“Never again!” – the dynamics of bank bailouts

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Abstract

We model bank bailout decisions by a state that looks beyond a bailout, taking into account future cost of rescuing or liquidating the bank. Using a repeated game we find that a long-term perspective makes both, the state and banks, more cautious. Yet, a looming “fiscal cliff” putting an end to bailouts, may make the state more aggressive. The expectation that a bank will never again need to be rescued in the future makes it an attractive bailout candidate in the present. Running out of money therefore is not an ideal commitment strategy. Political resolutions like “never again” are not only unrealistic but misdirected. Bailouts of systemically relevant banks are efficient not only ex post; they may also reduce moral hazard ex ante. Policy measure should focus on banks' systemic importance, not on bailouts.

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"Two watchwords guided us as we undertook to solve this problem: Never Again." (Nicholas Brady,[1] 1989)

"This legislation... [will] safeguard and stabilize Americas financial system and put in place permanent reforms so these problems will never happen again." (George Bush,[2] 1989).

" If we achieve nothing else in the wake of the crisis, we must ensure that we never again face such a situation." (Ben Bernanke,[3] 2010)

"[B]ecause of this law, the American people will never again be asked to foot the bill for Wall Street's mistakes." (Barack Obama,[4] 2010)

1 Introduction

Never again! From crisis to crisis, the adage remains the same: Bank bailouts with taxpayer money, though unavoidable this very time, are not to be repeated. But then they are. The recent financial crisis of 2007-08 is hardly an exception. After bank bailout programmes in several countries, most notably TARP[5] in the U.S., politicians asserted that "it" should happen never again. A number of countries enacted heavy legislation designed not only to prevent future crises, but also to avoid the use of taxpayer money should a crisis occur.[6] Yet, government abstention in the face of the failure of a systemically relevant financial institution is still a rare exception.[7] Even governments that are running out of funds try their best to prevent weak banks from collapsing.

Governments do not even adhere to the resolution "never again" as far as individual banks are concerned. A number of banks have received state assistance more than once during the recent crisis.[8] A rescued bank continues to exist and may collapse or need a bailout in the future.

[1] "Statement by the Secretary of the Treasury Nicholas F. Brady regarding the Presidents Savings and Loan Reform Program," News Release, Department of the Treasury, February 6, 1989, quoted from Shull (1993).

[2] President of the U.S., signing the FIRREA act, August 9, 1989

[3] Chairman of the Board of Governors, Federal Reserve System, March 20, 2010); http://www.federalreserve.gov/newsevents/speech/bernanke20100320a.htm

[4] President of the U.S., signing the Dodd-Frank Wall Street Reform and Consumer Protection Act, July 21, 2010), http://www.whitehouse.gov/the-press-office/remarks-president-signing-dodd-frank-wall-street-reform-and-consumer-protection-act

[5] Under the Troubled Asset Relief Program of October 3, 2008, the U.S. government purchased assets and equity from financial institutions to strengthen its financial sector.

[6] One example is the 2010 Dodd-Frank-Act in the U.S.

[7] One example is the fall of Lehman Brothers in 2008.

[8] European banks have benefited from repeated assistance programmes; so have the U.S. banks if quantitative easying is included. Some banks have received repeated financial or legal assistance on an individual basis (Northern Rock, Dexia, UBS).

The present model therefore takes into account that after a bailout a bank does not disappear. We use a repeated game between a bank and the state in which both players take present decisions with a view to potential future bailout decisions. The model is driven by two simple but realistic key assumptions. Both the bank and the state are blind on one eye: The bank neglects the systemic cost of its potential failure, while the state neglects that the money used to rescue a bank is transferred but not lost from a social point of view. We develop the model in three steps: In the basic scenario we introduce the main features of the model within a static or "one-shot" framework. We then look at the other extreme, an infinitely repeated game with rational forward looking players. Finally we analyze a finitely repeated game: We allow for an early termination of the game when the state runs out of money and cannot rescue a failing bank any longer.

Using a dynamic approach our model is most closely related to DeYoung et al. (2012). Theirs is one of the few papers that analyze the relation between the state and a bank as a repeated game. Their focus is on complexity (systemic cost of failure), while our key decision parameter is the bank's risk choice. While both approaches are complementary, our seems to yield somewhat richer results.

Contrary to a large part of existing research, we model agents as rationally forward looking and focus on subgame-perfect equilibria. The state's behavior is predictable; there is no signaling and reputation building or policy ambiguity, features of many models (see, e.g., Dam and Koetter, 2012), as these are the very features never observed in the real world of implicit state guarantee. If anything, letting a bank fail in order to signal a tough stance is likely to achieve the opposite: Hett and Schmidt (2013) find that the after the fall of Lehman Brothers in 2008 market discipline in the banking system all but disappeared. The systemic cost of the failure became so obvious, that it hardened the case for bailouts rather than market discipline.

Our model offers a fresh perspective on the problem of implicit state guarantee, putting into perspective some findings from the existing literature. First, it identifies the very systemic relevance of banks, rather than state guarantee, as the root of implicit subsidies (Baker and McArthur, 2009; Ueda and Weder di Mauro, 2013) and of banks' moral hazard and related distortions (Kacperczyk and Schnabl, 2011; Rose and Wieladek, 2012; Hakenes and Schnabel, 2012; Brandao-Marques et al., 2013; Elijah Brewer and Jagtiani, 2007; Davis and Tracey, 2012). Second, it casts doubt on state discipline: With a longer horizon the state becomes more picky in rescuing banks. Yet, as the state runs out of money, banks rather than the state become more prudent. These aspects, particularly the behavior of banks and states close to the "fiscal cliff", have hardly been discussed in the existing literature.

The findings of our model are but a piece of a larger puzzle. Banks and states are inter-locked in a complex relationship. On one hand, banks hold large amounts of government debt, and big banks even increase such exposure during periods of government default (Gennaioli et al., 2013). On the other hand, governments rescue systemically important banks at their own peril. Our model suggests that governments may even become more bailout-prone in the face of a "fiscal cliff". It therefore may contribute to our understanding of the "doom loop" between weak banks and weak states.

2 The model

2.1 Overview

We model the bailout problem as a game between a bank and the state. The bank's balance sheet is lumped into one asset called the "project". In the first move of the game the bank chooses the risk-return combination of this project. If the project succeeds the game ends. If the project fails the state decides whether to liquidate[9] or to rescue the bank (by a transfer payment). The game and all its parameters are common knowledge, with the exception of the project success probability chosen by the bank.

In a static setting (our first scenario), the game is just played once. In the repeated setting (our second scenario), the game is repeated after a each successful project or bank bailout. The game only ends once the bank's project fails *and* the state decides not to rescue the bank. In a finitely repeated setting (our third scenario) the game may end even though the state would be willing to rescue the bank but has run out of the funds required to do so.

2.2 The bank

The bank's only asset is the access to a project (the size of which we normalize to \$1) with expected return $E(R) = \pi R(\pi)$. In the first move of the game, the bank chooses the project's risk and return. The bank's choice is observable by the state, but not verifiable. In the second move, nature decides about project success or failure. In case of success the project has a positive return R; in case of failure the project yields nothing. Ex ante, there is a trade-off between the project's probability of success, $\pi \in [0, 1]$, and its return in case of success, $R(\pi)$. We denote the return on a safe project by $\underline{R} = R(1)$. We try not to restrict the risk-return trade-off unnecessarily and only assume:

- a tradeoff between safety and project return in case of success: $dR/d\pi < 0$,
- an interior maximum for expected return $E(R) = \pi R(\pi)$: $d^2E(R)/d\pi^2 < 0$.

We assume that the bank has limited liability; it has no funds it could commit in case of project failure. The return to a successful project cannot be taxed

[9] Liquidation is used as shorthand for any resolution that does not involve taxpayer money.

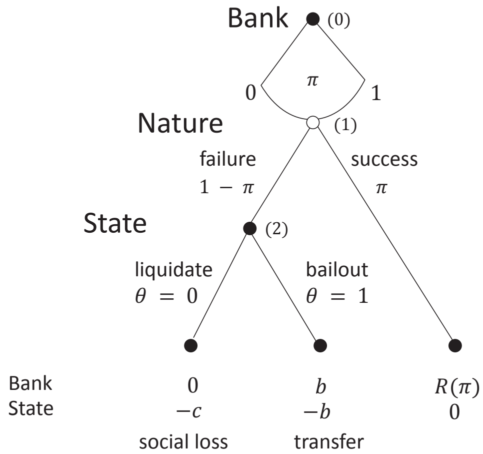

Figure 1: The game tree

and is fully distributed to (and consumed by) the bank's stakeholders. We do not distinguish between different stakeholders like depositors and shareholders (or management), though. Thus, on the liability side, just as on the asset side, we model the bank as a "monolith".

2.3 The state

The state is called into action when the bank's project has failed. The state can either liquidate the bank or rescue it. We denote the state's action with a variable $\theta \in \{0, 1\}$. Liquidation ($\theta = 0$) leads to a deadweight cost to the state of c ("collateral damage").[10] The state can avoid this cost by organizing a bailout ($\theta = 1$), i.e., by transferring the amount b ("bailout cost") to the bank. We assume that $b < R$, i.e., the bank does better in case of success than in a bailout. The game tree in Figure 1 summarizes the game (in the static scenario).

We assume that the state cannot take any action with which it would hurt itself *ex post*. (This limits the analysis to subgame-perfect equilibria and excludes revenge, threat, or "grim trigger" strategies by the state in a repeated game.)

[10]In practice, collateral damage has many components ranging from disturbances to the payments system to job losses in the economy.

2.4 The players' objectives

The bank and the state are both risk-neutral. They maximize expected income or, in the case of the state, minimize expected loss. In the repeated game scenario they discount the future with the same rate δ.

Both players behave opportunistically as regards bailout transfers:

- The state counts a bailout transfer payment to the bank as a cost (but not as an income to the bank).[11]
- The bank counts a bailout transfers payment from the state as an income (but not as a cost to the state).

In addition, players have an asymmetric perception of liquidation cost:

- The state counts the potential collateral damage caused by the bank's liquidation as a cost.
- The bank ignores the potential collateral damage caused by its liquidation.

The state, minimizing its own cost, does not maximize aggregate welfare. Therefore it ignores returns from the bank's project. It also ignores the loss in return due to a liquidation of the bank, as if a disappearing bank were immediately replaced by not systemically relevant banks with the same (aggregate) project size.

3 The static game

We first analyze the game in a static scenario represented in Figure 1. The static game corresponds to the myopic view that a bailout decision will occur only once in one's (political) lifetime: "when politicians are faced with catastrophe, long-term concerns tend to take a back seat to the immediate crisis." (Hart and Zingales, 2010)

3.1 The social optimum

As a benchmark we examine the social optimum that would be implemented by a social planner who could set both project risk π and bailout policy θ in order to maximize aggregate wealth. Aggregate wealth is equal to expected project return minus expected collateral damage from liquidation. The planner would thus solve:

$$\max_{\pi,\theta} V = \pi R(\pi) - (1-\pi)[(1-\theta)c + \theta \cdot 0]. \tag{1}$$

[11] Even among economists it is common to look at bailout payments as a cost (see, e.g., Veronesi and Zingales, 2009).

The optimal value of θ obviously is $\theta^* = 1$, i.e., a bailout whenever the project has failed. As the bank is not liquidated in any case, the optimal value for $\pi(\theta)$ maximizes expected project return for $\theta = 1$. The first order condition shows that the elasticity of project return in case of success with respect to success probability at π^* is minus one:

$$\eta_{R,\pi} = \frac{dR \cdot \pi}{d\pi R} = -1. \tag{2}$$

A planner who can set both π (success probability) and θ (bailout decision) would maximize aggregate project return net of collateral damage from liquidation (c). This would mean (i) choosing the success probability π^* that maximizes expected project return and (ii) following a strict bailout policy, $\theta^* = 1$. The aggregate (= social) return is represented by the solid line in Figure 2. Its maximum is indicated by Point S.

The planner's ability to disentangle risk choice from the bailout decision permits both, maximization of project return *and* elimination of liquidation cost. We will show that this is not the case once project choice and liquidation decision are "decentralized", i.e., left to the bank and the state, respectively.

3.2 The state's problem

The state is called upon to act when the bank's project has failed (after success the game ends). The state can bailout the bank ($\theta = 1$) or liquidate it ($\theta = 0$)). We have assumed that the state strictly minimizes its loss (without, e.g., taking revenge on the bank). The state minimizes its loss by solving:

$$\min_{\theta} V^S = (1 - \theta)c + \theta b. \tag{3}$$

It will bailout a bank if:

$$c \geq b \tag{4}$$

and liquidate it otherwise. (We assume as a tie-breaker that the state will choose a bailout if it is indifferent.)

Counting b as a cost, rather than as a transfer (with no loss of aggregate wealth), the state is subject to moral hazard. Whenever $b > c$ the state does not bailout a bank after project failure, neglecting systemic cost $c > 0$.

3.3 The bank's private optimum

The bank chooses:

- the first best risk level if there is no prospect of bailout,
- a project with a lower success probability (as well as lower project return) if it expects a bailout.

This follows directly from the bank's objective function. The bank chooses π such as to maximize expected profit V^B:

$$\max_{\pi} V^B = \pi R(\pi) + (1-\pi)[(1-\theta)0 + \theta b], \tag{5}$$

where the optimal choice, denoted by $\pi^B(\theta)$, solves the first order condition:

$$\frac{dV^B}{d\pi^B} = (\frac{dR \cdot \pi^B}{d\pi^B \cdot R} + 1)R - \theta b = 0, \tag{6}$$

or, in terms of the elasticity of R with respect to π at π^B:

$$\eta_{R,\pi} = -1 + \frac{\theta b}{R}. \tag{7}$$

If the bank does not expect a bailout ($\theta = 0$), then at the optimal π the elasticity is $\eta_{R,\pi}(0) = -1$. The bank thus maximizes expected project return. If the bank expects a bailout ($\theta = 1$) the elasticity at the optimal value of π is $\eta_{R,\pi}(1) = -1 + b/R > -1$. This implies that the bank chooses a lower π^B, i.e., a more risky project ($\eta_{R,\pi} > -1$) than in the absence of bailouts, i.e., $\pi^B(1) < \pi^B(0)$. (Proof: Since $dR/d\pi < 0$, the elasticity $\eta_{R,\pi}$ increases, and its absolute value decreases, in π; further, by assumption $b/R < 1$, i.e., the bailout "insurance ratio" is less than hundred percent.).

The bank's optimal decisions are illustrated in Figure 2.

- In the *no bailout case* the bank maximizes expected project return. Its optimal choice is $\pi^B(0)$. Aggregate social return (project return minus expected systemic damage) would be maximized at π^{**}, though.
- In the *bailout case* the bank maximizes expected project return plus bailout subsidy. Its optimal choice is $\pi^B(1)$. Aggregate social return (project return) would be maximized at $\pi^* = \pi^B(0)$.

The figure illustrates that the bank commits moral hazard in either case. In the no bailout case the bank neglects c, the systemic damage of its failure. In the bailout case the bank counts transfer b as an income. Moral hazard, therefore, is not a consequence of implicit state guarantee, but a consequence of banks' systemic importance, irrespective of whether such importance leads or does not lead to bailouts. The degree of moral hazard may somewhat differ in

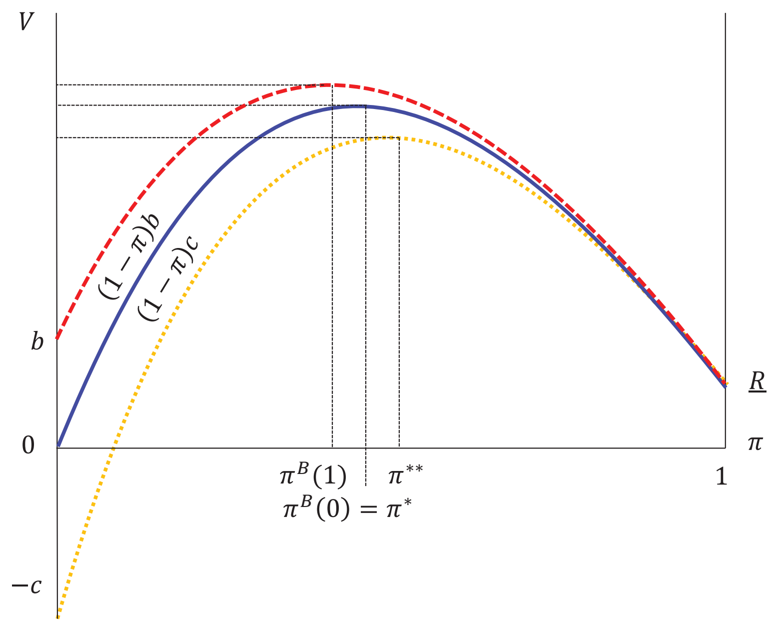

Figure 2: Expected returns: (i) project return (solid line), (ii) project return minus expected liquidation cost (dotted line), and (iii) project return plus bailout transfer. The bank's expected return is given by (i) in the bailout case and by (iii) in the no bailout case. Aggregate social return is given by (i) in the bailout case and by (ii) in the no bailout case.

between the two cases depending on the parameters of the model, and so may the respective levels of agency cost (the losses of expected return V from not maximizing along the dotted solid or the solid line, respectively).

3.4 Equilibria of the static game

Under separate private decisions (the bank chooses π, the state chooses θ) the social optimum as defined above is not an equilibrium of the game. Conversely, no equilibrium implements the (unconstrained) social optimum. Solving the game backwards stars from the state's decision, we can identify a non-bailout equilibrium (for $b > c$) and a bailout equilibrium (for $b \leq c$). We refer again to Figure 2.

- In the *no-bailout case* ($\theta = 0$) the bank's expected profit, $V^B(0)$ (the solid line), is maximized at success probability $\pi^B(0) = \pi^*$. The bank thus chooses the same project risk a social planner (controlling both θ and π) would. Yet, the no-bailout case is not a social optimum as long as $c > 0$: The state, failing to rescue the bank, burdens society with positive expected systemic cost $(1 - \pi^*)c$. The bank (ignoring such cost) gets expected profit equal to aggregate return in the social optimum: $V^B(0) = V^S$.
- In the *bailout mode* ($\theta = 0$) the bank's expected profit, $V^B(1)$ (the dashed line), is equal to the sum of the expected social return *plus* the expected bailout transfer payment $(1 - \pi)b$. Its maximum lies to the left of pi^* and is related to a lower success probability $\pi^B(1) < \pi^B(0) = \pi^*$. Again, the equilibrium is not first best: The state rescues a bank with a failed project (thus avoiding systemic cost), but the bank takes more risk than the social planner would choose.

3.5 The root of moral hazard

In 2013 the Chairman of the Financial Stability Board observed: "[t]he expectation that systemically important institutions can privatise gains and socialize losses encourages excessive private sector risk-taking".[12] Similar views are widely held (see, e.g., Stern and Feldman, 2004). With respect to not systemically relevant banks (c small), they may not be problematic. Yet, as we have shown, the view that state guarantee for *systemically relevant* banks $c >> 0$ creates moral hazard may be misleading. Given a bank's systemic relevance moral hazard arises with or without state guarantee.

Our results differ from widely held views not because of the stylized assumptions behind our model. Rather, the standard view neglects the fact that state guarantee for systemically important banks does not only induce banks to take more risk, but (by removing the systemic cost of failure) also increases the socially optimal level of risk. Bank bailouts may subsidize risk taking, but they are also a way to minimize the negative externality of systemic relevance. This identifies systemic relevance as the true root of moral hazard and of public subsidization of banks.[13] We will not address the chicken-and-egg-question, whether the existence of systemically relevant banks itself is a consequence of the existence of a state, or whether the state and its institutions have been shaped by the increasing systemic importance of banks.

[12] Mark Carney, Statement to the International Monetary and Financial Committee, October 12, 2013, p. 2; www.imf.org/External/AM/2013/imfc/statement/eng/FSB.pdf

[13] Of course, any third party guarantee for *not systemically relevant* banks and their depositors, as often found within deposit insurance systems, constitutes a subsidy and an incentive for moral hazard.

4 The infinitely repeated game

As a second benchmark case we analyze an infinitely repeated game in which a successful or rescued bank continues to exist and may pose a bailout problem in a future period. The repeated game is not entirely unrealistic; several banks have been rescued more than once.[14] It turns out that the long-term view makes both the bank and the state more cautious. The state does not bailout banks perceived as too risky. Banks, in turn, choose safer projects than in the static game if they do not expect a bailout. Above, a bank may choose a safer project in order to keep to bailout prospects. Bailout expectations may even lead banks to choose a safer project than under laissez-faire.

4.1 Additional assumptions

In each period t the bank chooses the success probability of its project, π_t. If the project succeeds or the bank gets a bailout ($\theta_t = 1$), the game is repeated. The game ends once the bank's project fails and the state abstains from a bailout ($\theta_t = 0$). We "reset" the game after each period by assuming that the bank's return from one period (R or, in case of a bailout, b) is consumed by its stakeholders and that the bank starts with a new project of the same size in the following period.[15] Symmetrically, we assume that the state's vault is automatically replenished, so that the state can always afford a further bailout (an assumption to be relaxed below).

The difference to the static model is the availability of a history. In the repeated game, the state knows the success probabilities the bank has chosen in the past, and the bank knows if it has received any bailouts yet. Potentially this opens a space for communication. The state may announce to let a bank fail unless it chooses some specific success probability. According to the Folk Theorem, any choice of the bank between $\pi^B(0)$ and $\pi^B(1)$ combined with any $0 \leq \theta \leq 1$ can be supported as an equilibrium. This would include the first best with $\pi*$ and $\theta = 1$. However, existence of such equilibria presupposes that agents can use "punishment" strategies if the opponent deviates. This is not the case under our strict assumption that the state can never hurt itself. The state has to choose the smaller of the two evils; it cannot let a bank fail for having chosen, say, $\pi^B(1)$ instead of $\pi^B(1)$ if such failure is more expensive than bailout and continuation

[14] With some banks, like Barings, e.g., a decades may between a rescue and the next failure. Other banks were rescued more than once within a few years of financial crisis after 2007. Examples include Northern Rock, Dexia, and UBS. UBS benefited from a rescue operation by Swiss authorities in Oct. 2008, later on from an official violation of Swiss bank secrecy law sparing the bank from US prosecution, and finally from a mild settlement in the Libor case (2012) with US authorities weary of the risks of a severe UBS problem to the international financial system. That settlement and similar ones with other banks led some commentators conjecture that some banks were "too big to jail".

[15] The alternative, keeping net return from one period as additional bank capital in the next period would lead to a richer if more complex model.

(even though the threat of bailout was part of an *ex ante* strategy).[16]The state therefore cannot make its decisions depend on history. It follows that the state's decisions can be anticipated and that history is not relevant for the bank either.

Under our assumptions, therefore, the repeated game is a potentially infinite repetition of the static game (Figure 1). Playing the Nash equilibrium strategies of the static game in each period is a subgame perfect equilibrium in the repeated game (Fudenberg and Tirole, 1991, p. 149). As all periods are identical in all relevant respects, and we can drop the time subscripts.

4.2 The state's problem

With decisions constant over time we can solve the game backwards like the static game, starting from the state's decision. For any given project success probability π the state solves the infinite version of (3):

$$\min_{\theta} V^S = (1-\theta)c + \theta b \frac{1}{1-\delta(1-\pi)}. \tag{8}$$

The state weighs liquidation of the bank ($\theta = 0$) against the present value of an infinite sequence of potential bailouts ($\theta = 1$). A bailout policy is chosen if:

$$c \geq b\frac{1-\delta\pi}{1-\delta}. \tag{9}$$

There is a critical project success probability $\bar{\pi}$ that satisfies (9) with equality and makes the state indifferent between liquidation and bailout:

$$\bar{\pi} = \frac{b-(1-\delta)c}{\delta b} \tag{10}$$

The government will bailout (liquidate) the bank if the probability of project success π exceeds (falls short of) a threshold value $\bar{\pi}$. The comparative statics of the bailout threshold (10) are intuitive: $\bar{\pi}$ decreases in the collateral cost of liquidation c, and increases in bailout cost b and in the weight of the future, δ. When $\delta = 1$, $\bar{\pi} = 1$, i.e., when the state weighs the future like the present, it never bails out a bank.[17]

There are two extreme values of $\bar{\pi}$ (deriving directly from (10)) beyond which the bank will always or never be bailed out – irrespective of the success probability π the bank chooses for its project.

- The bank will always be rescued if $c \geq b/(1-\delta)$

[16]This excludes so-called "grim trigger" strategies, e.g.

[17]A bailout would never be necessary either, as with $\delta = 1$ a bank would hold the safe asset.

- The bank will never be rescued if $c \leq b$.

In the first case, the "crash-cost" exceeds the present value of the cost of a bailout in every single period; in the latter case, the "crash-cost" is even smaller than the cost of one single bailout. Between those two borders bailout or liquidation depend on whether the bank's chosen π is above or below the threshold value.

4.3 The bank's problem

The bank is more cautious in a repeated game, compared to the static game, as long as it does not expect a bailout. If it expects a bailout policy it chooses the same risk level as in the static game. The fact that bailouts are only available at a minimum success probability may lead the bank to sacrifice same expected return in order to keep the bailout subsidy.

In the *no-bailout scenario* ($\theta = 0$) the bank solves:

$$\max_{\pi} V^B(0) = \frac{1}{1-\delta\pi}\pi R(\pi) \tag{11}$$

$$\text{s.t. } \bar{\pi} \geq \pi^B(0) \tag{12}$$

As the constraint never binds (the bank does not forego expected return in order to avoid a bailout), the solution is given by the F.O.C.:

$$\eta_{R,\pi}(0) = \frac{dR(\pi)\pi}{d\pi \cdot R(\pi)} = -1 - \frac{\delta\pi}{(1-\delta\pi)} < -1. \tag{13}$$

This means that the bank chooses a safer project than in the static game (7). Consideration of future returns leads the bank to behave more prudently, as it cannot rely on state assistance. Note that, as in the static game, the bank's choice (but not $\theta = 0$) is first best.

In the *bailout scenario* ($\theta = 1$) the bank solves:

$$\max_{\pi} V^B(1) = \frac{1}{1-\delta}[\pi R(\pi) + (1-\pi)b] \tag{14}$$

$$\text{s.t. } \pi^B(1) \geq \bar{\pi} \tag{15}$$

As long as the constraint does not bind, the F.O.C. yields:

$$\eta_{R,\pi}(1) = \frac{dR(\pi)\pi}{d\pi \cdot R(\pi)} = -1 + \frac{b}{R} > -1. \tag{16}$$

This is the identical elasticity as in the static game (7) for $\theta = 1$. In other words: In the repeated game the bank would like to choose the same project as in the static game. In the presence of bailouts the long-run perspective has no impact on the bank's decision, as long as the bailout threshold $\bar{\pi}$ does not bind. If the constraint binds the bank chooses a safer project than in the unconstrained case, in order to keep the bailout option. The project optimal from the bank's point of view may even be safer than the project the bank would choose in the laissez-faire case, in the absence of a bailout option.

The bank's problem is illustrated in Figure 3. The figure is the repeated-game counterpart to Figure 2. The main difference between the infinitely repeated and the static game is that in Figure 3 vertical values are scaled by the factor $1/(1-\delta)$ representing present values in an infinitely repeated game. This scaling has a different impact on the solid line (project returns) and on the dashed line (project return plus bailout subsidy). The dashed line shifts upwards, while the solid line, running through the origin, shifted upwards *and* to the right. As a consequence, the maximum of the bank's expected return cum bailout subsidy (dashed line), stays the same, while the maximum of the project return (solid line) moves to the right of its counterpart in the static version of the game. This reflects the fact that a bank without state guarantee becomes more cautious under the longer time horizon. With state guarantee, project failure is never punished, and the time horizon is irrelevant for the bank.

4.4 Equilibria of the infinitely repeated game

The infinitely repeated game may have a bailout equilibrium (constrained or non-constrained) as well as no-bailout equilibrium. Which equilibrium prevails depends on the model parameters, in particular on the bailout threshold $\bar{\pi}$ (given by (14)). Figure 3 illustrates the role of $\bar{\pi}$. The threshold means that the bank's choice of points on the dashed line of aggregate expected return cum bailout is restricted to points to the right of $\bar{\pi}$. A threshold at $\bar{\pi}_1$, for example, has no impact on the bank's decision, as it lies below the bank's preferred level of $\pi^B(1)$. To the right of that level, however, the threshold becomes binding, as illustrated by $\pi^B(2)$. The bank would comply with this threshold and sacrifice some expected return (accept a point on the dashed line below its peak) for the purpose of keeping the bailout option (staying on the dashed, rather than on the solid line).

With a threshold above $\bar{\pi}_0$ the bank, in order to keep the bailout option, chooses an even safer project than in a state-less laissez-faire world. The introduction of state guarantee, therefor, can make banks safer. This result confirms a similar finding by (Cordella and Yeyati, 2003) in a rather simple way. There is, however, a maximum success probability, indicated by $\pi^{'} = \bar{\pi}_3$, the bank would accept. For any $\bar{\pi}$ beyond that value the reduction in expected return would hurt the bank more than the loss of implicit state guarantee. The bank would sacrifice the bailout option; it would choose $\pi^B(0)$ with an expected return exceeding

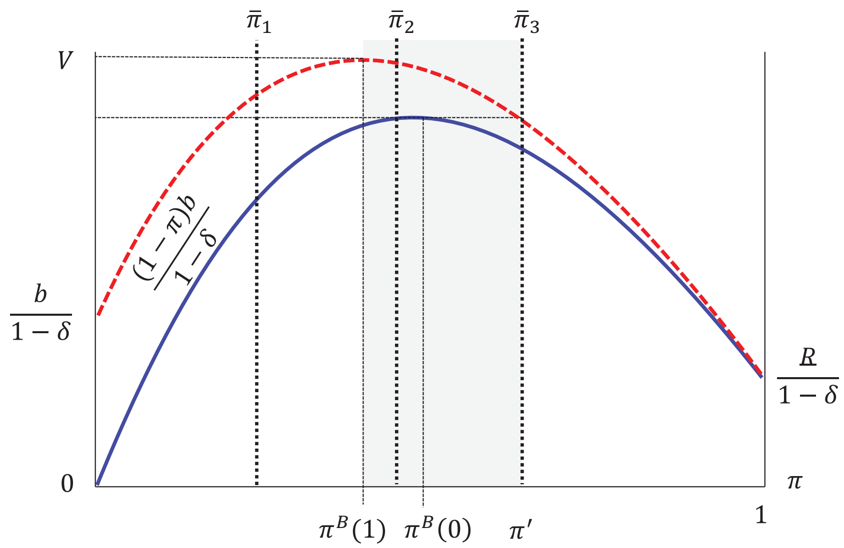

Figure 3: Expected returns: The banks' expected return with bailout (solid line) and and without bailout (dashed line). In the grey area the bailout threshold $\bar{\pi}$ constrains the bank's choice of success probability $\bar{\pi}$

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the one at $\bar{\pi}_3$. At $\pi^B(0)$ the bank gets a "reservation" level of expected return limiting concessions in favor of the bailout option.

The cliff effect is illustrated in Figure 4, plotting the bank's choice of π as a function of the bailout threshold $\bar{\pi}$. At low values of $\bar{\pi}$ the bailout constraint $\pi \geq \bar{\pi}$ does not bind. It only binds at levels above $\pi^B(1)$. Here, the bank is still safe enough to get a bailout, but it has to choose a safer project than it would in the absence of a constraint. To the right of $\bar{\pi}_3$ the constraint becomes too expensive. The bank ignores it and lives without state support.

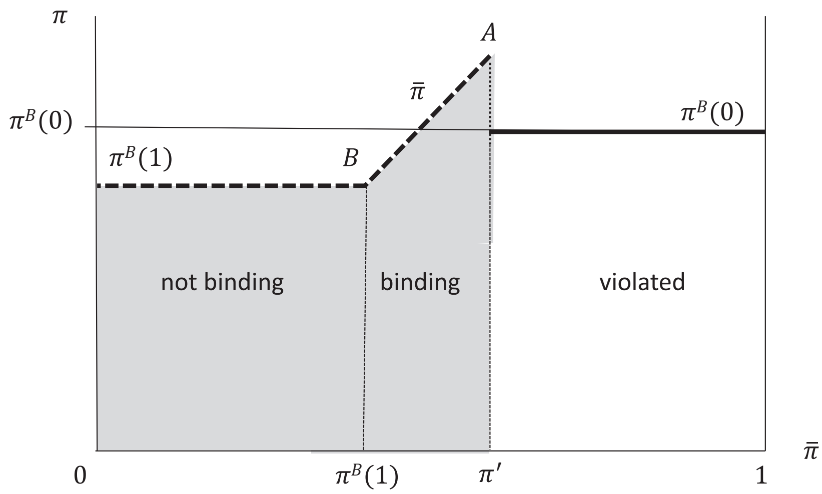

Figure 4: Equilibria of the infinitely repeated game: The bank's choice of project success probability (π) as a function of the bailout threshold $\bar{\pi}$ and the bailout region (shaded area). To the left of Point B, the bailout threshold does not bind ($\bar{\pi} < \pi^B(0)$). At B the constraint starts to bind. At Point A, π jumps down to $\pi^B(0)$ as the bank ignores the bailout option at higher values of $\bar{\pi}$ (the cliff effect).

5 The finitely repeated game

Implicit state guarantee for banks may come to a natural end when the state runs out of funds. Empty pockets may even be the only credible strategy to commit to "never again" bail out a bank. We therefore analyze a repeated game in which the state is subject to a financial constraint allowing only a finite number of bailouts. We denote the remaining number of potential bailouts at any time by n and call nb the "bailout fund".[18] With the state variable n individual rounds of the game are no longer identical. Neither the state's choice of bailout policy nor

[18]Note that n is not a time subscript; the game may have several consecutive rounds with project success and n constant.

the bank's project choice are likely to remain constant as n decreases over time. Indeed, as the bailout fund decreases, the bank becomes more cautious, trying to use the remaining bailout options parsimoniously. Conversely, increasing caution by the bank may lead the state to become more bailout-friendly, as it is cheaper to rescue a relatively safe bank.

In the finite game it is no longer the state who has the last word, but the bank (chooses the final π after the last bailout). The finite game therefore structurally differs from both the static and the infinitely repeated game. In order to keep the games comparable we modify one of our informational assumptions: We assume that the bank credibly announces the success probability π it will choose in the next period. This assumption gives the last word back to the state and keeps the finitely repeated game comparable to the static and the infinitely repeated game.

5.1 The state's problem

The state may become more cautious or more reckless when the bailout fund gets smaller. The state's decisions are still summarized by the bailout threshold $\bar{\pi}$; only, this threshold now has a subscript n for the (decreasing) number of "bullets" available to ward off a bank collapse. We will show under what conditions the threshold $\bar{\pi}_n$ increases or decreases in n.

With $n+1$ possible bailouts left the state solves:

$$\begin{aligned} \min_{\theta_{n+1}} V^S_{n+1} &= (1-\theta_{n+1})c + \theta_{n+1}(b+\delta v^S_n) \\ &= \min(c, b+\delta v^S_n), \end{aligned} \tag{17}$$

where V^S denotes the expected cost at the state's decision node, i.e., *after* the bank's project has failed. By contrast, v^S is the expected cost of optimal bailout/liquidation policy (with n potential bailouts left) *prior* to project success/failure. In Figure (1), V^S is expected cost at Node (2), while v^S is expected cost at Node (1). The relation between v^S_{n+1} and V^S_n, the pre- and post-bailout values in the same round of the game is:

$$v^S_{n+1} = \frac{1-\pi_n}{1-\delta\pi_n} V^S_n, \tag{18}$$

the fraction measuring the probability of one failure $(1-\pi_n)$ in a potentially unlimited number of success periods $(1-\delta\pi_n)$.

The bailout criterion with $n+1$ potential bailouts left becomes:

$$c \geq b + \delta v^S_n = b + \delta \frac{1-\pi_n}{1-\delta\pi_n} V^S_n, \tag{19}$$

i.e., the state weighs cost c against the cost of a bailout b plus the present value of future cost (of bailouts or liquidation), v_n^S. Take as an example the very last bailout decision (with $n = 1$). The state will use its last "bullet" if:

$$c \geq b + \delta v_0^S = b + \delta \frac{1-\pi_0}{1-\delta\pi_0} c, \tag{20}$$

where π_0 denotes the success probability the bank will choose once the bailout fund is exhausted. The state weighs the cost of an immediate bank collapse (c) against the direct cost of a bailout (b) plus the indirect cost in form of the eventual later collapse of the bank (the last term in (20)). In an analogy to music we could call that latter term the "coda", the end of a piece played after all repetitions. Note that it is the coda that distinguishes the repeated game at $n = 1$ from the static game discussed above.

Solving (20) for $\bar{\pi}_0$, the probability at which (20) holds with equality yields:

$$\bar{\pi}_0 = \frac{b - (1-\delta)c}{\delta b} = \bar{\pi} \tag{21}$$

This is a remarkable result: The bailout threshold at the very last bailout decision (at $n = 1$), $\bar{\pi}_0$, is identical to the bailout threshold in the infinitely repeated game $\bar{\pi}$. The existence of the bailout threshold does not require an expectation of an infinite series of future bailouts; the same threshold applies if the state just takes into account that a bank does not disappear with a bailout but lives on and will fail some day in the infinite future (with or without any further bailouts).

This benchmark result does not imply that the bailout threshold is independent of n. The bank is unlikely to choose $\pi_n = \bar{\pi}$ (see below). Therefore, we have to formulate the state's optimal policy for any path of π_n chosen by the bank. The state's policy consists of a path of $\bar{\pi}$ as a function of n. We denote by $\bar{\pi}_{n,n-1}$ the minimum success probability to be chosen by the bank at $n-1$ that induces the state to bailout the bank, if necessary, at n. For simplicity we drop the second subscript and define $\bar{\pi}_n \equiv \bar{\pi}_{n,n-1}$.

We find $\bar{\pi}_n$ by iterating (18) forward as:

$$v_n^S = \frac{(1-\pi_n)}{1-\delta\pi_n} V_{n-1}^S = \frac{(1-\pi_n)}{1-\delta\pi_n} \min(c, b + \delta v_{n-1}^S), \tag{22}$$

and solving (19) for equality. This yields:

$$\bar{\pi}_n = \frac{\min\left(c, b + \delta v_{n-1}^S\right) - (c-b)/\delta}{\min\left(c, b + \delta v_{n-1}^S\right) - (c-b)}. \tag{23}$$

From here, we derive the state's optimal policy, summarized by $d\bar{\pi}_n/dn$, in two steps. First, we look at $d\bar{\pi}_n/dv_{n-1}^S$, the change in the bailout threshold with a marginal change in the state's expected future cost. Second, we examine $\Delta v_n^S/\Delta n$, the change in expected future cost with a unit change in n.

The first step is the easier of the two. From (23) it follows that $d\bar{\pi}_n/dv_{n-1}^S > 0$. The higher the state's future cost, v_{n-1}^S, the higher the current bailout threshold. The nominator in (23), and hence the denominator, are positive (unless $b < (1-\delta)c$, in which case a bailout is always preferable, independently of π, see (10)). Taking derivatives yields $d\bar{\pi}_n/d\min(.) \geq 0$ and, if $\min(.) < c$, $d\bar{\pi}_n/dv_{n-1}^S > 0$).

The intuition for this result is straightforward. The higher the cost the state saves by the n-th last bailout compared to liquidation (the lower v_{n-1}^S), the more attractive is a present bailout, and the lower ceteris paribus the required next period $\bar{\pi}_n$.

Having shown that $\bar{\pi}_n$ increases with the state's expected future cost v_{n-1}^S, we need to examine how v_n^S changes, when n changes, i.e., when the bailout fund is depleted. Intuition suggests that the influence might go either way. On the one hand, lower n means that the bitter pill of a bank collapse cannot be postponed much longer; *ceteris paribus* the present value of the state's cost thus tends to *increase* as the bailout fund is depleted. The effect is strong when c is high relative to b. We call this the *loss* effect. On the other hand, lower n may lead the bank to become more cautious and choose higher π^B. A higher π_n^B, i.e., a reduction in bank risk, reduces the present value of the state's cost v_n^S and sweetens the bitter pill of the looming bank collapse. We call this the *probability* effect.

We illustrate the two effects by example of the last two "periods" with $n = 0$ and $n = 1$, respectively. Expected (pre-failure) cost terms v_0^S and v_1^S are:

$$v_0^S = \delta \frac{1-\pi_0}{1-\delta\pi_0} c, \tag{24}$$

$$v_1^S = \delta \frac{1-\pi_1}{1-\delta\pi_1} [b + \delta \frac{1-\pi_0}{1-\delta\pi_0} c]. \tag{25}$$

The right-hand side of (24) and the last expression in (25) are again the coda, as defined above. (The cost of any bailout at $n > 1$ can be found by iterating (25).)

The *loss effect* is visible if we hold π_n constant, i.e., $\pi_1 = \pi_0$. Then, the sign of the difference $v_1^S - v_0^S$ depends on the very right-hand terms in (24)and(25), respectively. If a bailout with the last "bullet" is cheaper than an immediate collapse ($c > b$+coda), then $v_1^S - v_0^S$ is negative. In other words: If the loss effect dominates the expected cost *increases* when the number of remaining potential bailouts n falls.

The *probability effect* is visible if we assume that the state is indifferent with the last bailout decision, i.e., the very right-hand terms are equal ($c = b + c > b$+coda). Then, the sign of the difference $v_1^S - v_0^S$ depends on the difference in the probabilities chosen by the bank. At the limit, a switch by the bank to total safety, from $\pi_1 < 1$ to $\pi_0 = 1$, would lead to $v_0^S = 0$. We will show below that the bank indeed becomes more cautious as the fiscal cliff approaches, i.e., $\pi_1 < \pi_0$. If $\pi_1 < \pi_0$, then c.p. $v_1^S - v_0^S$ is positive. In other words: If the probability effect dominates the expected cost *decreases* when the number of remaining potential bailouts n falls.

These results can be extended to the general case, the value of v_n^S being found by expanding (25). As the number of remaining potential bailouts n gets large, its marginal impact on the state's bailout threshold $\bar{\pi}_n$ becomes small (As $n \to \infty$, $\bar{\pi}_n - \hat{\pi}_{n-1} \to 0$) ($\bar{\pi}_n - \bar{\pi}_{n-1} \to 0$)).

We now have both elements to assess the impact of a decrease in the bailout fund on the state's optimal policy. We have shown first, that the state sets a higher bailout threshold $\bar{\pi}_n$, the higher the present value of the state's future cost (of bailout or bank collapse). Second we have shown that the present value of the state's future cost increases or decreases in n depending on which of the two effects, the loss effect and the probability effect, dominates.

Therefore we can summarize that state's bailout policy ($\bar{\pi}$) as a function of the number of remaining potential bailouts n as follows:

1. **Loss effect dominates:** With a reduction in the bailout fund,
   - the state becomes more conservative ($\bar{\pi}_{n-1} > \bar{\pi}_n$),
   - the state becomes worse off ($v_n^S < v_{n-1}^S$),
   - the state is eager to increase the bailout fund.
2. **Probability effect dominates:** With a reduction in the bailout fund,
   - the state becomes more aggressive ($\bar{\pi}_{n-1} > \bar{\pi}_n$),
   - the state becomes better off ($v_n^S < v_{n-1}^S$),
   - the state is eager to decrease the bailout fund.

These results may look paradoxical at first sight. Why would a state, if the loss effect dominates, become more conservative in its bailout policy, but eager to increase the bailout fund? The explanations is simple: The state wants to be as far from the last bailout as possible. Both, becoming conservative and increasing the bailout fund, serve that same purpose. Conversely, if the probability effect dominates, the bank becomes more aggressive, while it would want to commit not to be so. Here the explanation is that the state benefits from an exhaustion of the bailout fund both, by using it and by reducing it by other means.

5.2 The bank's problem

The bank tends to become more cautious, as the state's bailout fund gets exhausted by repeated bailouts. At each value of n, the bank's optimal response is pair of project success probabilities $\pi(\theta)$ for each of the two bailout parameters $\theta = 0$ (no bailout) and $\theta = 1$ (bailout)

In the *no-bailout scenario* ($\theta = 0$), when the bank knows (actually: chooses) that it will not be rescued, the number of potential bailouts is irrelevant for its decisions. In this case the bank solves:

$$\begin{aligned} \max_{\pi} V_n^B(0) &= \frac{1}{1-\delta\pi_n}\pi_n R(\pi_n) \\ \text{s.t. } \pi_n^B &< \bar{\pi}_n \end{aligned} \tag{26}$$

which is the same problem as in the no-bailout case of the infinitely repeated game (11). The constraint never binds, and the solution is the same $\pi B(0)$ as in the no-bailout mode of the infinitely repeated game above (13).

The more interesting is the *bailout scenario* ($\theta = 1$) in which the bank anticipates (or: chooses) a bailout when n potential bailouts are left. The bank solves:

$$\begin{aligned} \max_{\pi_n^B} V_n^B &= \frac{1}{1-\delta\pi_n}[\pi_n R(\pi_n) + (1-\pi_n)(b + \delta V_{n-1}^B)], \\ \text{s.t. } \pi_n^B &\geq \bar{\pi}_n. \end{aligned} \tag{27}$$

In the unconstrained case, the F.O.C. reads:

$$\frac{dV_n^B}{d\pi_n} = 0 = \frac{dR(\pi_n)\pi_n}{d\pi_n R} + \frac{1}{1-\delta\pi_n} - \frac{1-\delta}{1-\delta\pi_n}\frac{b+\delta V_{n-1}^B}{R}. \tag{28}$$

and the elasticity of period project return R with respect to π_n at the optimum, π_n^B, is:

$$\eta_{R,\pi_n}(1) = -1 - \frac{\delta\pi_n^B}{1-\delta\pi_n^B} + \frac{(1-\delta)\pi_n^B}{1-\delta\pi_n^B}\frac{b+\delta V_{n-1}^B}{R}, \tag{29}$$

This is equal to the elasticity in the infinite bailout case plus the term on the right-hand side. That term is positive, but smaller than the second term. That makes $\eta_{R,\pi_n}(1)$ in absolute terms smaller than its counterpart in the infinite no-bailout mode, but larger than in the infinite bailout mode. A lower elasticity in absolute terms implies higher π (see explanations to (7) above). Hence, the bank's optimal success probability with n remaining bailouts is higher than in the infinite no-bailout mode (13), but lower than in the infinite bailout mode (16): $\pi^B(1) < \pi_n^B(1) < \pi^B(0)$. Further, as $V_n^B > V_{n-1}^B$, the bank's optimal success probability increases, when n decreases: $\pi_n^B(1) < \pi_{n-1}^B(1)$.

To sum up: With an increase in the number of remaining potential bailouts the bank's optimal (unconstrained) success probability decreases:

$$\frac{\Delta \pi_n^B(1)}{\Delta n} \leq 0. \tag{30}$$

When the state runs out of funds, the bank knows that soon bailouts may not be available any more and chooses projects with increasing success probability. The bank's optimal success probability moves from the optimum with infinite bailouts to the optimum in the no-bailout scenario.[19] In Figure 3 the bank's unconstrained optimal value of $\pi_n^B(1)$ moves from the infinite bailout optimum $\pi^B(1)$ to the infinite no-bailout optimum $\pi^B(0)$.

In a constrained optimum, where (27) holds with equality, the banks chooses $\pi_n^B = \bar{\pi}_n$. However, with decreasing n, the present value of expected bailout subsidies falls. In Figure 3 the dashed line shrinks toward the solid line. The bank finds it less and less attractive to satisfy a $\bar{\pi}$-constraint that binds *above* the no-bailout optimum $\pi^B(0)$. The cliff effect illustrated in Figure 4 therefore erodes (π' moving to the left) as the bailout fund is depleted.

5.3 Equilibria of the finitely repeated game

Putting the state's and the bank's optimal strategies together yields the equilibria of the finitely repeated games. Optimal strategies of each player are bailout decisions (state) and success probability choice (bank) at each level of the bailout fund (n). At any n, each party's optimal decisions depend on its own and the counterparty's future decisions.

We solve the game backwards. The linchpin of equilibrium analysis is therefore π_0, the success probability the bank chooses if no more bailouts are available.

We first look at equilibria where the state would not bailout the bank at $n = 1$. This is the case when $\bar{\pi}_1 > \pi_0$. If the state does not use its last bailout bullet, the second last bullet ($n = 2$) automatically becomes the last. Hence, if there is no bailout at $n = 1$ there is never a bailout at any level of $n > 1$. This is a trivial case, and to some degree it is a well-known artifact of games with a finite horizon. In the infinitely repeated game, by contrast, we did find a bailout equilibrium in which the bailout threshold $\bar{\pi}$ exceeds the success probability the bank would choose in the no-bailout case $\pi^B(0)$. There, accepting a safety level above $\pi^B(0)$ was the price for the bailout option. The bridge between the finite and infinite models can be bridged by allowing the bank to pre-commit to future choices of π.[20] We did, in fact, assume that in the finite game the bank can promise π one period ahead. At $n = 1$, the bank may therefore promise some $\pi > \pi_0$ for the period immediately after the last bailout. If this is sufficient to

[19]Note that in our model a bailout does not create expectations regarding future bailouts; players are rationally forward looking and build expectations on the basis not of past but of future bailouts.

[20]An alternative would be stochastical termination, turning the finite game in a de facto infinite game.

comply with $\bar{\pi}_1$, the game has a permanent bailout equilibrium (until the first failure after reaching $n = 0$) characterized by $\pi_{n>0} = \bar{\pi}_1$. There is no "never again" effect at positive levels of n, though.

Second, we look at the more interesting equilibria characterized by a bailout at $n = 1$, i.e., by $\bar{\pi}_1 < \pi_0$. These equilibria are illustrated in Figure 5. The top Panel (a) illustrates the case where the loss effect dominates, i.e. where the bank's moral hazard at higher values of n is weak and the bank's optimal success probability π (solid line) increases but slowly as n goes to zero. In this case, the bank, even at higher levels of n, chooses a safer project than would be required for a bailout. The state's bailout threshold $\bar{\pi}n$ (dashed line) therefore decreases in n. To put it the other way round: When the loss effect dominates, the state becomes more cautious as the fiscal cliff ($n = 0$) approaches. Yet, the state's increasing caution is not relevant: The bank voluntarily chooses safer projects than are required for a bailout.

The bottom Panel (b) illustrates the case where the probability effect dominates, i.e. where the bank's moral hazard at higher values of n is strong and the bank's optimal success probability π (solid line) increases strongly as n goes to zero. In this case, the bank would choose levels of π below the bailout threshold $\bar{\pi}n$ at values of $n > n'$. The state's bailout threshold $\bar{\pi}n$ (dashed line) therefore increases as the fiscal cliff ($n = 0$) approaches. To the left of n' the bailout threshold binds, and the bank would choose at values of $n > n'$. Once, n drops to n' the state's grip becomes lose; the bank voluntarily increases its success probability above the levels required for a bailout.When the probability effect dominates, the state becomes more aggressive as the fiscal cliff ($n = 0$) approaches, but this is of no consequence.

The state is unlikely to follow a "never again" policy as the fiscal cliff gets closer. The state only tends to become more cautious when the loss effect dominates ($\bar{\pi}n$ increasing as n decreases); but this is the case in which the bailout threshold probability does not bind as it falls short of the bank's optimal success probability. In the opposite case, where the probability effect dominates ($\bar{\pi}n$ decreasing as n decreases), the state even becomes more aggressive as the fiscal cliff gets closer. The faster the bank reduces risk, the more attractive becomes a further bailout. The expectation that the bank will "never again" need a bailout in the future makes a present bailout almost irresistible.

6 Conclusions

The model presented above leads to rather sobering conclusions regarding implicit state (taxpayer) guarantee for banks. Governments may have the best intentions to rescue weak banks "never again"; yet, such intentions are hardly ever realistic, let alone. The state does not even lose its appetite for bailouts when it will soon run out of money. To the contrary, bailouts may even become

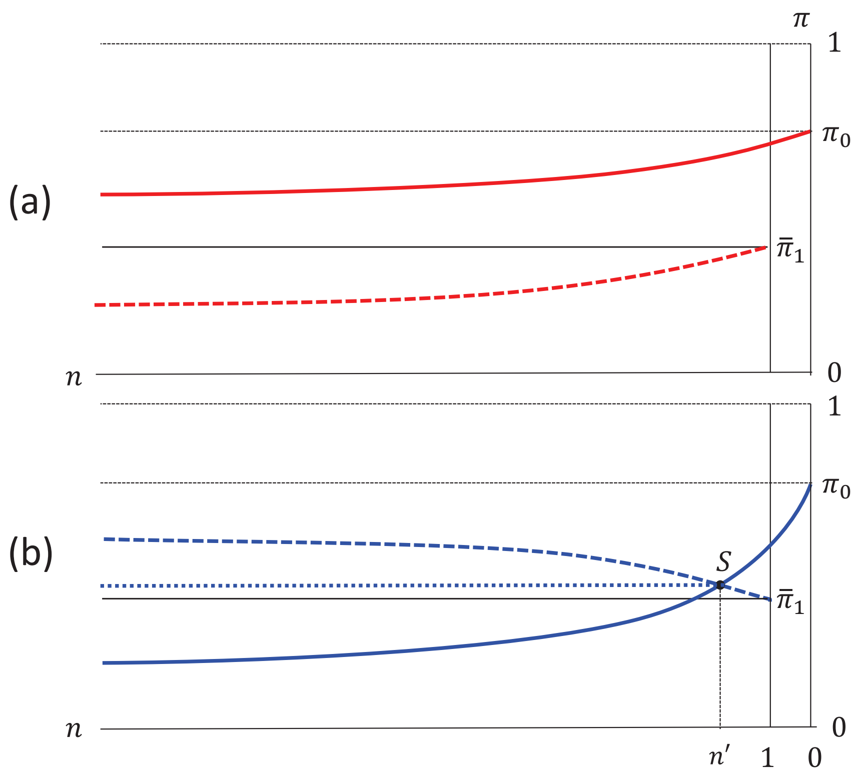

Figure 5: The bank's choice of success probability π (solid curves) and the resulting state's bailout threshold $\bar{\pi}$ at $n+1$ (dotted curves), both as a function remaining bailouts n. In Panel (a) the loss effect dominates; $\bar{\pi}$ never binds. In panel (b) the probability effect dominates; $\bar{\pi}$ binds from point S to the left (along the dotted line).

more attractive: As the state's "bailout fund" is depleted, banks are getting more cautious, and a cautious bank is cheaper to rescue than a risky bank. Only with a sufficiently long horizon (and the respective financial means) the state's dislike of bailouts tends to become a binding constraint on a bank's risk taking. With an infinite horizon, a bank may even find it optimal to reduce risk below the social optimum if this is necessary to preserve the bailout option.

A commitment to rescue banks "never again" is neither credible nor necessarily desirable. Letting a systemically relevant bank fail is not rational *ex post*. Even *ex ante*, implicit state guarantee may be better than its reputation. True, the prospect of a bailout leads a bank to take higher than socially optimal risk, a phenomenon usually called moral hazard. Yet, even in the absence of a state, systemically important banks (ignoring the collateral damage of their failure) assume more risk than would be socially optimal. Moral hazard is caused by banks' very systemic importance. State guarantee modifies, rather than causes moral hazard. As it avoids systemic damage from a bank collapse it increases welfare ex post and, on the bottom line, may even increase it ex ante.

The slogan "never again a bailout" therefore addresses the wrong problem. The real problem is not implicit state guarantee but banks' very "systemic relevance", the social cost of a bank collapse. For simplicity this cost is assumed to be exogenous to the above model. Yet, in the real world banks can influence the degree of their systemic relevance. The distortions created by banks' desire to become systemically relevant are an important aspect of the too-big-to-fail problem. The present paper suggests that fighting systemic relevance is the most promising strategy to deal with that problem. Rather than vilify bailouts we better ask: How can we prevent banks from becoming systemically relevant ever again?

Our findings may be relevant for real world issues like the bailout fund planned within the European Stability Mechanism (ESM). Such a fund may be less harmful than the moral hazard argument would suggest; it may even be too small to be effective (and it may not be financed by the ideal Pigouvian tax on systemic importance). Another issue are the so-called "living wills", bank's blueprints for resolution without systemic damage. If such blueprints work in practice they mitigate the problem of systemic cost of failure; yet, our model would suggest that the banks have an interest in blueprints that look as if they would work, but in an emergency situation do not. Such "cheating wills" would preserve systemic relevance and the related subsidies to the banking sector.

Our model cannot reject the pessimistic "doom-loop" view of banking and the state. If the existence of a protecting state leads banks to become systemically relevant and if, in turn, the existence of systemically relevant banks leads the state to become the lender (and loser) of last resort to the banks, then, market discipline in banking will only come back in financially failed states.

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