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Abstract

This paper presents a model analyzing the potential for an International Court with powers to declare standstills to mitigate the coordination problem inherent to roll-overs in sovereign debt markets. It is shown that, regardless of the quality of the information handled by such an Institution, the scale of the coordination problem is reduced since its mere existence forces investors to focus on the Court's course of action rather than on other investors' beliefs. Furthermore, the model shows that, in order to avoid moral hazard, the right of recourse to the Court should be made conditional.

Keywords: Sovereign Debt, liquidity runs, standstills, effort.

JEL Codes: D82, F02, K41

Introduction

The succession of financial crises in emerging markets since the mid 90's raised awareness about the specific risks posed by financial globalization for a number of countries. This realization prompted an intense debate on the reform of the international financial architecture, and various far-reaching proposals have been discussed over the last decade in both academic and official circles. More often than not, this debate has revolved around the extent to which emerging markets crises have been primarily a result of failures in international financial markets or of mistaken policies. Those stressing the importance of market failures have advocated for the creation of a meaningful official financial safety net articulated around the IMF acting as a pseudo-lender of last resort (Fisher, 1999). In turn, those stressing the importance of policy failures have prioritized the need to avoid distorting the incentives of both sovereign borrowers and private lenders, placing moral hazard at the centre of the discussion. Eventually, the debate has tended to result in the adoption of difficult compromises between the two camps, of which the Prague Framework for crisis resolution is a good example. According to this framework, adopted by the international community in 2001, liquidity crises ought to be resolved by combining limited and predictable official assistance, catalysis of private capital flows, and private sector involvement.

In the realm of solvency crises, two differing approaches can also be identified. On the one hand, according to the statutory approach, an international institution is needed to intervene in situations in which a standstill and/or a debt restructuring is needed to restore a country's solvency. Such an institution could take the form of an international solvency regime (Sachs, 1995 or Rogoff, 2003) or of the Sovereign Debt Restructuring Regime (SDRM) proposed by Krueger in 2002 and shelved in 2003. On the other hand, the contractual or market-based approach, which was ultimately adopted by the international community, argues in favour of including collective action clauses (CACs) in bond contracts (see Krueger, 2002 or Eichengreen et al., 2003). Such CACs allow for a pre-specified majority of bond holders to approve the terms of a debt restructuring, preventing such processes from being held hostage to the action of rogue creditors, and potentially mitigating the collective action problems inherent to debt restructurings. The inclusion of CACs in sovereign bonds is generally considered as a successful experience, given that this practice has become widely accepted by the market relatively fast. [1] Their potential in a crisis resolution setting, however, remains to be seen. Indeed, there is still a relatively large proportion of outstanding bonded debt that does not include CACs, and other contractual innovations, such as aggregation clauses, may be needed to prevent minority groups from disrupting restructuring processes.[2]

This paper provides a fresh look at the statutory approach to crisis resolution from a theoretical perspective. The framework outlined here, however, differs from previous proposals such as the SDRM in the sense that it is designed to cope with liquidity problems. . It is argued that there could be scope for creating an international entity, i.e. an International Investment Court (IIC) which would monitor countries, would be empowered to declare standstills under certain circumstances and, if necessary, would decide on how debt should be restructured.[3] The paper shows that designing debt contracts which, in case of a liquidity crisis, allow for arbitration and for the application of a standstill/restructuring, reduces the coordination problem faced by creditors, and enhances aggregate well being. It is also analyzed whether such a measure, as argued in the literature, may generate debtors' moral hazard. Although moral hazard can not be ruled out, conditions under which the presence the IIC represents an incentive to apply corrective policies are found.

Global games and standstills have rarely been analyzed together. The global games technique has been extensively used to analyze other policy measures against sovereign liquidity and solvency problems, such as collective action clauses or official lending.[4] Haldane et al. (2002) is an exception. They present a model which includes both a rollover global game and a restructuring game. However, they model standstills as an exit tax charged on creditors whenever they decide not to roll-over, but they do not include an international authority in the model. They discuss some possible drawbacks of a standstills policy, such as moral hazard or the effect on the composition and amount of capital inflows, but without conducting any formal analysis. Miller and Zhang (2000), using a different framework, argue that, without an orderly procedure, the IMF is de facto forced to bail out distressed members, leading to the risk of investors' moral hazard. In their opinion, the strategic reason for legalizing standstills on payments is to rescue the authorities from this 'time inconsistency' trap. Gai et al (2004) find that the effectiveness of standstills depend on the quality of official sector surveillance. Present results confirm this point. Moreover, the model identifies certain conditions in the economy and in the behavior of both investors and the Court which increase the standstill policy's potential to mitigate the coordination problem. In the model presented here standstills are used as a tool to avoid liquidity problems. This view is supported by the work of Haldane and Saporta (2003), who find that standstills are a useful tool for solving liquidity crises. Ghosal and Miller (2003) analyze the moral hazard implications of a SDRM (see Krueger, 2002 or Sachs,1995) which includes a public agency which implements the mechanism. They find that for the mechanism to give incentives to the debtor to exert effort it need to have been agreed ex-ante. Due to its statutory nature, the model presented here, fulfils this characteristic. Gai and Shin (2004) find that if an international solvency regime increases the recovery rate on default, this policy should not necessarily imply a rush for the exits. In Martin and Peñalver (2003) standstills tilt the term structure for sovereign bonds, due to a combination of reduced liquidity and reduced risk of default. The present analysis, from a partial equilibrium perspective, does not deal with these issues.

Eaton (2003) finds that the main risk of having an International Court comes from its possible moral hazard implications. He argues that if the Court were to impose sanctions only when justified it could increase the incentives of sovereign debtors to repay their debt.[5] He also concludes that for standstills to improve efficiency the Court has to be better informed than the creditors.

As Haldane et al. (2002), the model in this paper places the coordination problem, and more specifically the role of asymmetric information, at the core of the problem. This paper moves a step ahead by modelling the Court as an additional player. This is important because it permits to model the strategic interaction between both the Court and the players, who are forced to guess not only other investors´ moves but also the course of action by the Court. An important implication, is that as investors need to focus on the behavior of the Court, the extent to which other investors´ beliefs matter is reduced, mitigating the coordination problem. Another important result regards the role that the accuracy of the information handled by the IIC has. This paper elaborates on the point made by Eaton (2003), and shows the conditions under which a better informed court may not only improve the outcome, but may also reduce the coordination problem. It is also shown that better information does not always guarantee a smaller coordination problem. In line with the results presented in Ghosal and Miller (2003) it is found that ex-ante agreement on the circumstances in which standstills can be applied mitigates their potential moral hazard implications. In this paper the ex-ante agreement is related to the presence of conditionality.

From a technical point of view, the paper draws on Corsetti et al. (2005), which uses the same technique to analyze the role of the IMF as a lender of last resort. However, in the present analysis the "big player" only cares about liquidity problems, and therefore only acts in a determined interval. This departs from the solution presented in Corsetti et al. (2005). It is shown that, in a global game with heterogeneous agents, there is a unique equilibrium in which "small players" use trigger strategies even if the "big player" does not.

Section I outlines a simple model of debt crises where private and public information interact. In Section II the international arbitrator is introduced into the game, and some basic features of both models are compared. Section III evaluates the moral hazard implications of such a policy when it is implemented with or without conditionality. Section IV concludes. The more technical proofs can be found in the Appendix.

I. A benchmark model

To set the stage for the analysis, it is useful to use a model with standard features as a benchmark. The model is a modification of the global games literature pioneered by Carlsson and Van Damme (1993), and draws straight from Chui et al. (2002). It analyzes a small open economy during three time periods defined below.

There is a continuum of investors, with mass equal to one, willing to lend up to d in a short term horizon at an interest rate i. The outside option for the investors is a safe asset whose return is equal to the world sure rate of return i^w which, for simplicity, is set equal to zero. There is a government with own resources amounting to O. It has access to an international liquid asset denoted by M, and a domestic risky investment, I. The risky investment yields θ in period 2, or $\theta \ / \ (1+k)$ in period 1. We further assume that θ is normally distributed with mean

$\widehat{\theta} > i^w$, and variance $1 / \gamma$.[6] The parameter $k \in (0, \infty)$, reflects the existence of liquidation cost associated with the partial or complete liquidation of the investment prior to its completion in period 2. The government seeks to borrow in order to to carry on the investment opportunity. However, it can only borrow money on a short term basis and hence, in period 1, needs to be able to roll over this debt.

In period 0, the government invests both O and d, in the domestic investment I and in the international safe asset M, $O + d = M + I$. These parameters are taken as given.

In period 1, investors receive a private noisy signal about the state of the fundamentals, and based on it they take the decision of rolling over their loans or withdrawing.

In period 2, the government repays outstanding debt and consumes what is left.

Liquidity and solvency

Think first of a scenario where all investors decide to roll over. Define D as the amount due to repayment to foreign investors, i.e. $(1 + i)d = D$. In this case the country is solvent in period 2 whenever $\theta I + M \geq D$. This defines the minimum rate at which the country would still be solvent in the absence of a run. Call it *fundamental insolvency rate,* $\theta_s = \frac{D-M}{I}$.

In the unique equilibrium, a positive mass of investors withdraws their money. Denote the proportion of investors not rolling over with f. In period 1, the country needs an amount of liquidity equal to fD. If $M < fD$, the country will liquidate part of the domestic investment. The proportion of the domestic investment to be liquidated can be calculated as $l = (1 + k)\frac{(fD-M)_+}{\theta I}$. After liquidating part of its investment in order to repay early withdrawals, in period 2, the country counts with resources $\theta(1 - l)I$ to repay outstanding debt $(1 - f)D$. Then, for an observed level f of investors fleeing, the minimum rate, $\theta'(f)$, at which the country would still be solvent in period 2 is,

$$(1) \quad \theta'(f) = \theta_s + k\frac{(fD - M)_+}{I} > \theta_s.$$

Payoffs and information

Following Rochet and Vives (2004) and Corsetti et al. (2005), the payoff structure of the private investors is modelled as dependent on making the right choice. If the final outcome is a default, the right choice for the creditors would be to flee, which gives investors w more units of utility than rolling over. Instead, if the final outcome is not a default, the right choice would be to roll over, and doing so provides a utility r units larger than that obtained by withdrawing.[7] This assumption makes the perceived utility independent of the extent of default, implying that the analysis abstracts from distributional issues between the creditors and the country.

It is assumed that the economic fundamentals, θ, are unknown, although their distribution is common knowledge. Together with the payoffs, this is the public information in the model. In addition, investors receive private signals. The distribution of these signals is common knowledge, but the realization is privately observed. Creditors get a signal $s_i = \theta + \varepsilon_i$, where ε_i is normally distributed with zero mean and precision α. They will rely on their signals to update their beliefs. Their updated beliefs are normally distributed, $\theta|s_i \sim N(\frac{s_i\alpha+\widehat{\theta}\gamma}{\alpha+\gamma}, \frac{1}{\alpha+\gamma})$. The mean of this distribution will be denoted by $\rho_i = E[\theta|s_i]$. Φ and ϕ stand for the standardized cumulative distribution and the associated density function respectively.

Equilibrium: runs and solvency

Uniqueness, as shown in the Appendix, is guaranteed when the relative (with respect to the public) precision of the private signal is large enough. The unique equilibrium is defined by a unique rate of return θ', which produces a distribution of public and private signals such that there is a unique investor with signal s' which makes him indifferent between fleeing or staying. Private investors withdraw their money in period 1 if their updated beliefs about the fundamentals fall below some critical value ρ', which corresponds to the unique value s' of the private signal.In order to solve for the two unknowns, two equations have to be set.

The first comes from identifying the lower level of returns necessary to make a run successful, the "mass condition". That threshold is defined in equation (1). Given that the proportion of investors withdrawing corresponds with the proportion of investors receiving a signal below s',[8]

$f = P[s_i < s'|\theta] = \Phi(\sqrt{\alpha}(s' - \theta))$, the condition can be rewritten as,

$$(2) \quad s' = \theta' + \frac{1}{\sqrt{\alpha}}\Phi^{-1}((\theta' - \theta_s + \frac{kM}{I})\frac{I}{kD}).$$

The second equation can be obtained from the fact that, in equilibrium, the marginal investor is indifferent between staying or fleeing. The probability of a successful run is given by $P[\theta < \theta'/\rho_i]$, that can be expressed as $P[\theta < \theta'/\rho_i] = \Phi(\sqrt{\alpha+\gamma}(\theta' - \frac{\alpha s_i + \gamma\widehat{\theta}}{\alpha+\gamma}))$. Using this, the condition reads:

$$r[1 - \Phi(\sqrt{\alpha+\gamma}(\theta' - \frac{\alpha s'}{\alpha+\gamma} - \frac{\gamma\widehat{\theta}}{\alpha+\gamma}))] - w\Phi(\sqrt{\alpha+\gamma}(\theta' - \frac{\alpha s'}{\alpha+\gamma} - \frac{\gamma\widehat{\theta}}{\alpha+\gamma})) = 0.$$

For values above θ', the optimal action is to stay, which gives r units of utility more than fleeing, while for values below θ' a run is successful and therefore staying gives w units of utility less than fleeing. Manipulation of this expression delivers,

$$(3) \quad \theta' = \frac{\alpha s'}{\alpha+\gamma} + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{r}{r+w}) + \frac{\gamma\widehat{\theta}}{\alpha+\gamma}.$$

Equation (3), together with equation (2) allow to solve for the equilibrium values θ' and s'. These completely characterize the economy. The probability of observing a default is $P(\theta < \theta')$, and the size of the run is $P(s < s')$.

II. What can be gained by introducing standstills?

Now an International Investments Court is introduced in the economy described above. The Court will be in charge of calling standstills/ rescheduling the debt, when necessary. The first goal is to analyze how the coordination problem is affected by the presence of this entity. Later its moral hazard implications are analyzed.

An International Investments Court

Standstills, as well as the creation of an International Investments Court (IIC), are at the heart of many recent proposals aimed at mitigating the problems posed by sovereign defaults, and their adverse effects for the smooth functioning of financial markets. By analyzing the effect that creating an International Court in charge of rescheduling sovereign debt could have on the coordination problem faced by investors, both proposals are embedded. The role of such an institution would be to monitor issuing countries, and when these undergo financial stress, assess the situation, and decide whether allowing the country to temporarily suspend payments (go on a standstill) is the right measure. In line with the proposal by Ghosal and Miller (2003), the decisions of the Court are modelled in terms of a procedure to cope with liquidity problems. This view differs from the one held by the IMF (Krueger, 2002). In their SDRM proposal they envision this institution as a tool to cope with insolvency problems. The present proposal implies a contractual obligation, as it requires that both, creditors and sovereigns, submit to a supranational authority to determine when a standstill may be necessary.[9]

A model of sovereign debt crises in the presence of an IIC

Now there is a third actor, the IIC, which has its own rule of action based on its private information. This takes the form of a private signal received in the interim period. Both the Court and investors move simultaneously in period 1. The analysis, from a partial equilibrium perspective, leaves D and I unchanged.

Liquidity and solvency in the presence of IIC.

Recall that, if a proportion f of investors flee, the minimum rate $\theta^*(f)$ at which the country is still solvent in period 2 is $\theta^*(f) = \theta_s + k\frac{(fD-M)}{I}$. Whenever the value of the fundamentals falls in the interval $[-\infty, \theta^*(f)]$ the country will default if the IIC does not declare a standstill. However, even if the IIC declares a standstill, the country defaults if $\theta < \theta_s$. This implies that the only scenario in which the declaration of a standstill by the IIC will change the final outcome and avoid default by the country, is whenever $\theta \in [\theta_s, \theta^*(f)]$.

IIC: Payoffs and information

The IIC's goal, when using standstills, is to avoid liquidity problems that may evolve into default. Depending on its signal, it has to decide on whether the right action is calling a standstill or letting investors flee. It is assumed that the Court is not interested in protecting countries which are doomed to fail (those with $\theta < \theta_s$), nor countries which are solvent even in the presence of a run ($\theta > \theta^*(f)$).[10] As with investors, the Court's payoff depends on making the right decision. We assume that declaring a standstill has a fixed cost for the Court of $C > 0$. Apart from this fixed cost, if the standstill was properly called, the IIC perceives a utility R. But if the standstill was incorrectly called, the Court will face a disutility equal to qR. The Court will be willing to declare a standstill as long as the expected payoff from doing so is non-negative. As before, investors perceive utility r when, after rolling-over, the country does not default. Again, if an investor decided to flee and the country defaults, this utility will be w. Note that if the Court correctly called a standstill, those who rolled over receive a higher payoff.[11]

It is assumed that the Court only knows its own private signal, the distribution of the fundamentals, and that of the signals held by investors.

The IIC receives a signal $S = \theta + v$, where $v \sim N(0, \frac{1}{\beta})$. It uses it to update its beliefs, which become $\theta|S \sim N(\frac{(\beta S+\gamma\widehat{\theta})}{\beta+\gamma}, \frac{1}{\beta+\gamma})$. Define $\rho_{IIC} = E[\theta|S]$, and denote the cumulative distribution and the density function of the Court, with Π and π respectively.

Solvency, runs and standstills in equilibrium

This section characterizes the new equilibrium of the economy. As mentioned above, the IIC's main interest is to protect countries for which the declaration of a standstill may change the final outcome, those with $\theta \in (\theta_s,\theta^*(f))$. As in the simple framework analyzed before, the core of the model is the coordination problem among investors who are uncertain about each other's information. In addition, now they are also concerned with the information handled by the IIC. The payoff of rolling over depends positively on both the amount of investors rolling over and on the willingness of the Court to call a standstill. This set-up has a similar structure to that of Corsetti et al. (2004) and Corsetti et al. (2005). However, conversely to the contributions above, here the "big player" (the IIC) acts only for a determined range of signals. In the Appendix it is shown that, even in this case, the model presents an equilibrium in which investors employ trigger strategies. It is also shown that, by iterated deletion of strictly dominated strategies, the derived equilibrium in trigger strategies is the unique equilibrium of the game.,

Four variables characterize the equilibrium. A threshold for the fundamental, θ^*, below which the country defaults if there is no restructuring, a threshold s^* for the private signal of the investors, and two thresholds for the private signal of the Court, S, which represent the maximum and minimum signals for which the Court will act. These are represented by $S^{\sup}$ and $S^{\inf}$ respectively.

Let's start by θ^*. As before, if the threshold for the investors is s^*, the proportion of investors withdrawing corresponds to the proportion of investors with a signal below s^*, $f = Prob(\rho_i \leq \rho^* \backslash \theta) = prob(s_i \leq s^* \backslash \theta) = \Phi(\sqrt{\alpha}(s^* - \theta))$. Plugging this into equation (2), the upper threshold of the fundamentals implying insolvency becomes,

$$(4) \quad \theta^* = \theta_s[1 + k\frac{[\Phi(\sqrt{\alpha}(s^* - \theta^*)) \cdot D - M]_+}{D - M}].$$

When the Court does not intervene, there will be a default if $\theta \leq \theta^*(s^*)$.

Next the equation that determines $s^*, S^{\sup}$ and $S^{\inf}$ are introduced. The Court assigns the following probability to its intervention being successful $\int_{\theta_s}^{\theta^*} \pi((\sqrt{\beta+\gamma}(\theta - \rho_{IIC}))d\theta$, where $\rho_{IIC} = \frac{(\beta S + \gamma\widehat{\theta})}{\beta+\gamma}$. The IIC 's expected payoff becomes,

$$(5) \quad R\int_{\theta_s}^{\theta^*} \pi((\sqrt{\beta+\gamma}(\theta - \rho_{IIC}))d\theta - qR(1 - \int_{\theta_s}^{\theta^*} \pi((\sqrt{\beta+\gamma}(\theta - \rho_{IIC}))d\theta \geq C.$$

The optimal strategy for the Court is to declare a standstill whenever this inequality holds. In the margin, when the Court is indifferent between calling a standstill or not, the expression above holds with equality. As shown in Figure 1, this rule of action, as already mentioned, leads the Court to act only if its signal falls within a determined interval. This is formalized in the following proposition.

Proposition 1 *Let $C^* = (1 - q)R$.*

(1) *If $C < C^*$, the IIC's optimal strategy is to declare a standstill when its private signal falls within a range $[S_{IIC}^{\inf}, S_{IIC}^{\sup}]$, where $S_{IIC}^{\inf}$ and $S_{IIC}^{\sup}$ are the unique values of S for which* (5) *holds with equality, with $S_{IIC}^{\inf} < S_{IIC}^{\sup}$.*

(2) *If $C > C^*$, the Court never declares a standstill.*

The proof can be found in the Appendix.

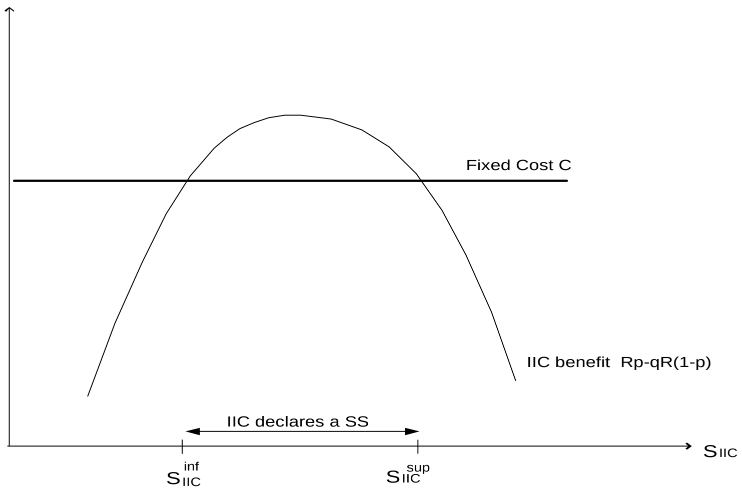

Figure 1. *IIC standstills declaration*

The intuition for this result is the following. As the signal of the IIC diminishes, the probability that a standstill avoids a default decreases, and this reduces the expected value of calling a standstill. Similarly, when the value of the signal increases, the probability of calling a standstill unnecessarily increases, which again reduces the expected value of calling the standstill. The IIC is interested in calling standstills when its updated beliefs do not fall far from the threshold for fundamental insolvency or for solvency even in the presence of a run.

Finally, one can solve for the threshold of investors. In order to maximize their utility, they take into account that if the true state of the economy is below θ_s, the economy will default in period 2 no matter what the IIC does. However, for values of the fundamentals lying in the interval $[\theta_s, \theta^*(s^*)]$, the country will default only if the IIC does not declare a standstill. Therefore, they assign probability $\Phi(\sqrt{(\alpha+\gamma)}(\theta_s - \rho_i))$ to the country defaulting no matter what the IIC does. As before, the threshold for the private signal of the investors is determined by the signal for which the creditor receiving it is indifferent between staying or running. Using the different utility outcomes defined above, the payoff from not rolling over can be defined as,

$$\begin{aligned} U^{NR} &= w[\int_{-\infty}^{\theta_s} \sqrt{\alpha+\gamma}\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))d\theta \\ &+ \int_{-\infty}^{S_{IIC}^{\inf}} \int_{\theta_s}^{\theta^*} \sqrt{\alpha+\gamma}\sqrt{\beta}\pi(\sqrt{\beta}(S_{IIC}-\theta))\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))dS_{IIC}d\theta \\ &+ \int_{s_{IIC}^{\sup}}^{\infty} \int_{\theta_s}^{\theta^*} \sqrt{\alpha+\gamma}\sqrt{\beta}\pi(\sqrt{\beta}(S_{IIC}-\theta))\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))dS_{IIC}d\theta], \end{aligned}$$

where ϕ and π are the density functions of Φ and Π respectively, and $\rho^* = \frac{\alpha s^* + \gamma\widehat{\theta}}{\alpha+\gamma}$.

The first element within the square brackets corresponds with the probability assigned by creditors to the country defaulting despite the IIC action. As long as the true rate of return falls below θ_s, the country always defaults, justifying an investor's decision to seek to run. The second and third elements correspond to the situations where creditors observe a signal on the interval in which the IIC's action could avoid default. In this scenario not rolling over is optimal conditional upon the IIC not acting. As the IIC will not act when its own beliefs fall outside the $[S_{IIC}^{\inf}, S_{IIC}^{\sup}]$ interval, it delivers the two terms, the first referring to the case with a signal below $S_{IIC}^{\inf}$, and the second corresponding to signals above $S_{IIC}^{\sup}$. Similarly we can define the corresponding payoff from rolling over as,

$$\begin{aligned} U^{R} &= r[\int_{\theta^*}^{\infty} \sqrt{\alpha+\gamma}\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))d\theta \\ &+ \int_{S_{IIC}^{\inf}}^{S_{IIC}^{\sup}} \int_{\theta_s}^{\theta^*} \sqrt{\alpha+\gamma}\sqrt{\beta}\pi(\sqrt{\beta}(S_{IIC}-\theta))\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))dS_{IIC}d\theta]. \end{aligned}$$

The first term expresses the probability of a run not succeeding whatever the Court does, while the second corresponds to the probability of being in the critical interval $[\theta_s, \theta^*(s^*)]$ conditional upon the IIC restructuring, and hence corresponds to the probability of the run being unsuccessful, conditional upon the Court calling a standstill.

It is important to note that the expressions above account for the fact that, for every threshold value for the updated beliefs set by the creditors, there is a different maximum rate for default, θ^*. This is so because every s^* determines a unique level of early withdrawals, which, in turn, implies a different maximum rate. Thereby, every threshold, by implying a different level of pressure on the domestic economy, leads to a different range of fundamentals under which the

IIC will be willing to act, i.e. $[\theta_s, \theta^*(s^*)]$.

With this, we can rewrite the "zero-profit "condition, $U^R - U^{NR} = 0$, as,

$$(6) \quad \frac{r}{r+w} = \Phi(\sqrt{\alpha+\gamma}(\theta^* - \rho^*)) - \int_{\theta_s}^{\theta^*} \sqrt{\alpha+\gamma}\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))\Pi(S_{IIC}^{\sup}, S_{IIC}^{\inf})d\theta,$$

where $\Pi(S_{IIC}^{\sup}, S_{IIC}^{\inf}) = \Pi(\sqrt{\beta}(S_{IIC}^{\sup} - \theta)) - \Pi(\sqrt{\beta}(S_{IIC}^{\inf} - \theta))$. All ρ^*,θ^*, $S_{IIC}^{\sup}$, and $S_{IIC}^{\inf}$ depend on s^*.

This equation determines the equilibrium threshold of the beliefs, s^*, below which private investors withdraw their money. Unfortunately, it is not possible to find a close form solution for the threshold for the beliefs. However, as shown in the Appendix , in the case of highly informative private signals, there is a unique trigger solution for this equation. This last equation, together with the one for $\theta^*(s^*)$, the one for θ_s, and the one determining $[S_{IIC}^{\inf}, S_{IIC}^{\sup}]$ completely characterize the equilibrium of the model. **The Appendix shows that, under standard conditions, there is a unique equilibrium in trigger strategies.**[12]

Aggressiveness and Probability of crises: comparing outcomes

How does the introduction of standstills affect creditors'?, Does the presence of the Court reduce the probability of observing a crisis?.

Proposition 2 *Allowing the IIC to declare standstills on the payments reduces agents' incentives to withdraw their money in the interim period, $s^* < s'$.*

The intuition is that the existence of such an institution mitigates the coordination problem faced by creditors by allowing them to be less concerned about what other investors think.

Proof. Without the Court, $\Phi(\sqrt{\alpha+\gamma}(\theta'(s') - \rho')) = \frac{r}{r+w}$, where $\rho' = \frac{\alpha s' + \gamma\widehat{\theta}}{\alpha+\gamma}$.

While with the Court,

$$\frac{r}{r+w} = \Phi(\sqrt{\alpha+\gamma}(\theta^*(s^*) - \rho^*)) - \sqrt{\alpha+\gamma}\int_{\theta_s}^{\theta^*} \phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))F(s^*)d\theta,$$

where $\rho^* = \frac{\alpha s^* + \gamma\widehat{\theta}}{\alpha+\gamma}$, $F(s^*) = \Pi(S_{IIC}^{\sup}, S_{IIC}^{\inf})$, $F(s^*) \in (0,1)$. Define $p = \sqrt{\alpha+\gamma}$.

Noting that $\Phi(p(\theta^*(s^*)-\rho^*)) - \int_{\theta_s}^{\theta^*} \phi(p(\theta-\rho^*))F(s^*)d\theta = \Phi(p(\theta'(s')-\rho'))$, then

$$\Phi(p(\theta^*(s^*)-\rho^*)) > \Phi(p(\theta'(s')-\rho')) \Leftrightarrow s^* - \theta^*(s^*) < s' - \theta'(s').$$

Now, using the "mass condition" one can see that both $\theta'(s')$ and $\theta^*(s^*)$ are strictly increasing in $s-\theta(s)$, so that $\theta^*(s^*) < \theta'(s')$. Use the positive relation between $\theta(s)$ and s to get $s^* < s'$. ■

This proves the initial statement. In the absence of a standstill policy, investors are more aggressive, meaning that they are ready to run with higher signals. This also implies that, absent a standstill policy, the true return which generates such signals is larger, thereby increasing the economy's vulnerability. This can be seen by analyzing the probability of observing a crisis, calculated as the probability of having a rate of return below the threshold, $Prob(\theta < \theta'(s')) > Prob(\theta < \theta^*(s^*))$. As a result, the ex-ante probability of observing a crisis is larger in the absence of the IIC.

The presence of an International Court with authority to call standstills can provide not only ex post benefits (as it can implement barriers to capital outflows when these appear), but is also beneficial ex ante, as it reduces the coordination problem by making agents less concerned about other agents information, making runs and crises less likely.

The role of the accuracy of the Court's information

The analysis above implies that the mere presence of the Court, even if its information is not very accurate, may be enough to reduce the coordination problem. When will the quality of the information handled by the Court increase its potential to mitigate the coordination problem?. The propositions below show that when the court is cautious enough, and fundamentals are such that the Court should act, the better informed the IIC, the smaller the coordination problem. First, a definition that will be used in proving the statement above is presented.

Definition 1 *The Court is said to act cautiously whenever its range of action* $(S_{IIC}^{\inf}, S_{IIC}^{\sup})$ *is contained in the interval* (θ_s, θ^*).

This means that it does not act if its own signal falls out of the range of fundamentals for which it should do so.

The next propositions show how a higher variable cost makes the Court more cautious and the implications this has for the precision of the Court's information.

Proposition 3 *When q is sufficiently large, the Court acts cautiously.*

Proof. *Recall the equation determining the interval of action for the Court:*

$$\Lambda(\widetilde{S}) = \int_{\theta_s}^{\theta^*} \pi(\sqrt{\beta+\gamma}(\theta - \frac{\gamma\widehat{\theta}+\beta\widetilde{S}}{\gamma+\beta}))d\theta = \frac{qR+C}{R(1+q)} = F(q).$$

Note that $\lim_{S_{IIC}^{\sup}\to\infty} \Lambda(S_{IIC}^{\sup}) = \lim_{S_{IIC}^{\inf}\to-\infty} \Lambda(S_{IIC}^{\inf}) = 0$. *Also note that* $\frac{\partial F(q)}{\partial q} > 0$. *It is clear that as q increases, $S_{IIC}^{\inf}$ has to increase and $S_{IIC}^{\sup}$ has to decrease. Given that the three equations are continuous, there exists a q such that* $(S_{IIC}^{\inf}, S_{IIC}^{\sup}) \subset (\theta_s, \theta^*)$. ■

Proposition 4 *If the Court acts cautiously and if $\theta \in (S_{IIC}^{\inf}, S_{IIC}^{\sup})$, then the bigger the precision of signal extracted by the Court, β, the smaller θ^*.*

Proof. *As already noted the reduction in the coordination problem can be measured by the size of the term* $\int_{\theta_s}^{\theta^*} \sqrt{\alpha+\gamma}\phi(\sqrt{\alpha+\gamma}(\theta-\rho^*))\Pi(S_{IIC}^{\sup}, S_{IIC}^{\inf})d\theta$. *The bigger it is, the smaller the coordination problem. Note that only* $\Pi(S_{IIC}^{\sup}, S_{IIC}^{\inf})$ *is changing with β.*

$$\begin{aligned}\frac{\partial\Pi(S_{IIC}^{\sup}, S_{IIC}^{\inf})}{\partial\beta} &= [\pi(\sqrt{\beta}(S_{IIC}^{\sup}-\theta))(\frac{\partial\sqrt{\beta}}{\partial\beta}(S_{IIC}^{\sup}-\theta)+\sqrt{\beta}\frac{\partial S_{IIC}^{\sup}}{\partial\beta}) \\ &\quad -\pi(\sqrt{\beta}(S_{IIC}^{\inf}-\theta))(\frac{\partial\sqrt{\beta}}{\partial\beta}(S_{IIC}^{\inf}-\theta)+\sqrt{\beta}\frac{\partial S_{IIC}^{\inf}}{\partial\beta})]\end{aligned}$$

What matters is the sign of the expression above. It has been shown that, if the Court is cautious then $\frac{\partial S_{IIC}^{\sup}}{\partial\beta} > 0$ *and* $\frac{\partial S_{IIC}^{\inf}}{\partial\beta} < 0$. *If in addition,* $\theta \in (S_{IIC}^{\inf}, S_{IIC}^{\sup})$ *all the elements have the correct sign as to guarantee that* $\frac{\partial\Psi(\beta)}{\partial\beta}$ *is undoubtedly bigger than zero.* ■

The condition $\theta \in (S_{IIC}^{\inf}, S_{IIC}^{\sup})$, as long as the Court is cautious, implies that $\theta \in (\theta_s, \theta^*)$. Whenever the fundamental position of an economy is such that a cautious Court should call a standstill, then the better informed the Court, the smaller the coordination problem becomes.

Figure 2 in the Appendix graphically represents the action interval of a cautious IIC.

Summary 1 *The presence of better informed IIC in illiquid economies:*

1) Reduces the region in which a coordination problem exists, $\frac{\partial(\theta^* - \theta_s)}{\partial \beta} < 0$.

2) As a result the probability of a debt crisis, $P(\theta < \theta^*)$ *is also reduced.*

III. A first look at moral hazard

Finally, the model assesses the implications of the proposed policy on debtors economies' incentives to implement costly adjustment policies. This is relevant given the importance of moral hazard considerations in the debate on the reform of the international financial architecture.

It will be shown that moral hazard will depend critically on the conditions under which sovereigns are allowed to resort to the Court. For simplicity the analysis is performed in the limit case, in which the precision of the private signals goes to infinity ($\alpha, \beta \to \infty$). This implies that in equilibrium, there will be no heterogeneity, and therefore partial withdrawals won't be observed.[13]

It is assumed that the government can implement some policies which increase the expected return from θ_L to θ_H, with a cost that is assumed to be fixed.

Analyze first the benchmark case, when no International Court exists. The country's welfare depends on the amount of effort as follows: if no effort is applied, then

$$\lim_{\alpha \to \infty} W^N(L) = \int_{\theta'}^{\infty} [\theta I + M - D] \cdot g(\theta/\theta_L) \cdot d\theta.$$

If effort is applied,

$$\lim_{\alpha \to \infty} W^N(H) = \int_{\theta'}^{\infty} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - Cost.$$

g stands for the density function for the distribution of the returns conditional on the level of effort, and G for the corresponding cumulative distribution.

The country's net change in welfare when implementing these policies is,

$\triangle W^N = I \cdot \triangle\theta(1 - G(\theta'/\theta_L)) + \int_{\theta'}^{\theta' + \triangle\theta} [\theta I + M - D] g(\theta/\theta_H) \cdot d\theta - Cost.$

The lower limit of integration corresponds with θ', as only for returns above that threshold will the country have some cash left. The benefits of implementing the effort come from both, the increase in the expected return of the project, and the effect that this has on creditors' behavior, as it will be more likely that their signals will go above the critical threshold, which reduces liquidation costs.

When the IIC is present, the country's welfare can be calculated as,

$\triangle W^{IIC} = I \cdot \triangle\theta(1 - G(\theta_s/\theta_L)) + \int_{\theta_s}^{\theta_s+\triangle\theta} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - Cost.$

For arbitrarily precise signals, two things occur. First, the IIC never defends a country when the rate of return is below θ_s. Second, creditors never withdraw if the return is above θ_s. This explains why the lower limit of integration is θ_s. Again, the first element in the right hand side of the equality collects the increase in output due to the increase in the average return. The second accounts for the drop in liquidation cost due to the lower probability of observing a run. To analyze the moral hazard implications of the introduction of standstills one has to compare the net benefits under both scenarios. The best way to do so is to compare them element by element. Define $\triangle W^{IIC} - \triangle W^N = A + D$. As $\theta' > \theta_s$, then

$$A = I \cdot \triangle\theta[G(\theta'/\theta_L) - G(\theta_s/\theta_L)] > 0,$$

and

$$D = \int_{\theta_s}^{\theta_s+\triangle\theta} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - \int_{\theta'}^{\theta'+\triangle\theta} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta < 0$$

The presence of the IIC increases the range of fundamentals for which the country can enjoy the increased return, making effort more attractive than in the absence of the Court. This is the effect displayed in A.In addition, the returns for which the country saves liquidation costs are lower in the case in which the Court can act. The presence of the IIC protects countries in such a way that only under relatively low returns a run is observed. Countries tend to worry less about the liquidation cost occurring on that tail of the distribution, so they have little interest in applying effort. They are already hedged against runs by the presence of the Court. This is the element reflecting the moral hazard, its effect being displayed by D. It is not possible to give an *a priori* answer of the moral hazard effects from having an IIC.

Numerical evaluation

Given the difficulties to obtain analytical conclusions, the effect of the IIC on the incentives to apply effort is numerically analyzed. The focus is on how the results change as the average return without effort (θ_L), the return to effort ($\triangle\theta$), and the variance of the public signal ($\frac{1}{\gamma}$) are allowed to change.[14] The values used on the parametrization are summarized in Table 1.

E	0.1	k	0.8
M	0.5	θ_L	$(1.25, 1.50)$
I	1	$\triangle\theta$	$(0.1, 0.35)$
i	0.1	$\frac{1}{\gamma}$	$(0.2, 1.2)$

Table 1. Parameter values.

The model was parameterized to obtain situations where the Court could both represent an incentive to exert effort, and generate moral hazard. To get this result two things had to be assumed.[15] First, the liquidation costs have to be high. It was not possible to find situations in which, with liquidation costs below 70%, the IIC represented a good incentive. Second, highly leveraged governments has to be assumed. Given the parametrization above, the value of $\frac{d}{I}$ equals 0.95. This is a situation of extreme leverage, as most of the investment is being financed exclusively through debt. This should be seen as an indication of the fact that the introduction of the Court is very likely to generate negative incentives to apply effort. Figures $3a$ to $3f$, summarize the results.

Figures $3a$ and $3b$ show how the moral hazard changes with the initial average return, in scenarios with low/high variance where return to effort is kept low, and scenarios with low/high returns to effort while keeping the variance low. Clearly, increases in the initial return increase the incentives problem generated by the Court. Only when the variance or the return to effort are low, one observes that for low initial returns the IIC represents an incentive to exert effort. The reason is that, as the initial average return increases, the saving in liquidation costs faced when the court is not present grows much faster than in the presence of the Court, which makes effort relatively more desirable in the absence of the Court.

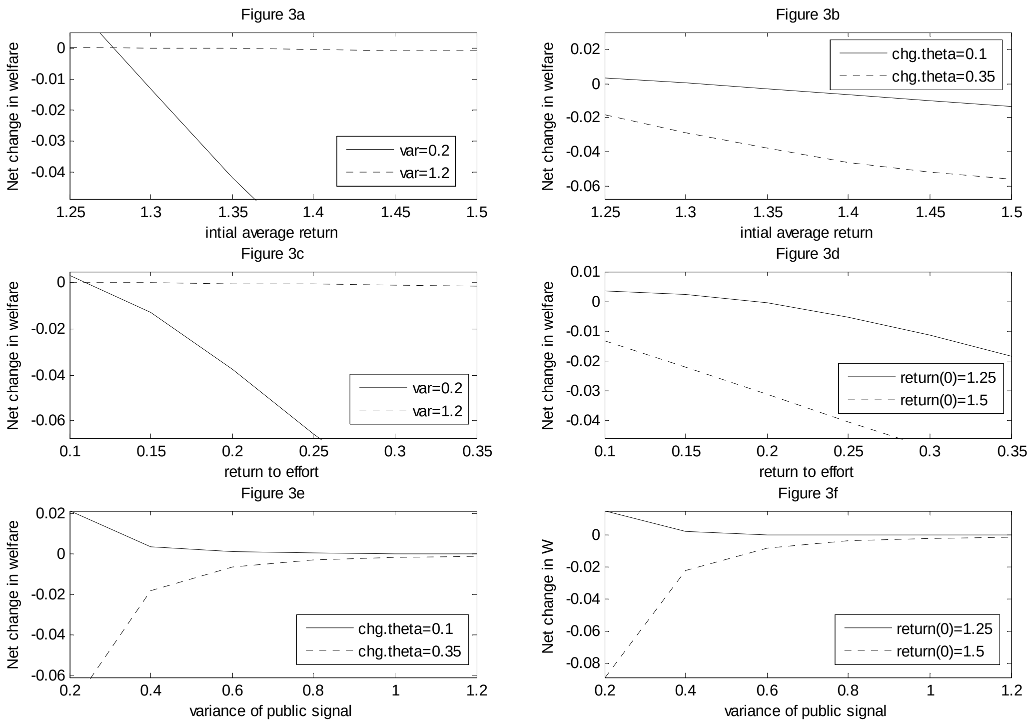

Figure 3: Incentives to apply effort under different parametrizations

As shown in figures 3*c* and 3*d*, similar results are obtained when the return to effort is allowed to change. Again, the only situations in which the Court does not generate moral hazard are the ones where variance, initial return and return to effort are low. Increases in the return to effort are much less of an incentive when the Court is present. This is explained by the fact that without the Court the greater return to effort, the greater the reduction in liquidation costs if effort is applied. Finally, the effect on the incentives stemming from changes in the precision of public information is analyzed. When public information is scant, the difference in incentives vanishes. This is so because, as uncertainty increases any outcome becomes more feasible, reducing the relative gains in terms of increased returns or reduced liquidation costs. This can be seen from figures 3*e* and 3*f*.

Summary 2 *The only situations where the Court represents an incentive to apply costly policies are those with low initial return and low return to effort. However, this incentive vanishes as uncertainty increases. The results seem to reflect the general view that policies aimed at helping* *countries in financial stress, generate moral hazard problems. However, it is worth noting that in cases where the situation is relatively bad (low initial return), the IIC can represent a good incentive to convince these countries to apply costly policies.*

If this was all, one should question if such a policy option is a good idea. However, as the next point makes clear, standstills can become a useful tool also to generate incentives on debtors if resort to the Court by sovereigns is conditioned on ethe country's adjustment effort. .

Addressing the incentives problem: Conditionality

What would happen if resort to the IIC by sovereigns was conditioned to the adjustment effort?.

To introduce the effort decision, the timing of the game is slightly modified by introducing a new period, in which the government has to make a decision on its effort. Now, in period 0, the government has to choose whether to apply a high or low level of effort.[16] It will be assumed that this decision can be perfectly monitored.[17] This implies that everybody knows if the country has applied the commited policies. Therefore, when investors have to play the roll-over subgame, they know if they can expect the IIC to intervene or not.

With this set-up the game is solved basically as before. The only difference is that, now, investors take into account the level of effort exerted. Investors know that if the level of effort is high, the IIC will be there to consider the application of a standstill. In that situation they will again set their threshold for the private signal at s^*. Conversely, if they observe that the level of effort is low, they know that the IIC will not grant a standstill whatever happens, and they will choose to run whenever their private signals fall below the threshold s'. These changes affect the incentive to exert effort in the presence of the IIC. Now the level of utility of the government conditional on its effort is $\triangle W_{cond}^{IIC}(L) = \int_{\theta'}^{\infty}[\theta I + M - D] \cdot g(\theta/\theta_L) \cdot d\theta$, if low, and, $\triangle W_{cond}^{IIC}(H) = \int_{\theta_s}^{\infty}[\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - Cost$, if high.

Therefore, with an IIC, the increase in utility from exerting effort is,

$$\triangle W_{cond}^{IIC} = \int_{\theta_s}^{\infty}[\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - \int_{\theta'}^{\infty}[\theta I + M - D] \cdot g(\theta/\theta_L) \cdot d\theta - Cost.$$

In the absence of the IIC the incentive to exert effort is the same as before,

$$\triangle W^N = \int_{\theta'}^{\infty} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - \int_{\theta'}^{\infty} [\theta I + M - D] \cdot g(\theta/\theta_L) \cdot d\theta - Cost.$$

The moral hazard implications of this way of implementing standstills are summarized in the following two propositions.

Proposition 5 *Making the application of standstills conditional on whether effort is exerted increases the incentives to apply effort with respect to the situation in which standstills are granted regardless of the level of effort,* $\triangle W^{IIC}_{cond} > \triangle W^{IIC}$.

Proof. *The difference in welfare increase due to increased effort (which is the difference in incentives to exert effort) between conditional and unconditional standstill policy is*

$$\triangle W^{IIC}_{cond} - \triangle W^{IIC} = \int_{\theta_s}^{\theta'} [\theta I + M - D] \cdot g(\theta/\theta_L) \cdot d\theta$$

which as long as $\theta_s < \theta'$ *is strictly positive.* ■

Proposition 6 *When compared with the incentive to exert effort in the absence of standstills, the policy of conditional standstills enhances the incentives of the debtor country to do so,* $\triangle W^{IIC}_{cond} > \triangle W^N$.

Proof. *In this case we want to analyze the sign of the following difference*

$$\triangle W^{IIC}_{cond} - \triangle W^N = \int_{\theta_s}^{\infty} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta - \int_{\theta'}^{\infty} [\theta I + M - D] \cdot g(\theta/\theta_H) \cdot d\theta$$

which again as long as $\theta_s < \theta'$ *is strictly positive.* ■

Two extreme cases have been analyzed here. One, where help is unconditional, and one where the help is conditioned in some, perfectly observable actions. As expected, results say that conditionality and perfect monitoring make an effort-increasing device of standstills. The main conclusion is that while a policy of unconditional restructuring is likely to have perverse effects on the incentive to exert effort, the implementation of a conditional standstills policy, in which restructuring depends on the country's behavior, represents an incentive to apply effort.

It would be interesting to adapt the set-up to recognize that monitoring is not perfect. It seems reasonable that the lower the ability to monitor the country is, the greater the possibility of the policy generating moral hazard problems.

IV. Conclusions

This paper analyzes the potential for a standstills policy applied by an International Court to mitigate the coordination problem inherent to sovereign debt contracts in the context of liquidity problems. It is found that presence of the Court forces investors to focus on its course of action rather than just second guessing other investors beliefs, thereby reducing the scale of the coordination problem and creditors' aggressiveness in situations of stress. This result, which holds regardless of the precision of the information handled by the Court, runs against the "rush for the exits" critique (see Gai and Shin, 2004). However, the paper shows that, if the Court acts cautiously, its potential to mitigate the coordination problem increases the better informed it is. From this perspective, it is suggested that a standstill policy can be welfare enhancing. However, the parametrization of the model shows that, under general conditions, such a policy can introduce distortions on debtors' incentives. For the case in which policy implementation is perfectly observable, the use of conditionality has the potential to mitigate such moral hazard. Some questions remain unanswered. For instance, it is not addressed whether the Court may affect the returns demanded on sovereign debt by creditors or whether it may reduce the stock of capital available for the sovereigns (see Martin and Peñalver, 2003). Subsequent research could address this issue while keeping the focus on the coordination problem, which is at the core of the model developed here.

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Appendix

I. Benchmark economy. Uniqueness

Here it will be shown that, for the benchmark, uniqueness is guaranteed as long as the relative precision of the private signal is large enough. The proof follows Bannier (2003).

Equation (2) has a slope $\frac{\partial s'}{\partial \theta'} = 1 + \frac{1}{\sqrt{\alpha}} \frac{\partial \Phi^{-1}((\theta' + \frac{kM}{I} - \theta_s)\frac{I}{kD})}{\partial \theta'}$.

Rewriting equation (3) as $s' = \frac{\alpha+\gamma}{\alpha}(\theta' - \frac{\gamma\widehat{\theta}}{\alpha+\gamma} - \Phi^{-1}(\frac{r}{r+w})\frac{1}{\sqrt{\alpha+\gamma}})$, its slope is $\frac{\partial s'}{\partial \theta'} = \frac{\alpha+\gamma}{\alpha}$.

The sufficient condition for uniqueness is satisfied if $\frac{\alpha+\gamma}{\alpha} < 1 + \frac{1}{\sqrt{\alpha}} \min(\frac{\partial \Phi^{-1}((\theta' + \frac{kM}{I} - \theta_s)\frac{I}{kD})}{\partial \theta'})$, as in that case, the slope of equation (2) is always bigger than that of equation (3), implying that at most there is one crossing point. Note that the minimum of $\frac{\partial \Phi^{-1}(.)}{\partial \theta'}$ is equal to the reciprocal of the maximum value of $\frac{\partial \Phi(.)}{\partial \theta'}$, which is $\frac{1}{\sqrt{2\pi}}$. Thus, we can rewrite the condition as $\alpha > \frac{\gamma^2}{2\pi}$. As long as,the condition on the precision of the public and private signals stated above holds, the derived trigger equilibrium is unique.[18]

II. Proof of Proposition 1

Suppose that $C < (1-q)R$. We define $\rho_{IIC} = \frac{\gamma}{\beta+\gamma}\widehat{\theta} + \frac{\beta}{\beta+\gamma}S$. Recall

$$A(\rho_{IIC}) = R(1+q)\int_{\theta_s}^{\theta^*} \pi((\sqrt{\beta+\gamma}(\theta - \rho_{IIC}))d\theta = qR + C$$

Note that $\lim_{\rho \to -\infty} A(\rho_{IIC}) = \lim_{\rho \to \infty} A(\rho_{IIC}) = 0$.

Solving $\max_{\rho} A(\rho_{IIC}) = \max_{\rho}(R+qR)[\Pi(\overline{x}) - \Pi(x_s)]$, where $\overline{x} = \sqrt{\beta+\gamma}(\theta^* - \rho_{IIC})$ and $x_s = \sqrt{\beta+\gamma}(\theta_s - \rho_{IIC})$.

The first order condition is, $\pi(\overline{x}) = \pi(x_s) \Longrightarrow \pi(\sqrt{\beta+\gamma}(\theta^* - \rho_{IIC})) = \pi(\sqrt{\beta+\gamma}(\theta_s - \rho_{IIC}))$. There are two possibilities for this equation to hold.

The first one implies $\theta^* = \theta_s$, and ρ_{IIC} not defined, which is obviously not the case because as long as $f > 0$ we know that $\theta^* > \theta_s$. The second one, which makes use of the symmetry of the normal distribution, implies that $\rho_{IIC} - \theta_s = \theta^* - \rho_{IIC}$. It is easy to see that the maximum of the function above is obtained for $\rho_{IIC}^M = \frac{\theta^* + \theta_s}{2}$.

Finally, using again the first order condition just derived, the behavior of the function optimized above can be analyzed. $\frac{\partial A(\rho_{IIC})}{\partial \rho_{IIC}} = \begin{cases} > 0 \text{ if } \rho_{IIC} < \rho_{IIC}^{M} \\ < 0 \text{ if } \rho_{IIC} > \rho_{IIC}^{M} \end{cases}$. All this can be used to prove the proposition. Note that $A(\rho_{IIC})$, which is continuous, starts at zero and ends up also at zero. Note also that it continuously increases until $\rho_{IIC} = \rho_{IIC}^{M}$, and decreases afterwards.

Then as long as $R(1+q)\int_{\theta_s}^{\theta^*} \pi((\sqrt{\beta+\gamma}(\theta - \rho_{IIC}^{M}\ ))d\theta - qR > C$, the function $A(\rho_{IIC})$ intersects twice with the line $C + qR$.

Call those values $\rho_{IIC}^{\sup}$ and $\rho_{IIC}^{\inf}$. Use $\rho_{IIC} = \frac{\gamma}{\beta+\gamma}\widehat{\theta} + \frac{\beta}{\beta+\gamma}S$ to recover $S_{IIC}^{\sup}$ and $S_{IIC}^{\inf}$. Moreover, for all values of the signal between those two the equation above holds with strict inequality, and the Court will declare a standstill for all signals falling in the interval $[S_{IIC}^{\inf}, S_{IIC}^{\sup}]$ as stated in the proposition.

III. Existence of a unique equilibrium in trigger strategies with the Court

Here it will be shown that the proposed equilibrium is, if some conditions to be derived below hold, unique. Recall equations $(4), (5), (6)$.

Applying the following changes of variables $\overline{\lambda} = \sqrt{\alpha+\gamma}(\theta^* - \frac{\gamma}{\gamma+\alpha}\widehat{\theta} - \frac{\alpha}{\gamma+\alpha}s^*)$, and $\overline{\lambda}_s = \sqrt{\alpha+\gamma}(\theta_s - \frac{\gamma}{\gamma+\alpha}\widehat{\theta} - \frac{\alpha}{\gamma+\alpha}s^*)$, equation (6) can be rewritten as,

$$\frac{r}{r+w} = \int_{-\infty}^{\overline{w}} \phi(w)dw - \int_{\overline{w}_s}^{\overline{w}} \phi(w)(\Pi(\overline{\mu}) - \Pi(\overline{\mu}_s))dw,$$

where $\overline{\mu}$ and $\overline{\mu}_s$ are implicit functions of λ, $\overline{\lambda}, \overline{\lambda}_s$ and other parameters of the model.

The right hand side of the above expression is increasing in both $\overline{\lambda}$ and $\overline{\lambda}_s$. To see it decompose further the expression above to get,

$$\begin{aligned} \frac{r}{r+w} &= \int_{-\infty}^{\overline{\lambda}_s} \phi(\lambda)d\lambda + \int_{\overline{\lambda}_s}^{\overline{\lambda}} \phi(\lambda)d\lambda - \int_{\overline{\lambda}_s}^{\overline{\lambda}} \phi(\lambda)(\Pi(\overline{\mu}) - \Pi(\overline{\mu}_s))d\lambda \\ &= \int_{-\infty}^{\overline{\lambda}_s} \phi(\lambda)d\lambda + \int_{\overline{\lambda}_s}^{\overline{\lambda}} \phi(\lambda)F(\overline{\mu}, \overline{\mu}_s)d\lambda. \end{aligned}$$

It is evident that, as long as the function $F(\overline{\mu}, \overline{\mu}_s) \in (0,1)$, for increases in $\overline{\lambda}$ and $\overline{\lambda}_s$ the value of the right hand side increases. But, as $S_{IIC}^{\sup} > S_{IIC}^{\inf}$, the function F is always in that interval, and therefore the expression is always increasing in both arguments.

The next step is proving that the partial derivative of both $\overline{\lambda}$ and $\overline{\lambda}_s$ with respect to s^* is negative. This implies that increases in threshold for the signal of the small investors reduced the value of $\overline{\lambda}$ and $\overline{\lambda}_s$, and therefore reduce the expression on the right hand side. The fact that the expression is strictly decreasing in s^* implies that there is a unique point where the equality holds, and this is the unique solution for the problem.

Rewrite (4) using the definition of $\overline{\lambda}$ as,

$$(8) \quad \theta^* = (\theta_s - \frac{kM}{I}) + \frac{kD}{I}\Phi(-\overline{\lambda} - \frac{\gamma}{\sqrt{\alpha+\gamma}}\widehat{\theta} + (\sqrt{\alpha+\gamma} - \sqrt{\alpha})\theta^* + (\sqrt{\alpha} - \frac{\alpha}{\sqrt{\alpha+\gamma}})s^*).$$

Now, calculate the derivative of $\overline{\lambda}$ with respect to s^*,

$$(9) \quad \frac{\partial\overline{\lambda}}{\partial s^*} = \sqrt{\alpha+\gamma}\frac{\partial\theta^*}{\partial s^*} - \frac{\alpha}{\sqrt{\alpha+\gamma}}.$$

Plugging $\frac{\partial\theta^*}{\partial s^*} = \frac{\frac{kD}{I}\phi(.)[-\frac{\partial\overline{\lambda}}{\partial s^*} + (\sqrt{\alpha} - \frac{\alpha}{\sqrt{\alpha+\gamma}})]}{(1 - \frac{kD}{I}\phi(.)(\sqrt{\alpha+\gamma} - \sqrt{\alpha}))}$ back into (8) gives,

$$\frac{\partial\overline{\lambda}}{\partial s^*} = \frac{\frac{kD}{I}\phi(.)[\frac{(\alpha+\gamma)\sqrt{\alpha} - \alpha\sqrt{\alpha}}{\sqrt{\alpha+\gamma}}] - \frac{\alpha}{\sqrt{\alpha+\gamma}}}{1 + \frac{kD}{I}\phi(.)\sqrt{\alpha}}.$$

As stated, a sufficient condition for the equilibrium to be unique is that the derivative above is negative. As the denominator is positive, in order to have uniqueness, the following must hold,

$$(10) \quad \frac{\partial\overline{\lambda}}{\partial s^*} < 0 \Leftrightarrow \phi(.)[\frac{(\alpha+\gamma)\sqrt{\alpha} - \alpha\sqrt{\alpha}}{\sqrt{\alpha+\gamma}}] - \frac{\alpha}{\sqrt{\alpha+\gamma}} < 0,$$

so that $\frac{kD}{I}\phi(.)\gamma < \sqrt{\alpha}$. But ϕ has its maximum value at the mean, $\phi(mean) = \frac{1}{\sqrt{2\pi}}$. This leads to $\alpha > \gamma^2\frac{k^2D^2}{2\pi I^2}$. For private signals with precision above the one just derived $\frac{\partial\overline{\lambda}}{\partial s^*} < 0$. As $\frac{\partial\overline{\lambda}_s}{\partial s^*} = -\frac{\alpha}{\sqrt{\gamma+\alpha}} < 0$ independently of the precision, for signals with the precision just derived, both derivatives are negative and therefore there is a unique s^* solving (6). This unique s^* determines θ^*, and this last one uniquely determines $S^{\sup}$ and $S^{\inf}$.

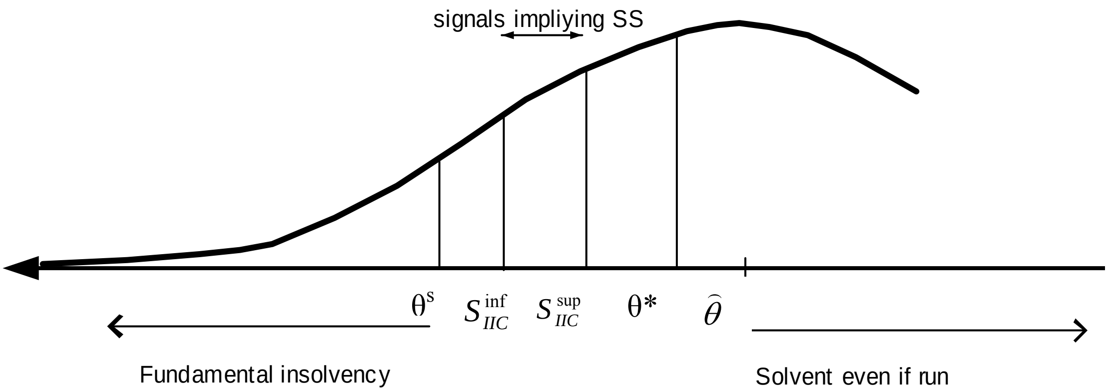

Figure 2: Range of action of a cautious IIC

Notes

[1]At the end of June 2005, the stock of outstanding EM sovereign bonds including CACs was 53% in value, with the issuance proportion at 86% of such bonds (by value) between the first quarter fo 2003 and the second quarter of 2005. See Global Financial Stability Report (IMF, 2005).

[2]It might be worth noting that such provisions were included in recent debt exchanges by Argentina, the Dominican Republic and Uruguay (IMF, 2005, p. 44).

[3]Although very important it is out of the scope of the paper to address the political difficulties of making such an institution operational.

[4]See Haldane et al. (2004) on the first, and Corsetti et al (2005), Rochet and Vives (2004) or Morris and Shin (2006) on the second.

[5]Willingness to repay is another important aspect of the sovereign debt problem. Although is not explicitly in our model one could argue that moral hazard is directly related to willingness to repay.

[6]Rate of return and the fundamentals of the economy will be used as synonyms.

[7]This can be rationalized by assuming that investors have a utility function which is just the sum of consumption at any date. In this case if waiting gives bigger consumption waiting is the right option.

[8]Since noise is independent, the probability of a creditor holding beliefs below ρ' is equal to the proportion of investors with beliefs below ρ'.

[9]A sovereign state can only renounce immunity from jurisdiction and execution by contractual means (Horn, 2004).

[10]The assumption that the IMF seeks to intervene only when the country is fundamentally sound is standard in the literature (see Morris and Shin, 2006). Here it is assumed that it is also a valid assumption for the supranational authority. It seeks to intervene and disrupt market functioning as little as possible.

[11]In Rochet and Vives (2004) the big player´s payoffs can be understood as monetary payoffs. In this case it seems more natural to think that the costs reflect, not only the cost of the analysis (which is relatively small), but also costs associated with the disruption of capital flows which will affect both the economy and international financial markets in general.

[12]See Section 7.2 in Vives (JEL, 2005) for a proof that this type of supermodular games has only solutions in trigger strategies.

[13]Corsetti et al. (2005) contains a similar analysis.

[14]The return to effort is modeled as the percentage increase with respect to the initial return.

[15]It should be noted that this part of the analysis is not intended as a calibration exercise based on some underlying empirical observations.

[16]It has to decide if it applies some costly adjustment policies or not.

[17]This assumption is standard in this kind of models. For an example see Morris and Shin (2003).

[18]This is only a sufficient condition. Additionally, iterated deletion of strictly dominated strategies can be used to show that this equilibrium is the unique equilibrium (see Morris and Shin, 2000).

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