

Confidence Banking^{*}

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Abstract

A shadow unregulated banking system flourished during the first decade of the century and suddenly collapsed in less than a year. It is widely accepted this shadow system was based on confidence, but it is not clear how confidence can spur so much and then disappear so fast. In this paper I argue confidence is sustained by the recognition that financial agents care about reputation. While reputation incentives generate an alternative cheaper than traditional banking to provide financing needs, it is also a fragile alternative, that may suddenly collapse. This implies financial regulation should be counter-cyclical, but not imposing more costs to traditional banking during good times but inducing more benefits to better firms during bad times.

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1 Introduction

The first part of this century witnessed the flourishing of a new banking system. This system was characterized by a wide myriad of highly leveraged non-deposit-taking institutions that lend long and illiquid and borrow short in liquid markets. These institutions were functionally very similar to banks but barely supervised or regulated. They hold very little capital and were not subject to any meaningful prudential requirements as regards liquidity, leverage or any other feature of their assets and liabilities. They also have very few reporting obligations and have to meet few governance standards. Examples include hedge funds, private equity funds, money-market funds, monolines, conduits, SIVs and other special-purpose, off-balance sheet vehicles.

This system, which grew exponentially during a decade, suddenly disappeared in less than a year. The panic that destroyed the system started in August 2007 and was characterized by a run in the repo market¹ which suffered a run when "depositors" required increasing haircuts (Gorton and Metrick (2009)). Prior the repo market, there was also a run on SPVs. (Gorton (2010)).

In this paper I argue that this system emerges and spreads out based on agents' confidence that unregulated financial institutions will behave as if they were regulated. Confidence is sustained because agents recognize financial institutions are concerned in building a reputation of good behavior. If confidence prevails, this system generates a cheaper alternative to provide the same services than those provided by traditional banking.

Reputation concerns are based on two premises. The first is that the value of reputation critically depends on the expected aggregate state. If business opportunities in the future are not very promising, the value of having a good reputation is not very valuable. Second, reputation formation creates complementarities across financial institutions. If investors think that all institutions will fulfill their promises, an institution that decides not to do so will suffer a big reputation loss. Contrarily, if investors believe most institutions will misbehave, bad results cannot provide enough information to update reputation. These two properties imply that reputation con-

¹The repo market is a form of banking that involves the "deposit" of money on call (short term, mostly over night) backed by collateral

cerns may suddenly collapse and, with them the "confidence system".

There is ample evidence that the system developed in the last years have relied heavily on confidence about the good behavior of counterparties. Similarly, the collapse since August 2007 also seems to have been determined by a collapse in confidence about the whole system. In a Washington Post column, Samuelson wrote, at the onset of the current crisis "It's all about confidence. Every financial system depends on trust. People have to believe that the institutions they deal with (their "counterparties") will perform as expected. We are in a full-blown crisis because investors and financial managers the people who run banks, investment banks, hedge funds, insurance companies have lost that trust. Banks recoil from lending to each other; investors retreat".²

Given the wide diversity of institutions that compose "confidence banking", I formalize the effects of reputation concerns focusing on just one of these instruments, Special Purpose Vehicles (SPVs). These are bankruptcy remote legal entities set up by a sponsoring institution to finance itself off-balance sheet. All other instruments share the reliance on confidence and hence its fragility.

Each firm (or financial intermediary) in the economy need to finance two indivisible projects. There are two types of firms: Good firms have very valuable projects, each of which generates enough to cover the total debt when succeeding. Bad firms' projects can only cover its own debt when succeeding. We compare two financing alternatives. Raising debt to finance both projects or financing one with debt and the other with an SPV.

Debt is on-balance sheet, which means it is subject to bankruptcy procedures in case of default. This generates incentives for firms to avoid bankruptcy whenever as possible, which means good firms only default in case both projects fail. Contrarily, SPVs are off-balance sheet, which means they are bankruptcy remote (they can default but there is no bankruptcy in that case). This means good firms should cover them only in case the related project succeed, since effectively the project's proceeding are sold to investors.

However good firms may have incentives to channel funds from a successful project financed by debt to cover SPVs in trouble too. Doing this, the firms may send a

²"The Great Confidence Game", R. Samuelson, Washington Post, 09/28/08.

signal to investors that they manage good projects, since bad firms cannot cover both debt and SPV with just one project. However this incentive exists as long as the expected gains from reputation are large enough. When these incentives are small and investors believe good firms will not cover SIVs in trouble, there is no reputation gains in case of payment and hence no incentives for good firms to cover SPVs.

This complementarity between firm's actions channeled through investors' beliefs create multiplicity. We select a unique equilibrium by assuming imperfect information about the expected aggregate state that affect reputation gains and then applying global games techniques. The unique equilibrium is characterized by a sudden change in firms strategies to cover SPVs in trouble. For example, if firms suddenly decide not to cover SPVs, there is a sudden increase in haircuts and a collapse of this particular "confidence banking" instrument.

Good aggregate perspectives create reputation incentives for firms to cover SPVs in trouble without relying on costly regulation procedures. This is true for all instruments and institutions that are based on confidence and hence belong to "confidence banking". When bad news arrive and the aggregate perspectives deteriorate reputation incentives, there may be a sudden collapse in the system.

I introduce also monitoring of projects, such as good firms are not only running projects with higher expected payoffs but also have the possibility of monitoring projects at a cost and identifying those with a higher probability of success. However the incentives to monitor reduce as good perspectives increase, reducing the difference between probability of success between good and bad firms. Since the signalling when good perspectives is weaker, the reputation incentives are also weaker, and hence even mild news may generate a collapse in the system.

This result is relevant for thinking the future financial landscape and the role of regulation in it. I show "confidence banking" is desirable since it leverage on costless reputation concerns to induce efficient allocations. However it faces the possibility of a sudden and costly collapse. This suggests the need of a cyclical regulation.

After the recent financial crisis there is a growing agreements among academics and regulators about the need for introducing counter-cyclical elements into regulation. The idea is that regulation should be more stringent during the height of a bubble in order to reduce the incentives for excessive risk-taking. However these proposals

relate to regulation for the regular banking system. For example, Goodhart and Persaud³ have presented a specific proposal: increasing Basel II capital requirements by a ratio linked to recent growth of total banks assets.

In this paper I also argue counter-cyclical regulation is optimal. However, I show counter-cyclical regulation based on increasing the "sticks" for traditional banking may be misleading. The reason is that, during booms, confidence allows the generation of unregulated "confidence banking". More stringent regulation during booms spur "confidence banking", and hence the probability of a financial collapse remains in the economy.

I argue regulation should be designed to make "carrots" counter-cyclical. By buffering losses in bad times to those firms that increase or maintain their reputation it is possible to avoid collapses in reputation incentives. Similarly, during good times it is not necessary to provide "carrots" since the system can sustain "confidence banking" by itself. A similar reasoning applies to introduce incentives to monitor. Even when in good times monitoring cannot improve probabilities much, regulation can increase the expected gains for a given difference in reputation. Hence regulation can be made counter-cyclical by tying rewards to aggregate state and to changes in reputation.

In next section I describe the institutional details of SPVs, which make them an instrument based on confidence. In Section 3, I show why these instruments rely on reputation concerns, their source of efficiency and also their source of fragility. In Section 4, I add to the model monitoring decisions. In Section 5, I discuss regulation implications. In Section 6, I show simulation of how monitoring and default decisions reinforce each other. Finally, in Section 7, I make some final remarks.

2 Special Purpose Vehicles

The traditional banking sector is regulated to prevent crises. The clearest example is insured demand deposits. Another example is the use of bankruptcy laws that provides an insurance mechanism for creditors. The existence of these firewalls is costly but important to avoid panics, losses of confidence, etc.

³"How to avoid the next crash", Financial Times, 01/30/08.

In this paper we focus on a particular method of unregulated financing instrument, special purpose vehicles (SPVs), which we argue constitute a particular form of what we call "confidence banking". By financing the firm using both on-balance sheet and off-balance sheet instruments, the SPV sponsoring firm maintains control over the business decisions while the financing is done in SPVs that cannot make business decisions. The key is that SPVs are not subject to bankruptcy costs because, as a matter of design, they cannot in practice go bankrupt.

To describe SPVs we follow Gorton and Souleles (2006). SPVs are essentially robot firms that have no employees, make no substantive economic decisions, have no physical location, and cannot go bankrupt. We argue that investors are willing to acquire these instruments at a price beneficial to the firm, even when bankruptcy is not an option, if they believe sponsors will behave as if they were subject to bankruptcy procedures.

These beliefs may be sustained by reputation concerned sponsors, even though they are not legally bound to support their SPVs. In fact under accounting and regulatory rules sponsors are not supposed to provide support. However, this support is recognized by U.S. bank regulators who usually refer as implicit recourse or moral recourse as the provision of credit support, beyond contractual obligations. Gorton and Pennacchi (1989 and 1995) discussed the issue of implicit recourse in financial markets in the context of the bank loan sales market and provide empirical evidence for its existence.

In the U.S. it is not possible to waive the right to have access to the governments bankruptcy procedure, but it is possible to structure an SPV so that there cannot be an event of default which would throw the SPV into bankruptcy. This means that debt issued by the SPV should not include a premium reflecting expected bankruptcy costs, as there never will be any such costs. A benefit to sponsors is that off-balance sheet debts are cheaper, *ceteris paribus*.

In what follows, and based on Klee and Butler (2002) and Gorton and Souleles (2006), I discuss the institutional details of SPVs. A special purpose vehicle is a legal entity which has been set up for a specific, limited purpose by another entity, the sponsoring firm. An SPV can take the form of a corporation, trust, partnership, or a limited liability company. The SPV may be a subsidiary of the sponsoring firm, or it may be an orphan SPV, one that is not consolidated with the sponsoring firm for tax, account-

ing, or legal purposes (or may be consolidated for some purposes but not others). An SPV is off-balance sheet of the sponsor firm if meeting the requirements set forth in Financial Accounting Standard 140. To fulfill these requirements the SPV must be a separate and distinct legal entity from the sponsor (the sponsor does not consolidate the SPV for accounting reasons). It must be an automaton in the sense that there are no substantive decisions for it to ever make, simply rules that must be followed; it must be bankruptcy remote, meaning that the bankruptcy of the sponsor has no implications for the SPV

That the SPV itself must (as a practical matter) never be able to become bankrupt is its most essential feature. This means that should the sponsoring firm enter a bankruptcy procedure, the firm's creditors cannot seize the assets of the SPV. It also means that the SPV itself can never become legally bankrupt. The most straightforward way to achieve this would be for the SPV to waive its right to file a voluntary bankruptcy petition, but this is legally unenforceable. The only way to completely eliminate the risk of either voluntary or involuntary bankruptcy is to create the SPV in a legal form that is ineligible to be a debtor under the U.S. Bankruptcy Code. The SPV can be structured to achieve this result. The use of SPVs is simply a disguised form of bankruptcy waiver (Klee and Butler (2002)).

To make the SPV as bankruptcy remote as possible, its activities can be restricted, for example, from issuing debt beyond a stated limit. The SPV can also obtain agreements from its creditors that they will not file involuntary petitions for bankruptcy. Depending on the legal form of the SPV, it may require more structure to ensure effective bankruptcy remoteness. For example, if the SPV is a corporation, where the power to file a voluntary bankruptcy petition lies with the board of directors, then the charter or by-laws can be structured to require unanimity.

For securitization vehicles, shortfalls of cash leading to an inability to make promised coupon payments can lead to early amortization rather than an event of default on the debt. There is also the risk that if the sponsor of the SPV goes bankrupt, the bankruptcy judge will recharacterize the true sale of assets to the SPV as a secured financing, which would bring the assets back onto the bankrupt sponsor's balance sheet. Or the court may consolidate the assets of the sponsor and the SPV. As a result of this risk, most structured financings have a two-tiered structure involving two SPVs. The sponsor often retains a residual interest in the SPV that provides a form of

credit enhancement, but the residual interest may preclude a true sale. Consequently, the residual interest is held by another SPV, not the sponsor. The true sale occurs with respect to this second vehicle.

Securitization is one of the more visible forms of off-balance sheet SPVs. Securitization involves the following steps: (i) a sponsor or originator of receivables sets up the bankruptcy remote SPV, pools the receivables, and transfers them to the SPV as a true sale; (ii) the cash flows are tranching into asset-backed securities, the most senior of which are rated and issued in the market; the proceeds are used to purchase the receivables from the sponsor; (iii) the pool revolves in that over a period of time the principal received on the underlying receivables is used to purchase new receivables; (iv) there is a final amortization period, during which all payments received from the receivables are used to pay down tranche principal amounts.

3 Model

3.1 Description

A firm (or financial intermediary) seeks to finance two one period indivisible project. Each project requires \$1 to operate and is successful with probability p . There are two types of firms. Projects from good firms generate cash flows y_G in case of success while projects from bad firms generate $y_B < y_G$ in case of success. All projects generate 0 if failing. Each firm knows its own type and its reputation ϕ is the probability agents assigned it is a good firm.

Since firms do not have cash to invest, they have to borrow the money from infinitely many, risk neutral and perfectly competitive investors. Hence, the cost of the loan R will be determined such that lenders break even. Risk free interest rate is 0.

I assume $py_i > 1$ (regardless of the firm type, each project has a positive expected net present value), $y_i > R$ (the success of just one project is enough to pay the debt of that project, which is obviously an endogenous variable, but expressed in terms of primitives), $y_G > 2R$ (the result of a single good firm's project is enough to pay for the whole debt) and $y_B < 2R$ (the result of a single bad firm's project is not enough to pay for the whole debt).

There are several regulatory costs firms has to cover. We focus on bankruptcy costs C , which are determined by the procedures firms have to follow in case of default of their on-balance sheet debts. Since investors break even in determining the cost of the loan R , bankruptcy costs are effectively borne by the firm.

We will explore two financing possibilities:

- Financing both projects using debt (on-balance sheet). In this case the firm has total control and knowledge about the projects' proceedings and is subject to bankruptcy in case of default. In the case of bankruptcy, as in the standard debt contract, the creditors seize the total value of the asset at a cost C .
- Financing one project with debt (on-balance sheet) and the other via securitization, by establishing a SPV (off-balance sheet). The SPV is not subject to bankruptcy in case of default, but legally represents the sale of an asset back security or the proceedings of a certain project. In the model we assume for simplicity it is the second option and investors observe the success of the project financed by the SPV. Introducing the first option leads to the same conclusion, but with the need of adding an additional element, such as a collateral, which value (or probability of default) is observed ex-post and not related to the type of the firm.

3.2 Benchmark without Securitization

Given the assumption that lenders represent the long side of the market, the interest rate R is determined by equalizing the expected payment with the size of the individual loan 1. Hence, the interest rate R depends on the firm's reputation ϕ and the bankruptcy cost C .

$$R(\phi) = \frac{1 + [1 - (\phi\alpha_G + (1 - \phi)\alpha_B)]C}{\phi\alpha_G + (1 - \phi)\alpha_B}$$

where $\alpha_G = p + p(1 - p)$ is the probability good firms pay a debt (when either project succeed) and $\alpha_B = p^2 + p(1 - p) = p < \alpha_G$ is the probability bad firms pay a debt (when the related project succeed). The interest rate is basically the debt plus the expected

bankruptcy costs (which is transferred to the firm) divided the expected probability of repayment. Recall in this case firms do not have incentives to default when projects succeed. This is because default triggers bankruptcy and it is preferred for the firm to gain the difference $y - R$ if paying than nothing if going to bankruptcy.

Since expected bankruptcy costs are decreasing in ϕ and expected probability of repayment is increasing in ϕ , interest rates are decreasing in reputation. However, even when interest rates depend on reputation, default decisions do not. This is because bankruptcy imposes incentives to pay back debts, and does it at an expected cost $[1 - (\phi\alpha_G + (1 - \phi)\alpha_B)]C$.

The value function for a firm of type $i \in \{B, G\}$ is

$$U_i(\phi) = 2py_i - 2\alpha_i R(\phi) + \beta [\alpha_i V(\phi_P) + (1 - \alpha_i)V(\phi_{NP})]$$

where

$$\begin{aligned}\phi_P(\phi) &= \frac{\alpha_G \phi}{\alpha_G \phi + \alpha_B (1 - \phi)} \\ \phi_{NP}(\phi) &= \frac{(1 - \alpha_G) \phi}{(1 - \alpha_G) \phi + (1 - \alpha_B)(1 - \phi)}\end{aligned}$$

and $V(\phi)$ is a payment at the end of the period, which depends on reputation. For expositional reasons we assume this payment is exogenous and increasing in ϕ . It is possible to endogeneize $V(\phi)$ as a continuation value that naturally depends positively on ϕ through the negative relation with interest rates. This extension, even when cumbersome, it is straightforward and not necessary to illustrate the main point.⁴

It is important to highlight at this point that reputation updating only depends on the observation of payment or default. Since good firms are less likely to default and go to bankruptcy (in case both project fail) than bad firms (in case one project fails), observing payment is a good signal and reputation increases.

⁴See an application of how endogeneizing value functions in Ordóñez (2009)

3.3 Reputation and Securitization

We analyze securities as a financing mechanism that allows savings in bankruptcy and regulatory costs involved in on-balance sheets methods of finance. We propose reputation as the disciplining device firms and financial institutions use to pay securities that, given their off-balance sheet classification, are not subject to regulation and bankruptcy requirements. Securitization is then interpreted as a collusion between investors and the firm to save on bankruptcy costs or in general other regulatory costs. The idea is that one of the projects is financed through debt (on-balance sheet, subject to bankruptcy) and the other is financed through securitization (off-balance sheet, not subject to bankruptcy). We show these instruments arise in equilibrium when reputation concerns incentives work.

While the firm uses the proceedings from the project financed by securitization to cover its debts, it may decide not to use the cash flow from the project financed by debt to cover the payment to securitization. As discussed above, this is just one possible interpretation. Another possibility is to sell an asset back security, where the collateral value does not depend on the type of the firm and it is not known ex-ante by investors. Also in this case the good firm may decide to cover the security with proceedings from their projects in order to build reputation. A similar application can be used for credit card securitization where there is an implicit recourse of the bank to cover early amortizations, saving capital requirements (Calomiris and Mason (2004)).

Investors may charge different payments for the debt R_D and for the security R_S , such that, in expectation, they break even. From participation constraint, the debt interest rate is,

$$R_D(\phi) = \frac{1 + [1 - (\phi\alpha_G + (1 - \phi)\alpha_B)]C}{\phi\alpha_G + (1 - \phi)\alpha_B} = R(\phi)$$

The price of securities depends on the beliefs about good firms covering securities in trouble. In particular, $\hat{\alpha}_G(\hat{\tau}) = p + p(1 - p)$ is the probability good firms pay back the security, $\tau \in [0, 1]$ is the probability the firm uses the proceedings from a single project to pay back a security and $\hat{\tau}$ are the beliefs of investors about the firm's strategy. Hence $\hat{\alpha}_G(1) = \alpha_G > \hat{\alpha}_G(0) = p$

Bad firms keep paying securities just from the proceedings from the project financed

by those securities, not having enough funds to cover securities if only the project financed by debt succeed. Hence $\hat{\alpha}_B = \alpha_B = p$

$$R_S(\phi|\hat{\tau}) = \frac{1}{\phi\hat{\alpha}_G(\hat{\tau}) + (1-\phi)\alpha_B}$$

If $\hat{\tau} = 1$

$$R_S(\phi|1) = R_D(\phi) - \frac{[1 - \phi\alpha_G + (1-\phi)\alpha_B]}{\phi\alpha_G + (1-\phi)\alpha_B}C < R_D(\phi) = R(\phi)$$

The value function for good firms when following strategy τ , conditional on lenders believing those firms follow strategy $\hat{\tau}$

$$\begin{aligned}\tilde{V}_G(\phi, \tau|\hat{\tau}) &= 2py_G - \alpha_G R_D(\phi) - \hat{\alpha}_G(\tau) R_S(\phi|\hat{\tau}) \\ &\quad + \beta [\hat{\alpha}_G(\tau) V(\phi_P(\phi|\hat{\tau})) + (1 - \hat{\alpha}_G(\tau)) V(\phi_{NP}(\phi|\hat{\tau}))]\end{aligned}$$

Naturally, in this case, updating of reputation depends on the beliefs about the decisions of good types $\hat{\tau}$.

$$\begin{aligned}\phi_P(\phi|\hat{\tau}) &= \frac{\hat{\alpha}_G(\hat{\tau})\phi}{\hat{\alpha}_G(\hat{\tau})\phi + \alpha_B(1-\phi)} \\ \phi_{NP}(\phi|\hat{\tau}) &= \frac{(1 - \hat{\alpha}_G(\hat{\tau}))\phi}{(1 - \hat{\alpha}_G(\hat{\tau}))\phi + (1 - \alpha_B)(1 - \phi)}\end{aligned}$$

As shown in Figure 1, $\phi_P(\phi|\hat{\tau}) - \phi_{NP}(\phi|\hat{\tau})$ increases with $\hat{\tau}$.

Good firms cover a security in trouble with the proceedings a single successful project ($\tau = 1$) whenever

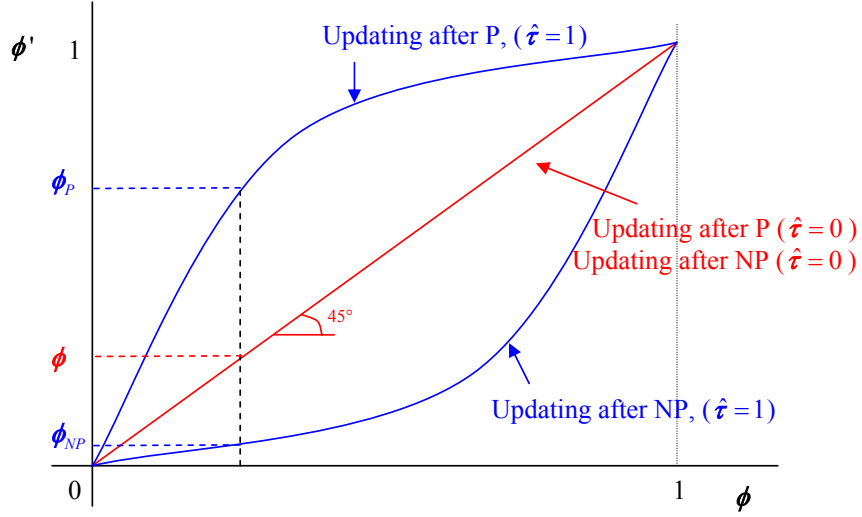
$$\Delta(\phi|\hat{\tau}) = \tilde{U}_G(\phi, \tau = 1|\hat{\tau}) - \tilde{U}_G(\phi, \tau = 0|\hat{\tau}) > 0$$

which can be rewritten as

$$\Delta(\phi|\hat{\tau}) = p(1-p)[\beta\hat{V}(\phi|\hat{\tau}) - R_S(\phi|\hat{\tau})] > 0$$

where $\hat{V}(\phi|\hat{\tau}) = V(\phi_P(\phi|\hat{\tau})) - V(\phi_{NP}(\phi|\hat{\tau}))$. Hence, the sufficient condition for a reputation equilibrium to exist ($\tau = \hat{\tau} = 1$) is,

Figure 1: Reputation Updating



$$\beta \widehat{V}(\phi|1) \geq R_S(\phi|1)$$

and no payment is an equilibrium ($\tau = \widehat{\tau} = 0$) if

$$\beta \widehat{V}(\phi|0) \leq R_S(\phi|0)$$

We call a reputation equilibrium a situation where firms cover securities in trouble with proceedings from a single successful project ($\tau = 1$), even when not being formally subject to bankruptcy procedures. The value function for good firms in a reputation equilibrium is,

$$\begin{aligned} U_G^s(\phi, \tau = 1 | \widehat{\tau} = 1) &= 2py_G - \alpha_G [R_D(\phi) + R_S(\phi|1)] + \beta [\alpha_G V(\phi_P|1) + (1 - \alpha_G) V(\phi_{NP}|1)] \\ &= U_G(\phi) + \alpha_G \frac{[1 - \phi\alpha_G + (1 - \phi)\alpha_B]C}{\phi\alpha_G + (1 - \phi)\alpha_B} \end{aligned}$$

The value function with securities in a reputation equilibrium is greater than without securities, since the same allocation is achieved but without paying expected bankruptcy costs. The problem is that reputation equilibrium is fragile. In a full fledged repeated game, reputation incentives can cease to exist depending on the economic perspectives firms face, while the one based on bankruptcy costs does not.

3.4 Multiplicity of equilibria

Since the update $(\phi_P - \phi_{NP})$ is increasing in $\hat{\tau}$ and V increases with ϕ , then $\hat{V}(\phi|1) > \hat{V}(\phi|0)$. Also, since $\hat{\alpha}_G(1) > \hat{\alpha}_G(0)$, then $R_S(\phi|1) < R_S(\phi|0)$. Combining these inequalities with equilibrium conditions it is possible to find situations in which reputation and no reputation equilibria coexist.

Now, we introduce a fundamental $\theta \in \mathbb{R}$ distributed following a normal distribution $\theta \sim \mathcal{N}(\mu, \frac{1}{\gamma_\theta})$, that increases the difference of future payments $\hat{V}(\theta, \phi|\hat{\tau})$ for all $\hat{\tau}$. This assumption allows us to characterize multiplicity in a situation where the expected situation of the market in the future (captured by θ) can be hit by shocks in expectations (captured by μ). This assumption will also allow us to select a unique equilibrium by using techniques from global games.

First, assume $\hat{V}(\theta, \phi|\hat{\tau})$ increases with θ . Second, assume θ is observed after signing the loan. Since firms cover securities in trouble only when expected gains from reputation are large enough and these gains increase with fundamentals θ , firms follow a cutoff rule of the form,

$$\tau(\phi, \theta) = \begin{cases} 1 & \text{if } \theta > \theta^*(\phi) \\ 0 & \text{if } \theta < \theta^*(\phi) \end{cases}$$

hence interest rates are based on expectation such that we need to redefine $\hat{\alpha}_G(\hat{\theta}^*) = p + p(1-p)(1 - \mathcal{N}(\hat{\theta}^*))$, where $\hat{\theta}^*$ is the cutoff lenders believe firms will follow and $\mathcal{N}(\hat{\theta}^*)$ is the ex-ante expectation of $\theta < \theta^*(\phi)$. Then,

$$R_S(\phi|\hat{\theta}^*) = \frac{1}{\phi\hat{\alpha}_G(\hat{\theta}^*) + (1-\phi)\alpha_B} < R(\phi)$$

Finally we assume uniform dominance regions. This is we assume there is a $\bar{\theta}(\phi)$ such that $\beta\hat{V}(\bar{\theta}, \phi|0) = R_S(\phi|\bar{\theta})$ and $\underline{\theta}(\phi)$ such that $\beta\hat{V}(\underline{\theta}, \phi|1) = R_S(\phi|\underline{\theta})$. Naturally, $\underline{\theta}(\phi) < \bar{\theta}(\phi)$ and for all $\theta \in [\underline{\theta}(\phi), \bar{\theta}(\phi)]$, both equilibria coexist.

3.5 Uniqueness with imperfect information

Following Ordonez (2009), we assume firms i and lenders j observe an informative signal $s_i = \theta + \epsilon_i$ where $\epsilon_i \sim N(0, \frac{1}{\gamma_s})$ about the fundamental. The cutoff strategies firms follow are based on signals such that,

$$\tau(\phi, s_i) = \begin{cases} 1 & \text{if } s_i > s^*(\phi) \\ 0 & \text{if } s_i < s^*(\phi) \end{cases}$$

After observing a signal s_i , the differential gains from covering securities in trouble are given by taking expectations over different θ

$$E_\theta [\Delta(\phi, \theta | \hat{\tau}(s_i)) | s_i] = p(1-p) \left[\beta E_\theta [\hat{V}(\phi, \theta | \hat{\tau}(s_i)) | s_i] - R(\phi | \hat{s}^*) \right]$$

where $\hat{s}^*$ is the cutoff investors believe firms are following.

Proposition 1 *Provided that γ_s is big enough, there is a unique equilibrium where every firm decide to cover securities in trouble if and only if $s > s^*(\phi)$, where*

$$\beta E_\theta [\hat{V}(\theta, \phi | \hat{\tau}(s^*)) | s^*] = R(\phi | s^*)$$

where $\hat{\tau}(s^*) = 1 - \Phi(\sqrt{\gamma}(s^* - \mu))$ and $\gamma = \frac{\gamma_s \gamma_\theta^2}{(\gamma_\theta + \gamma_s)(\gamma_\theta + 2\gamma_s)}$

Proof Since s^* is the signal that makes the firm indifferent between covering and not a security in default, the condition at s^* is clearly

$$\beta E_\theta [\hat{V}(\theta, \phi | \hat{\tau}(s^*)) | s^*] = R(\phi | s^*)$$

where $\hat{\tau}(s_i) = 1 - \Pr(\hat{\theta}_j < \hat{\theta}_i | s_i)$

The updated believe of the firm about the fundamental, after observing a signal s_i is

$$\hat{\theta}_i = E(\theta | s_i) = \frac{\gamma_\theta \mu + \gamma_s s_i}{\gamma_\theta + \gamma_s}$$

The updated distribution of the fundamental after the firm observes the signal s_i is

$$\theta|s_i \sim \mathcal{N}(\hat{\theta}_i, \frac{1}{\gamma_\theta + \gamma_s})$$

and the distribution of the investor's signal, conditional on the firm's signal is

$$s_j|s_i \sim \mathcal{N}(\hat{\theta}_i, \frac{1}{\gamma_\theta + \gamma_s} + \frac{1}{\gamma_s})$$

Hence,

$$\begin{aligned} Pr(\hat{\theta}_j < \hat{\theta}_i | s_i) &= Pr\left(s_j < \hat{\theta}_i + \frac{\alpha}{\beta}(\hat{\theta}_i - \mu) | s_i\right) \\ &= \Phi(\sqrt{\gamma}(s_i - \mu)) \end{aligned}$$

where $\gamma = \frac{\gamma_s \gamma_\theta^2}{(\gamma_\theta + \gamma_s)(\gamma_\theta + 2\gamma_s)}$

As $\gamma_s \rightarrow \infty$, $\gamma \rightarrow 0$, then $\hat{\tau}(s_i) = \frac{1}{2}$ for all s_i . In this extreme case, the unique cutoff s^* is uniquely determined by $\beta E_\theta \left[\hat{V}(\theta, \phi|\frac{1}{2}) | s^* \right] = R(\phi | s^*)$

Q.E.D.

Lenders update reputation based on their beliefs, which depend on their signals. When a lender observes s_j , $\hat{\tau}(s_j) = 1 - Pr(s_i < s^* | s_j) = 1 - \Phi \left[\sqrt{\frac{\gamma_s(\gamma_\theta + \gamma_s)}{\gamma_\theta + 2\gamma_s}} (s^* - \frac{\gamma_\theta \mu + \gamma_s s_j}{\gamma_\theta + \gamma_s}) \right]$. As $\gamma_s \rightarrow \infty$, $\hat{\tau}(s_j) \rightarrow 0$ if $s^* > s_j$ (since $\hat{\theta}_j \rightarrow s_j$) and $\hat{\tau}(s_j) \rightarrow 1$ if $s^* < s_j$. This basically means that, whenever lenders observe a signal above than s^* , they believe firms covered securities in trouble, updating reputation. Similarly, whenever lenders observe a signal below s^* , they believe firms did not covered securities in trouble and reputation is not updated.

Once we know the unique equilibrium cutoff s^* it is also possible to determine the equilibrium fraction of firms $x^*(\theta)$ covering securities in trouble at each level of fundamental θ .

$$x^*(\theta) = Pr(s_i < s^* | \theta) = \Phi(\sqrt{\gamma_s}(s^* - \theta))$$

Now, I will show that, when the expected situation in the economy, and then the expected gains that come from reputation, declines, this may fuels an important de-

cline in the power of reputation to sustain securities. We can represent this decline in expected future conditions by a decline in μ .

There are two effects from a reduction of μ . Mechanically, it reduces the ex-ante probability that firms will not cover troubled securities. This is just because it is ex-ante more likely the firm faces a θ for which securities are not covered. However, there is also an effect from an increase in $s^*(\phi)$, making the firms less willing to cover securities for any θ and reducing the set of situations for which reputation is effective.

Proposition 2 *The cutoff s^* increases as μ declines.*

Proof A decline in μ increases $R(\phi|s^*)$ for a given s^* (by an increase in the cumulative distribution up to s^*). This requires a larger $s^*(\phi)$ to raise $E_\theta [\hat{V}(\phi, \theta|\hat{\tau}(s^*))|s^*]$ and compensate. This is a direct feedback that increases $s^*(\phi)$. Furthermore, this increase in $s^*(\phi)$ implies an increase in $R(\phi|s^*(\phi))$, which reinforces the direct increase in $s^*(\phi)$ through a larger μ .

There is an additional effect that comes from reducing beliefs $\hat{\tau}(s_i)$ for each s_i , from $\hat{\tau}(s_i) = 1 - \Phi(\sqrt{\gamma}(s_i - \mu))$, hence reducing $E_\theta [\hat{V}(\phi, \theta|\hat{\tau}(s_i))|s_i]$, for every signal. Then it is necessary a further increase in s^* to compensate for this reduction.

Q.E.D.

A high μ implies a low interest rate since it is more likely firms cover securities in trouble. In the assumption that probabilities of success also increase with θ , the conclusion is reinforced. Given a gradual decline in fundamentals, more and more reputation levels moves towards positions in which firms would not decide to cover securities in trouble. This implies a gradual increase in haircuts and eventually a total collapse in the market for securities.

4 Monitoring

In this section we explore the incentives firms have to monitor and introduce efforts in running projects. This is important because monitoring decisions are related to the probability a system based on confidence collapses. This interplay is created by

reputation concerns. First, less monitoring generates a higher probability of collapse because it makes more difficult for investors to learn about firms type, weakening the power of reputation to sustain a confidence banking system, making it fragile. Second, a higher probability of collapse generates less incentives to monitor because in expectation investors will not update beliefs anyways. These two relations reinforce each other, creating a vicious circle of low monitoring and higher probability of collapse, only sustained by good economic perspectives and only put on danger under some shake on those perspectives.

To study monitoring formally I introduce a monitoring stage before the game described before. Monitoring is also induced partly by reputation incentives in the next stage. The reason is that monitoring increases the differences in success probabilities between good and bad firms, which are then used to form opinion about the firm. We show the less monitoring in the first stage, the higher the probability of collapse in the following stage, not only for an obvious increase in interest rates but also from a decrease in incentives to cover debts based on confidence.

Monitoring efforts increase the probability of projects' success since the firm has better elements to choose the best projects available. I assume good firms can strategically choose to make these efforts or not, while bad firms simply cannot. We also assume that p increases with θ (more specifically, $\frac{\partial p}{\partial \theta} > 0$, $p : [-\infty, \infty] \rightarrow [0, 1]$). A good firm can increase the probability of success by $\lambda(1 - p(\theta))$ by paying a fix cost C_m . Hence the gains from monitoring decrease monotonically with θ .

This monitoring stage is previous to the confidence game described above. The timing is as follows:

- The initial prior about θ is $\theta \sim \mathcal{N}(\mu_0, \frac{1}{\gamma_\theta})$.
- Monitoring efforts, that determine p , are taken.
- News arrive, and the distribution of fundamentals is updated, $\theta \sim \mathcal{N}(\mu_1, \frac{1}{\gamma_\theta})$.
- Loans are negotiated and interest rates R_D and R_S are determined.
- Fundamental θ is realized and firms and lenders observe signals s_i and s_j .
- Firms decide to cover securities in trouble or not.

- Payments $V(\phi)$ are realized.

The game described in the previous section starts at the third bullet point, with a mean of fundamentals $\mu = \mu_1$. The monitoring game is just determined by the first two bullet points.

Defining $m \in [0, 1]$ as the good firms' monitoring probability. As $\theta \rightarrow \infty$, the gains from monitoring in improving the probability of project success are 0. Contrarily, as $\theta \rightarrow -\infty$, and for $\lambda \rightarrow 1$, monitoring increases the probability of success from 0 to 0.5.⁵ We assume a decision to monitor increases the probability of success of both projects, just by paying a single C_m . Here we assume the firm just make a total monitoring decision, but assuming monitoring efforts are choices for each project does not change the main conclusions.

Assuming there is a fundamental θ low enough such that it is optimal to monitor (just an assumption on the size of C_m), the cutoff for monitoring is determined by

$$C_m = \mathbf{V}_G(\phi|m=1, \mu^*) - \mathbf{V}_G(\phi|m=0, \mu^*)$$

where,

$$\begin{aligned} \mathbf{V}_G(\phi|m, \mu_0) = & E_{\theta|\mu_0} [2p(\theta, m)y_G - \alpha_G(\theta, m)R_D(\phi, m) + \alpha_G^S(\theta, m)R_S(\phi, m)] \\ & + \beta E_{\theta|\mu_0} [\alpha_G(\theta, m)V(\phi_P(\theta, m)) + (1 - \alpha_G(\theta, m))V(\phi_{NP}(\theta, m))] \end{aligned}$$

where $\alpha_G(\theta, m) = p(\theta, m) + p(\theta, m)(1 - p(\theta, m))$, $p(\theta, m) = p(\theta) + m\lambda(1 - p(\theta))$, $\alpha_G^S(\theta, m) = p(\theta, m) + p(\theta, m)(1 - p(\theta, m))$ for $\theta > s^*$ and $\alpha_G^S(\theta, m) = p(\theta, m)$ for $\theta < s^*$.

Good or no news arriving after monitoring decisions (this is $\mu_1 \geq \mu_0$) can sustain an equilibrium without monitoring and "confidence banking" in which good firms cover SPVs in trouble. Contrarily, when there is no monitoring and bad news arrive $\mu_1 < \mu_0$ there may be a collapse in the market since the differences in probabilities of success are not big enough to justify paying back and gaining reputation. This shows the importance of news in coordinating confidence losses and panics. This is completely consistent to a lack of monitoring when optimism exist and changes to pessimism.

⁵Naturally, this is just to illustrate extremes. The probability of success cannot be too low, otherwise we would violate the assumption that projects have a positive NPV.

Something important is that there may be multiple ranges in the θ dimension that alternate between monitoring and non-monitoring equilibria. At the extremes, when μ_0 is very high, there are no incentives to monitor whatsoever. When μ_0 is very low, there are incentives to monitor, improving the quality of projects and reducing lending rates. However it is possible to have monitoring for intermediate high levels of μ_0 because in expectation the system based on confidence exist with high probability and then reputation is updated. Contrarily, there may be a range of intermediate low μ_0 in which the system based on confidence will not exist and then reputation is not updated based on non-default.

This is important because it shows that bad news when coming from optimism implies a higher probability of collapse, not only because there is a new wave of pessimism that reduce reputation incentives to cover securities in trouble but also because the elements used to update reputation are fewer (since there is no monitoring and the differences in success probabilities to infer type from payments are not very large).

Contrarily, the possibility of collapse in the system affects the probability of monitoring. The less sustainable the system, the less incentives for firms to monitor since a collapse reduces updating and the incentives to improve reputation.

5 Regulation

The previous analysis about how confidence based on reputation concerns spurs and disappears is relevant in discussing the optimal regulation and in thinking the new financial landscape. The results above suggests the importance of counter-cyclical intervention to allow for a cheap system based on confidence that has the possibility of providing financial needs, but reducing the probability of collapse.

After the financial crisis there seems to be a growing agreement among academics and regulators about the need for introducing counter-cyclical into regulation. The main idea is to reduce excessive risk-taking during good times by imposing higher regulatory costs and increasing inefficiently low risk taking during bad times by reducing them.

Based on our analysis, the problem with making more stringent the regulation targeted towards traditional banking is that it generates a fertile environment for the "confidence banking" to arise, and unregulated institutions to spur, effectively increasing the probability of collapse.

As can be seen, the challenge is to create conditions for reputation incentives not collapsing when bad news arise. If this is the case, confidence will be encouraged and the cheap alternative provided by the "confidence banking" sustained. I propose to increase benefits for reputation during bad times to maintain incentives to behave even when receiving bad news. I propose to create a schedule of taxes and subsidies as a function of reputation that allow for "confidence banking" without collapsing. In particular, it is possible to impose taxes increasing in reputation that allows "confidence banking" to exist and work and to impose subsidies increasing in reputation such that reputation incentives are maintained even when bad times are forecasted.

More formally, in the case of no monitoring decisions, it is possible to design a schedule of taxes $T(\theta, \phi) > 0$, where $\frac{\partial T(\theta, \phi)}{\partial \theta} > 0$ such that $\widehat{V}(\theta, \phi|\widehat{\tau})T(\theta, \phi)$ allows a reduction in s^* (as defined in Proposition 3.5), below which "confidence banking" collapses. Without balance budget (for example in the case lump sum transfers are allowed), it is always possible to generate an schedule $T(\theta, \phi)$ that generates a s^* where $\mathcal{N}(s^*)$ is arbitrarily small.

The same is true allowing for monitoring efforts. Recall the incentives to monitor were defined by the improvement in success probabilities achieved from monitoring efforts (just a technological assumption) and by the reputation gains created by such an improvement. In good times the incentives to monitor are low because the gains in success probabilities in relation to the projects from bad firms, and hence the reputation gains, are low, not justifying the costs.

By modifying expected value functions in the same fashion as before, $\widehat{V}(\theta, \phi|\widehat{\tau})T(\theta, \phi)$, where $\frac{\partial T(\theta, \phi)}{\partial \theta} > 0$, allows to induce monitoring when good times are expected and also when bad times are expected and monitoring can be performed even with lower reputation gains.

6 Simulations

TO BE ADDED

7 Conclusions

This paper justifies the raise, grow and collapse of unregulated banking systems based on confidence. "Confidence Banking" is sustained by reputation concerns of the financial institutions that interact in the system. While good times are expected, gains from having a good reputation are important, introducing incentives for good behavior (coverage of securities in trouble, debt payments, etc). These incentives create an alternative cheaper than traditional banking to cover financing needs.

However, when bad news arise and future perspectives are not bright, reputation gains are not strong enough to provide incentives for good behavior. Furthermore, these incentives have the weakness to being subject to a sudden collapse, which creates a fast destruction of the confidence banking. This makes confidence banking a cheap but also fragile system.

This suggest a counter-cyclical government intervention. However, differing from current proposals of higher regulatory costs in good times to prevent collapses in bad times, I propose to increase of subsidies during bad times to maintain reputation incentives. Hence, even when optimal regulation seems to be counter-cyclical, the possibility of a confidence banking to arrive makes counter-cyclical "carrots" more effective than counter-cyclical "sticks".

This paper can be extended in several ways. First, the reputation gains can be determined endogenously, allowing different states to condition the taxing schedule. Second, more financial institutions and instruments can be modeled to be based on confidence through reputation concerns. Third, the model can be extended to more projects and to obtain payments from collaterals, which value depend on the state of the world. All these extensions would make the model richer and would allow to discuss taxation in more practical terms. However, the main point would remain.

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