External discipline and financial stability

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Abstract

The paper examines the costs and benefits of external discipline (dollarization, foreign short-term debt) from the point of view of the stability of the financial system of an emergent/LDC economy. External discipline solves the time-inconsistency problem of central bank policy to help banks in trouble but at the cost of excessive liquidation of projects. The latter may be quite important when the danger of coordination failure of investors is large. © 2002 Elsevier Science B.V. All rights reserved.

JEL classification: G28; F30

Keywords: Moral hazard; Bailouts; Lender of last resort; Coordination failure; Dollarization; Foreign short-term debt

1. Introduction

The banking and financial system helps to overcome problems associated with asymmetric information (adverse selection and moral hazard) in an economy. However, precisely because of asymmetric information this system is subject to the failure of institutions, panics, and systemic crises that potentially have a major impact on the economy. The great depression of the 1930s is a good example, and more recent episodes of financial crisis in the US, Scandinavia, Mexico, East Asia and Russia, to name a few, remind us of the potential for economic disruption.

The problems of adverse selection and moral hazard are bound to be more acute in emerging and developing (LDC) economies. The role of the banking and financial system to alleviate these problems, or to worsen them in a crisis episode, is therefore crucial. Emergent/LDC countries also tend to have a weak institutional structure. This problem is compounded with short horizons of central bankers and weak protection of public officials, political instability and regulatory capture, to yield a lack of capacity...
of policy commitment. Indeed, in the circumstances the building of a reputation by
regulators is very difficult indeed.

The lack of commitment prevents the resolution of the typical problem of time
inconsistency of help to a banking system. Once a crisis has occurred it tends to
be optimal to help but doing so generates bad incentives ex ante in the face of
a moral hazard problem. Indeed, a major problem in emerging markets is the ten-
dency towards bailouts and blanket insurance in the event of a banking crisis, as the
cases of crisis in Argentina, Mexico or Thailand show.1 The anticipation of a bailout
renders ineffective the potential disciplinary action of the market and the threat of
closure.

A potential solution for those countries is to import discipline. We examine how
short-term foreign debt and/or dollarization may provide external discipline and the
costs and benefits of doing so. Dollarization implies a commitment to a restricted use
of the lender of last resort (LLR) facility. Similarly, foreign short-term debt cannot
be inflated away. The basic trade-off is between the commitment value of external
discipline, which checks moral hazard, and excessive liquidation of projects induced
by a tough market constraint which may be aggravated by a coordination failure among
investors.

This paper puts in a common framework the models in Gale and Vives (2002)
and Rochet and Vives (2000). Section 2 presents a stylized model and two examples.
Section 3 develops the equilibrium of the game of investors and a welfare benchmark
for comparison. Section 4 considers central bank policy in a small open economy and
Section 5 analyzes the trade-off involved in importing external discipline. Sections 4
and 5 follow the approach in Gale and Vives (2002). Concluding remarks follow.

2. A stylized model and examples

Consider a world with a single good (for consumption and investment). There are
three periods \( t = 0, 1, 2 \) and two possible investments: A safe one with (normalized)
zero interperiod return and a risky one with random unit return of \( R \) at \( t = 2 \) or \( \gamma R \),
with \( 0 < \gamma < 1 \), if the investment is liquidated at \( t = 1 \). The distribution of the risky
return \( F(R, e) \), with density \( f \), can be improved with (unobservable) effort \( e \in \{0, 1\} \)
exerted by the manager of the project at date \( 0^+ \). Assume that \( F(R, e) \) fulfils the
monotone likelihood ratio property (MLRP, that is, \( f(r, 0)/f(r, 1) \) is decreasing in \( r \)).
Effort has cost \( A > 0 \) and can be interpreted as the benefit that the manager derives
from selecting “bad” projects. For simplicity, it is assumed that the manager is not
sensitive to monetary incentives but enjoys a benefit \( B > 0 \) from continuing the project
until \( t = 2 \).

A continuum of ex ante identical investors have each one a unit to invest and are
offered a standard deposit/debt contract paying for each unit invested at 0, \( d_1 \) at \( t = 1 \)

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1 See Calomiris and Powell (2000) for the Argentinian case and Martinez Peria and Schmukler (2001)
for a study of market discipline in Argentina, Chile and Mexico.
or $d_2$ at $t = 2$ ($d_2$ can be chosen large enough so that at $t = 2$ creditors are residual claimants in case of failure).

At $t = 1$ investors observe $R$.\(^2\)

At $t = 0$ the portfolio $(I, M)$ of investment in the risky $(I)$ and safe asset $(M)$ as well as the terms of the contract $d_1$ and $d_2$ are determined. It is assumed that it pays to induce the manager to exert effort. Two examples of such choice follow. Example 1 is taken from Gale and Vives (2002) and Example 2 is a modified version of the model in Rochet and Vives (2000).\(^3\)

2.1. Example 1. Competitive banking with risk averse depositors

Suppose that investors are risk averse and that a proportion $\lambda$ are early consumers and a proportion $(1 - \lambda)$ are late consumers. Types are unobservable and at the beginning of date 1 agents learn their type and late consumers receive a private signal about $R$. The ex ante expected utility of an investor is $Eu = \lambda u(c_1) + (1 - \lambda)u(c_2)$, where $u(\cdot)$ is smooth, increasing and strictly concave and $c_t$ consumption at date $t$.

A bank is seen as a coalition of agents that pool endowments and hire a manager to monitor the investment. The deposit contract offers $d_1 = d$ units of consumption at $t = 1$ or the residual left at $t = 2$.

In a competitive system the bank will choose the portfolio $(I, M)$ and the contract $d$ at date 0 maximize $Eu$ subject to the investment technology and the manager’s incentive constraint.

2.2. Example 2. Lending to a stockholding company

Investors are risk neutral and have an outside investment opportunity with return normalized to 0. The project (a bank/firm or a banking system/country) is financed with short-term debt (normalized to 1) and equity (including long-term debt) $E$. Assume that $d_1 = d_2 = d$. Under normal circumstances, the returns $RI$ on these assets are collected at date $t = 2$, the debt is repaid, and the stockholders of the bank/firm get the difference when it is positive. However, the debt may not be rolled over at an interim date $t = 1$, once investors have information about the future realization of $R$. Withdrawal at $t = 1$ entails a small cost for an investor. If withdrawals exceed the cash reserves $M$ of the bank/firm, it is forced to liquidate. The balance sheet of the bank/firm at $t = 0$ is given by $1 + E = I + M$.

The bank/firm chooses the portfolio $(I, M)$ and the debt contract $d$ at date 0 to maximize its expected profits subject to the technological constraints, the individual rationality constraint of investors and the manager’s incentive constraint. We assume thus here that the bank/firm has all the bargaining power in its relation with investors.

\(^2\)With incomplete information we could assume that active investors receive a private noisy signal about $R$ and that the pooling of the signals reveals $R$.

\(^3\)The reader may want to consult those papers for details of the analysis.
3. Equilibrium

3.1. Equilibrium of investors’ game

At $t = 1$ given the portfolio investment $(I, M)$ and deposit/debt contract $d$ the investor’s game typically will have multiple equilibria, some of which will exhibit coordination failure. There are solvency and “supersolvency” thresholds, $R^s$ and $R^s/\gamma$, respectively, with $R^s = (d - M)/I$ such that for $R \leq R^s/\gamma$ for all investors to withdraw (run) is an equilibrium and for $R \geq R^s$ for no investor to run is an equilibrium. In the latter case it is still possible that if there are investors with urgent liquidity needs, the early consumers of Example 1, that they withdraw their deposit at $t = 1$. This means that in the range $(R^s, R^s/\gamma)$ run and no-run equilibria coexist. For $R < R^s$ the bank is not solvent and investors run at $t = 1$ because they realize returns are low. For $R > R^s/\gamma$ there is no incentive to run for an investor even in the worst-case scenario that other investors run. This is so because the liquidation value of the project $\gamma R > R^s$ is enough to pay back the promised return. In the middle range there may be a coordination failure. Investors may run only out of fear of other investors not rolling over their short-term debt. A solvent bank may fail. The investors’ game is typically one of strategic complementarities. The differential payoff to withdrawing is increasing in the amount of other investor’s withdrawing.\(^4\)

3.2. Benchmark and banking equilibrium

3.2.1. The incentive-efficient solution

The incentive-efficient solution chooses $(I, M)$ and a probability of continuation of the project at $t = 1$, as well as allocations for the investors, to maximize the expected utility/surplus subject to resource and incentive constraints (for the manager and late consumers in Example 1). The probability of continuation is a function of $R$.\(^5\)

It is optimal to use a cutoff rule (since the MLRP holds for $F(R, e)$) and liquidate the project if and only if $R < R^0$ where $R^0$ is, given that to liquidate the project is costly, the smallest cutoff that satisfies the incentive compatibility constraint of the manager: $(F(R, 0) - F(R, 1)) \geq A/B$.

\(^4\)See Chapter 2 in Vives (1999) for definitions and properties of such games (including Bayesian games). With incomplete information, and in a somewhat modified game, we may have a unique equilibrium if investors’ signals are precise enough. This is shown using the “global game” methodology of Carlsson and Van Damme (1993). (See Rochet and Vives (2000), Goldstein and Pauzner (2000), and Morris and Shin (2001) for different approaches. Postlewaite and Vives (1987) make an early use of incomplete information to obtain a unique equilibrium with a positive probability of a bank run.) At this equilibrium each investor uses a threshold strategy $\bar{s}$. Investor $i$ receives signal $s_i$ and withdraws at $t = 1$ if and only if $s_i < \bar{s}$ and the bank/firm fails if and only if $R < R^*\in [R^s, R^s/\gamma]$.

\(^5\)With incomplete information the pool of the signals of investors reveals $R$ and therefore in a revelation mechanism we will also have that the probability of continuation depends on $R$. 
3.2.2. Banking equilibrium

At the banking contract the deposit return offered \( d \) determines the equilibrium cutoff \( \hat{R} \), for which the bank/firm fails for \( R \) below the threshold. The cutoff \( \hat{R} \) equals \( R^o \) or \( R^o/\gamma \). \(^6\) We have that \( \hat{R} \geq R^o \) since incentives have to be provided to the project manager. The banking contract is third best. This is so because typically \( \hat{R} > R^o \) and there is excessive liquidation. The reason is that a competitive bank has to promise a relatively high return to depositors that want to withdraw early to insure themselves (Example 1), in order to provide an adequate return to investors (Example 2), and/or because of coordination failure among investors. The excessive liquidation problem may be particularly acute if the coordination problem of investors is severe. In Example 1 the banking equilibrium is third best even if \( \hat{R} = R^o \) because of inefficient risk sharing.

4. Policy in a small open economy and external discipline

Consider a small open economy with a central bank that supplies money (pesos). Suppose that the dollar is the reserve currency and serves as the unit of account (we may identify one dollar with one unit of consumption). The central bank controls the price level (or, equivalently, the exchange rate) by exchanging the domestic currency for goods (dollars). Assume also that the price level is equal in both periods 1 and 2.

In this monetary economy contracts can be written in nominal terms and the central bank by manipulating the price level can affect real allocations. The central bank has available public information. The central bank observes the realization of \( R \) at \( t = 1 \). \(^7\) A central bank policy is therefore a function which determines the price level for any realized \( R \). For example, by inflating the central bank can make unattractive to run on the bank or call back the short-term debt provided, obviously, that deposits/short-term debt are denominated in the domestic currency. The central bank policy could be equivalently understood in terms of direct help (loans) to the banking system. We have in mind open market operations to help a banking/industrial system in trouble.

The central bank wants to maximize the expected utility of the representative investor but faces a time inconsistency problem. A well-intentioned LLR will find it optimal ex post to help whenever this salvages the value of projects. Banks/firms, anticipating the help, will exert suboptimal effort. If the central bank cannot commit at \( t = 0 \) to a policy (price level as a function of \( R \)) then it will always help at \( t = 1 \) and no effort will be exerted by the project manager. In contrast, if the central bank can commit then the incentive-efficient solution can be implemented by an appropriate choice of price policy. This involves not helping whenever \( R < R^0 \).

In summary, the problem arises that while ex ante it is optimal to commit not to help when returns are low, ex post, once effort decisions have taken place, it is optimal to help to avoid costly liquidation. A central bank will have incentives to inflate to

\(^6\) See Rochet and Vives (2000) for how to determine the early failure cutoff in the case of incomplete information.

\(^7\) In the incomplete information case the central bank can infer \( R \) from the proportion of withdrawals.
reduce the real value of nominal debt commitments when the banks or firms are in trouble. This will avoid liquidation but destroy incentives to exert effort. In a country in which institutions have a hard time building a reputation the commitment to a policy of not helping in some circumstances has to be external.

How can discipline be imported?

Adopting another (stable) currency: Dollarization represents a commitment to a limited use of the LOLR facilities. This is so because in a dollarized regime arrangements must be made in advance in order to help the banking system. This may be accomplished with stabilization funds or pre-contracted in the international market. Adoption of another currency represents a commitment for a country because it is costly to reverse. The reason is that once the domestic currency has been replaced by the dollar or the euro to introduce it again may prove unfeasible or extremely costly. A currency board (where the domestic currency is backed by dollar/euro reserves) represents a lower degree of commitment being typically established by a law of the Parliament (like in Argentina for example). To scrap the board needs a legislative change and this may be costly.

Acquiring foreign short-term debt: Short-term debt denominated in domestic currency will lose its disciplining effect if the central bank in case of trouble can inflate and devalue the currency. This is not the case with short-term debt denominated in foreign currency. Firms may decide to obtain foreign short-term financing in order to elicit effort from their project managers.8

Short-term debt may ameliorate also the default problem of an opportunistic populist government that repays debt only if it is in its short term interest to do so and where default is costly. Then to take foreign short-term debt is good in a country prone to populist governments.9

5. Cost and benefits of external discipline

What are the costs and benefits of dollarization in a small open economy? Dollarization provides a commitment not to help at the cost of not helping in circumstances where it would be ex ante optimal to do so. Dollarization is therefore a third-best solution and brings back the allocation to the real contracts world. Refusing help to the banking sector creates incentives for managers to exert effort, but the probability of default implicitly chosen by the banking/industrial sector may be much higher than the incentive-efficient level required to encourage managerial effort.

The benefit of dollarization is that it imposes discipline by avoiding excessive help from the central bank. This solves the time-inconsistency problem of central bank policy but at the cost of excessive liquidation of projects. When the moral hazard problem $A/B$ is extreme then it becomes very expensive to provide incentives and it is better to let the central bank help and allow managers to exert suboptimal levels of effort. When

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8 It may well also be that the lower interest rate obtained with foreign debt more than compensates the expected cost of liquidation for a owner-managed firm. See Jeanne (2000).

9 See Rodrik and Velasco (1999).
the cost of liquidation is very large (γ small) again dollarization is not a good idea. This is so for two reasons. First, a higher cost of liquidation may make the cost of imposing discipline prohibitive. Second, a higher cost of liquidation may induce more coordination failure.\textsuperscript{10} For dollarization to be good it is necessary also that effort is important to improve returns (that is, that the effect of e on F be significant enough).

Foreign short-term debt may also provide discipline at a cost. The optimal level of foreign short term has to balance the expected benefit of increased effort in monitoring projects with the raised expected cost of liquidation. Larger levels of short-term debt increase the likelihood of coordination failure.\textsuperscript{11} The associated real consequences of failure also increase with the stock of short-term debt. To study the optimal level of short-term debt the model could be extended to a continuous effort selection. Then countries with a higher cost of liquidation would induce less effort by taking less short-term debt for the same level of the moral hazard problem.

Dollarization or a relatively high amount of foreign short-term debt will be good in emerging/LDC countries with a credibility problem for the central bank in which: there is a significant but not extreme moral hazard problem; monitoring effort by bankers and entrepreneurs is important in improving returns; and the cost of liquidating projects is not very large.

Candidate countries have therefore a weak institutional structure but no extreme agency problem. Those countries are likely to have an intermediate status among the overall candidate emerging/LDC countries. In Gale and Vives (2002) an attempt is made to measure the deep parameters of the model in Example 1 to assess the trade-off involved in dollarization from the perspective of the stability of the financial system of a small open economy. This allows a classification of countries according to the level of the moral hazard problem (severe, significant or moderate) and according to the level of liquidation costs (high, medium or low). The candidates for dollarization are at the intersection of significant or moderate levels of the moral hazard problem and medium or low levels of liquidation costs.

6. Concluding remarks

The challenge is how to design institutions that allow the implementation of the incentive-efficient solution. The role of international institutions like the IMF should be understood at this light. Further research is needed to explore the effects of partial dollarization or to ascertain the right amount of foreign short-term debt for an emergent economy from the perspective of the stability of the financial system. This analysis should be complemented then with the macroeconomic view of those issues.\textsuperscript{12}

\textsuperscript{10} Rochet and Vives (2000) show in a version of Example 2 under incomplete information that the failure threshold $R^*$ (at the unique equilibrium of the investors’ game) decreases with $\gamma$ and the range of realizations of $R$ where coordination failure occurs, $R^* - R^s$, increases with a lower $\gamma$.

\textsuperscript{11} In Rochet and Vives (2000) the range of realizations of $R$ where coordination failure occurs under incomplete information $R^* - R^s$ increases with the level of short-term debt. The authors show that $R^* - R^s$ decreases with the solvency ratio $E/I$, where $E$ includes both equity and long-term debt.

\textsuperscript{12} See Alesina and Barro (2002).
Acknowledgements

This paper draws heavily from my joint work in banking with Douglas Gale and Jean-Charles Rochet. I am grateful to Ramon Caminal for helpful comments.

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