\theta) \approx 0$ and/or $c_{\xi}(0;\theta^*) \geq -V'(k^*)$ in Section 2. For combinations where these conditions do not hold, the planner will likely have to choose less regulation and less discretion on at least some dimensions. An important question is which dimensions.

Note that less regulation does not necessarily mean less oversight. An important consideration in designing regulation is the complementarity between regulation and supervision.

While regulation is by definition rules-based, supervision instead relies on discretion on the part of the supervisor. Just as discretion on the part of regulated institutions has its benefits and costs, so does the discretion inherent in supervision. On one hand, supervisors can exercise discretion to obtain information about the health of supervised (and regulated) institutions that may not be apparent in regulatory filings. Effective supervision can thus counteract the negative effects of discretion allowed to these institutions while keeping interventions nimble in the face of an evolving institutional environment.

On the other hand, supervisors have the discretion to postpone action, leading to worse outcomes down the road. As noted above, this was the case during the S&L crisis. Similarly, supervisory discretion in (not) taking rapid action to address risk management failings at SVB contributed to its eventual demise. Indeed, the Barr Review of the supervision and regulation of SVB notes that "[w]hen supervisors did identify vulnerabilities, they did not take sufficient steps to ensure that Silicon Valley Bank fixed those problems quickly enough." Thus, from a financial stability perspective, supervision, regulation, and financial institutions' individual objectives have to be in balance, so that the externalities generated by individual institutions are adequately addressed by regulation and supervision acting in concert, and regulation and supervision remain sufficiently attentive to allowing enough credit to the nonfinancial sectors of the economy. Formally modeling the role of supervision in complementing regulation and accounting discretion to maximize social welfare when banks can engage in evasive activity is an open area for future research.

Finally, more empirical work is needed on how uninsured depositors—and short-term creditors, more generally—acquire information about their banks and form expectations about what other depositors are going to do. As we discussed, one of the main rationales for bank regulation stems from the existential role that depositor beliefs play, which itself stems from the fundamental fragility of the banking business model. We also saw that reducing panic-based runs by allowing banks to manage the information environment is a key argument for discretion in the accounting literature. Using an instrument that constrains banks

(regulation) along with an instrument that can be used to relax the constraint (discretion) to tackle the same problem is at best a needle that must be carefully thread. A better understanding of the expectation formation process of depositors would help integrate these two perspectives on fragility. Sandri et al. (2024) have begun to use information provision experiments in household surveys to learn about retail depositors, and further work in this vein seems promising for the integration sought here.

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Table 1: **Post-WWII U.S. Banking Crises**. This table summarizes the major banking crises in the post-WWII period in the U.S., focusing on the risks accumulated on the asset side, liability side, or both.

Event	Assets	Liabilities	Resolution	References
Continental Illinois Failure (1984)	Rapid growth through risky loans to oil and gas companies	Money market (eurodollar); 15% insured deposits only	Bank run (electronic) by uninsured depositors; Federal Reserve loan to finance "any extraordinary liquidity requirements"; FDIC took 80% ownership	Wall & Peterson (1990), Carlson & Rose (2016), Swary (1986), Jayanti & Whyte (1996), Rose (2023)
Savings and Loan Crisis (1986)	Deteriorating balance sheet health in late 1970s combined with regulatory forbearance led to increasingly riskier and/or poorly underwritten loans	Essentially all-deposit (with no equity) financing; 20-year phase-in rule to reach 3% capital requirement	Insolvent institutions resolved by Federal Savings and Loan Insurance Corporation (1986-1989, 296 institutions, $125 billion assets) and then by the Resolution Trust Corporation (1989-1995, 794 institutions, $394 billion assets)	Curry & Shibut (2000), Caprio & Klingebiel (1996), Calavita et al. (1997), Kane (1985), Lindgren et al. (1996), Akerlof & Romer (1993), Field (2017)
Global Financial Crisis (2007)	Rising real estate prices combined with ability to move assets to off-balance-sheet special purpose vehicles	Financing through wholesale short-term funding	Extensive public sector interventions: liquidity support, government guarantees, asset purchases	Brunnermeier (2009), Claessens et al. (2010), Keys et al. (2010), Obstfeld & Rogoff (2009), Laeven & Valencia (2010)
SVB Failure & Regional Banking Crisis (2023)	Large fixed income investment during period of low interest rate combined with risk management failures	Concentrated, uninsured depositors (90% of deposits)	Electronic bank run; FDIC insurance of all deposits; Federal Reserve Bank Term Funding Program to lend to solvent banks against good collateral at face value	Jiang et al. (2024), Cipriani et al. (2024)