Co-ordination Failure, Moral Hazard and Sovereign Bankruptcy Procedures

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November 26, 2002

Abstract

We study a model of sovereign debt crisis that combines problems of creditor co-ordination and debtor moral hazard. In the face of sovereign default, the need to give appropriate incentives to the debtor leads to excessive 'rollover failure' by creditors. We discuss how the incidence of crises might be reduced by international sovereign bankruptcy procedures – involving increased 'contractibility' of sovereign debtor's payoffs, suspension of convertibility in a 'discovery' phase and penalties in case of malfeasance. In relation to the current debate, this is more akin to the IMF's Sovereign Debt Restructuring Mechanism than the Collective Action Clauses promoted by others.

JEL Classification: F02, F30, F33, F34

Keywords: International financial architecture, Sovereign debt restructuring, Creditor co-ordination, Moral hazard.

1 Introduction

Following Mexico's moratorium on its external debt payments in 1982, virtually all voluntary lending to emerging markets by commercial banks ceased (Buchheit, 1999); and the eighties came to be known as the 'lost decade' in Latin America. When lending to these markets restarted in the 1990s, as a result of the Brady Plan, lenders sought to avoid any repeat of the write-downs imposed on commercial banks by swapping loans for sovereign bonds. Unlike bank lending, however, Brady bonds issued under New York law cannot be restructured without unanimous consent. While this may be a useful check on debtor's 'moral hazard', it means that emerging markets are exposed to financial crisis due to creditor panic or

*Acknowledgements: We are grateful for comments received at the Royal Economic Society meetings at Warwick and conferences at IIE, Washington, D.C. and at the Bank of England where David Vines was discussant. We also acknowledge suggestions made by Aloiso Aruajo, Ricardo Cavaclanti, Ronato Flores, Federico Sturzenegger and others at the Latin American Meetings of the Econometric Society in Sao Paolo, and at seminars in UTDT, Buenos Aires and FGV, Rio de Janeiro. Financial support from the ESRC under project No. R000239216 'Moral Hazard and Financial Institutions' and from the Centre for the Study of Globalisation and Regionalisation, University of Warwick is gratefully acknowledged, as is the technical assistance of Pongsak Luangaram of the CSGR.

extraneous shocks to their debt service capacity. Nevertheless, for some years, capital kept flowing to emerging markets at modest rates of interest – underwritten in part by an IMF policy of (ever increasing) bail-outs. Following Russia's partial foreign debt repudiation in August 1998, however, generous inflows to Latin America once again came to a standstill; and sovereign interest rate spreads rose to over 1600 basis points on the EMBI+ index, remaining above 700 basis points for the next two years.

These developments – together with the collapsing currencies and soaring sovereign spreads facing many Latin American countries in 2001/2 – have put in question traditional explanations for financial crises, based on current account and fiscal deficits. They suggest the need to focus on the intrinsic behaviour of capital markets (Calvo et al, 2002). Why do sudden stops to the flows of finance occur? What are the economic consequences, and the implications for institutional design?

In this paper, we focus on how problems of creditor co-ordination interact with debtor's incentives to generate excessive crises. In the literature, however, these issues are typically treated separately. In explaining bank runs, for example, Diamond and Dybvig (1983) demonstrated the possibility of multiple equilibria in financial markets, taking as given the structure of demand deposit contracts (i.e. the right of depositors to withdraw on demand) and the choice of investments by the bank. To help select the "good" equilibrium, three institutional mechanisms were discussed – provision of liquidity, suspension of convertibility and deposit insurance. Analogous co-ordination problems arise in connection with emerging-market bonds[1] and similar proposals have recently been made. Stanley Fischer (1999), Radelet and Sachs (1998) and Truman (2001), for example, have emphasised official provision of liquidity; while Krugman (1998) called for capital outflow controls to protect East Asian currencies (i.e. a suspension of convertibility). There has not been much talk of explicit insurance, Soros (1998) and Jeanne (2001) being exceptions: but an additional possibility has been widely discussed, that of revising the nature of sovereign debt contracts themselves. Eichengreen and Portes (1995), Buchheit and Gulati (2000) and Taylor (2002) have advocated the insertion of collective action clauses to assist creditor co-ordination.

Such proposals to solve creditor coordination problems have been criticised for failing to take into account their effect on sovereign debtors' incentives. Barro (1998, p.18), for example, suggested that bail-outs can increase the probability of sovereign default, stating that " bailouts increase 'moral hazard' by rewarding and encouraging bad policies by governments and excessive risk-taking by banks". With reference to $42 billion package for Brazil in 1998, for example, Barro asked: "How did the Brazilians qualify for this support? They did so mostly by not exercising sound fiscal policies. If their policies had been better, they would not be in their current difficulties and would not qualify for IMF money". After further discussion of the bailouts for Mexico and Russia, he concluded "the IMF might consider changing its name to the IMH– the Institute for Moral Hazard".

Typically, however, debtor's moral hazard has been considered in a separate strand of the literature which focuses on the use of punishment strategies in models of repeated interaction. In Bulow and Rogoff (1989a), for example, trade sanctions are the punishment mechanism to prevent strategic default. But since their bargaining model assumes a single creditor lending

[1] Eaton (2002) uses a variant of Diamond and Dybvig (1983) in a sovereign debt context.

to a single debtor, creditor coordination problems are not discussed. Nor are they addressed in Kletzer and Wright (2000), who use a repeated game model to study how restricting access to capital markets can check moral hazard.[2]

A convincing treatment of sovereign debt crises and their resolution needs to combine creditor co-ordination and debtor incentives in a consistent framework. In this paper, we develop such a framework. It implies that bail-outs do not solve the underlying causes of a sovereign debt crisis; and that the market equilibrium needed to provide the right incentives is excessively prone to financial crisis (i.e. to sudden stops in capital flows). To improve on the equilibrium market outcome, we analyse an international bankruptcy procedure as ex-ante commitment device that involves (a) ensuring partial contractibility of sovereign debtor's payoffs, (b) temporary suspension of convertibility in a 'discovery' phase and (c) ex-post transfers. The mechanism we describe incorporates features of the bankruptcy procedures advocated by the IMF (Krueger, 2002) – though, unlike the IMF's proposal, it is not restricted to cases of 'insolvency'. On the other hand, it differs sharply from the 'crisis insurance fund'[3] recommended by Jeanne (2001) who assumes that solving the creditor coordination problem has no impact on the debtor's incentives.

In related work, Tirole (2002) has recently emphasised the 'common agency problems' affecting sovereign borrowing: the contracting externalities which may lead to over-borrowing and excessive short-term debt, and the collective action problems that prevent efficient roll-over and restructuring. Though our focus is somewhat different – we take both the amount and maturity structure of sovereign debt as given – the analytical approach we use has many features in common, including the assumption that there are debtor payoffs which cannot be secured by creditors (i.e. are not 'contractible') and the links that are established between ex-post resolution procedures and ex-ante debtor incentives. Our institutional recommendation for increasing the contractibility of the debtor payoffs is not unlike Tirole's proposal to increase the 'pledgable income' of the sovereign debtor.

While in the main body of the paper, we have, for simplicity, assumed that shocks are temporary and creditors have symmetric (but incomplete) information about these shocks and the actions chosen by the debtor, the appendix discusses the issues that arise when creditors are unsure and disagree whether the shock is temporary or permanent [4]. The model and results in the Appendix share with Calvo (1999) the focus on asymmetric information and heterogenous creditors as causes of excessive crises.

The paper is structured as follows. To set the scene, we first describe the two principal proposals for improving the international financial architecture currently under active consideration, the Sovereign Debt Restructuring Mechanism (SDRM) advocated by the IMF and the Collective Action Clauses recommended by the US Treasury. The analysis begins in section 3 with a canonical two-player game of *creditor coordination* where neither creditor can make a credible commitment not to play a grab race, even when shocks are temporary. To

[2] Bulow and Rogoff (1989b) point out that the threat of exclusion from capital markets may fail to satisfy renegotiation proofness and may be of limited use in the case of a small open economy with access to insurance markets.

[3] which bails out all governments facing a rollover crisis, conditional on fiscal adjustment.

[4] Although the link between asymmetric information (among creditors) and ex-ante debtor's incentives is ignored in the Appendix, we plan to analyse in future work.

select between the multiple equilibria of the creditor game, we use debtor's incentives – rather than sunspots or risk dominance. To this end, we present a generic model of *debtor moral hazard*, where the sovereign debtor cannot credibly (or verifiably) commit to putting in effort ex-ante, due to either sovereign immunity or non-contractibility of debtor payoffs; nor can he commit to ex-post bargaining in the event of default. Then we examine how the equilibrium selection in the creditor coordination problem interacts with the sovereign debtor's incentives and show that solving the sovereign debtor's incentive problems requires excessive 'project termination' by creditors when sovereign default occurs. Though, in general, we treat interest rates as given, we discuss briefly how they may be determined endogenously, depending on equilibrium selected. Lastly, we consider potential improvements involving either SDRM or changes to contracts. The Appendix contains a model of asymmetric information and excessive crisis.

2 Sovereign debt restructuring: Two mechanisms

2.1 Collective action clauses in bond contracts

After the Mexican crisis of 1994/5, the Deputies of the G-10 made a number of recommendations to facilitate crisis management (Group of Ten Report, 1996). As regards liquidity provision, for example, they suggested that the IMF should 'lend into arrears' for countries whose domestic policies were deemed acceptable. For the private sector, they commended **changes to contractual provisions** covering sovereign debt (so as to allow for the collective representation of bondholders; for supermajority voting on changing the terms and conditions of the debt contract; and for sharing of proceeds among creditors). Such ideas had found academic support in the work of Eichengreen and Portes (1995) who also recommended the creation of a Bondholders Council to help negotiate debt reconstruction. But markets have proved very slow to respond. To date, only two sovereign debtors have incorporated such clauses in their foreign currency liabilities, but these are the UK and Canada and not the emerging market debtors for whom the recommendation was intended – probably because of a signalling problem (Eichengreen, 1999).

The increasingly desperate case of Argentina has re-opened the debate on sovereign debt restructuring.[5] Thus in April 2002, John Taylor (2002), on behalf of the US Treasury, argued forcefully for the inclusion of collective action clauses in the emerging market debt. To help overcome the problem of transition, the US Treasury proposed adding substantial "carrots and sticks" as incentives to change. (Positive incentives could include lower interest rate charges when borrowing from the IMF; and further financial inducements to carry out bond swaps on the existing stock: as a punishment, the insertion of such clauses could be made a precondition of seeking an IMF program.) To tackle problems of asset diversity, it was proposed that such clauses could be included in bank debt as well. For problems of aggregation across creditor classes, it was proposed that disputes between creditors could be handled in an arbitration process provided for in the contracts themselves. An alternative

[5] The sovereigns involved in the 1997/8 financial crisis in East Asia were not substantial debtors (at least *ex ante):* the debt was largely private and so in principle involved issues of corporate debt restructuring.

suggestion from Morgan Chase and Co. is that of a two-step bond swap where the first step is designed to achieve uniformity of claim, and the second step is the actual restructuring, Bartholomew, Stern, and Liuzzi (2002).

2.2 A sovereign debt restructuring mechanism

Jeffrey Sachs's response to the Mexican crisis of 1994/5 was that sovereigns needed the basic protections available to corporate borrowers and he proposed an **international bankruptcy court** for sovereign debt restructuring. Rogoff and Zettelmeyer (2002) provide an account of this and other proposals for revising an international financial architecture to incorporate bankruptcy-style procedures.

The new Sovereign Debt Restructuring Mechanism first outlined by Anne Krueger in November 2001 was clearly inspired by the analogy of the US corporate bankruptcy procedures (Chapter 11, in particular). While collective action clauses also embody similar provisions for supermajority voting, the IMF claims that SDRM is necessary to solve the problems of aggregation and of transition discussed above (Anne Krueger, 2002, p.14).

2.3 The evolution of corporate debt restructuring and its implications

Buchheit and Gulati (2002) contrast the different paths taken by Britain and United States in respect of corporate debt restructuring. As indicated in Column 1 of the table below, UK creditors inserted collective action clauses into their bonds in the nineteenth century; but – because these clauses were not acceptable under New York law – the US adopted court-ordered bankruptcy proceedings under Chapter 11 of the Bankruptcy Code. Buchheit and Gulati argue that the global economy should now follow the lead of the London bond market by adopting collective action clauses, implemented if neccessary by 'exit consent swaps', i.e. bond exchanges where creditors accepting the new contract agree to changes which render the old contracts less attractive. These links between corporate history and the current debate on sovereign debt are summarised in Table1.

Table 1: Debt restructuring: Two approaches

	Corporations	Sovereign states
Self-organizing creditors	19th century Britain: Majority Action Clauses	London debt: Collective Action Clauses. New York Debt: Exit Consent/ Swaps
Court-ordered restructuring	20th century USA: Chapter 11 Bankruptcy	Sovereign Debt Restructuring Mechanism (SDRM)

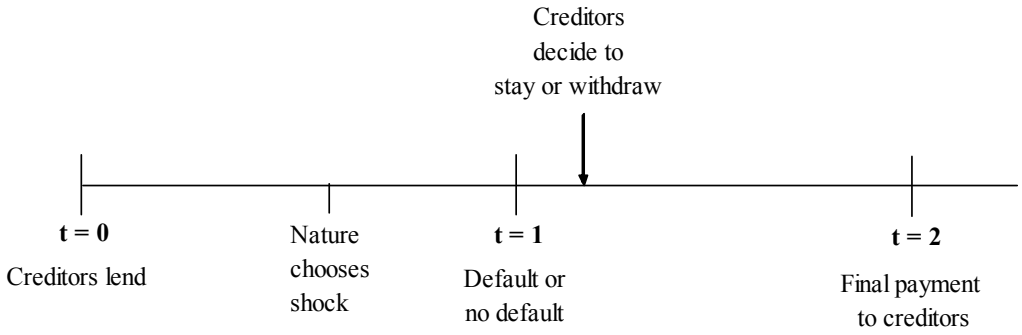
This historical summary may suggest that collective action clauses and court-ordered procedures are substitutes. But the London capital market has subsequently gone on to develop court-ordered bankruptcy procedures analogous to those in the US, so they may well be complementary (Miller, 2002). It may be easier in the short run to solve the transition problem of modifying bond contracts than it is to revise the IMF Articles of Agreement; there

may nevertheless be advantages in having an explicit sovereign debt restructuring mechanism.The simple model of sovereign debt that follows abstracts from the aggregation and transition problems which play such an important role in the current debate: it does suggest, however, that sovereign bankruptcy procedures combined with IMF-style conditionality can better achieve the commitment needed than would collective action clauses inserted into bond contracts.

3 Creditor co-ordination without moral hazard

Take the case of a sovereign embarking on a bond-financed investment project, costing K, which lasts only two periods. All the finance is supplied by two investors, investing b each, who are promised returns of r in the first period and $(1 + r)$ in the second period. So long as resources available cover these payments (i.e. cash flow in period 1 is greater than $2rb$ and cash flow in period 2 is greater than $(1 + r)2b$), all is well and the project will run to completion.

Figure 1: Timeline of events: Liquidity shocks



Consider what happens if an unanticipated, exogenous shock ('bad luck') lowers the capacity to pay in period one below the amount that is due to bond holders under their contract. If it is strictly a shock to liquidity, which is what we assume here, then project net worth will be unchanged. One example might be a country hit by contagion where the funds earmarked for debt service are suddenly withdrawn (as for Korea in 1998); another would be a sovereign debtor in a 'credit chain' forced into default by delays in payment by its creditors. Since failure to comply with the terms of the debt contract constitutes technical default, each creditor is entitled to accelerate its claim, demanding the capital sum as well as the current coupon owed in period 1, i.e. technical default makes the debt 'callable' in period 1 and exposes the sovereign to the risk of a *liquidity crisis*. (Acceleration of the claim

in this way normally requires a minimum percentage of creditors to act, usually 25%: but in our two-creditor model, one is enough.)

The co-ordination game facing the two creditors is shown in Table 2 below where the actions of Creditor 1 (Quit, Stay) are indicated by rows 1 and 2 respectively; likewise for Creditor 2 by the columns. In the cells showing the resulting payoffs, those for Creditor 1 are given first.

Table 2: How Payoffs depend on Creditor Co-ordination

Actions	2 QUITS		2 STAYS	
1 QUITS	$\overline{Q}/2 - L$	$\overline{Q}/2 - L$	$\min\{(1+r)b, \overline{Q}\} - L$	$\max\{\overline{Q} - (1+r)b, 0\}$
1 STAYS	$\max\{\overline{Q} - (1+r)b, 0\}$	$\min\{(1+r)b, \overline{Q}\} - L$	$(1+r)b$	$(1+r)b$

Symbols used and key assumptions made in determining the payoffs are as follows. First, if either creditor accelerates its claim, the project will end (i.e. there is a minimum level of resources $K_1 < K$ required for continuation, and $(1+r)b > K - K_1$) where $\overline{Q} < K$ is the recovery amount if the project is terminated in period 1. Second, the creditor who accelerates when the other does not, reckons to recover either his initial investment b plus interest rb or the full quit value *minus* the privately borne legal costs of quitting L – leaving the other creditor with the residual, if any, as in a grab race for a firm's assets where liquidation allows the first mover to exit without much loss of value but liquidation is costly for other creditors. Third, if both quit, they each pay legal fees, L, and split the expected recovery amount equally between themselves. (Most bargaining solutions support the latter assumption, including those of Nash and Kalai - Smorodinsky.) Last of all, we assume that unpaid interest is rolled-up and added to the coupon in period 2, so there is no loss of value to the bondholders if the project continues. Thus, if both creditors decide to stay, the payoffs are as shown in the bottom right cell.

As is evident after normalising the payoffs[6] (see table 3, where $1 > \varepsilon > 0 > \delta$), this coordination game has three Nash equilibria, two in pure strategies (Stay, Stay) – with unit payoffs and (Quit, Quit) with zero payoff – and a third in mixed strategies where each creditor quits with probability $q = \frac{1-\varepsilon}{1-\varepsilon-\delta}$. The payoffs of the normalised game are shown in Fig. 2 together with three equilibria indicated at A, B and C. Pure strategy equilibrium A represents a total coordination failure among creditors; and the mixed strategy equilibrium B represents a partial coordination failure.

Table 3: Normalised expected, discounted payoffs for the co-ordination game

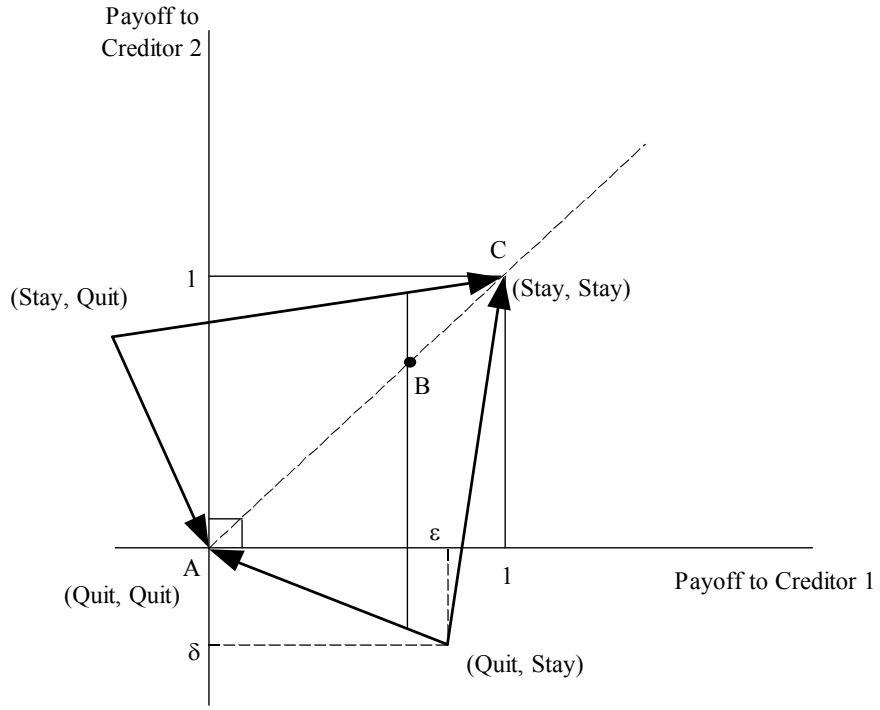
Actions	2 QUITS		2 STAYS	
1 QUITS	0	0	ε	$\delta(<0)$
1 STAYS	$\delta(<0)$	ε	1	1

What quit rates might one expect in the mixed strategy equilibrium? In their discussion of sovereign spreads, Cline and Barnes (1997) use a recovery rate of 0.5. If, correspondingly,

[6] By subtracting payoffs in the top left cell and scaling by payoffs in the bottom right cell.

one was to assume that the recovery value if the project is liquidated in the first period is sufficient to repay only one of the two creditors i.e. $\overline{Q} = (1 + r)b$, and that the legal fee faced by any creditor accelerating his claim is equal to 10 % i.e. $L = 0.1(1 + r)b$, we find that, in the mixed strategy equilibrium, the individual quit rate is 0.2 and the continuation probability is 0.64. In the case, the pay-offs and equilibria will appear as in Fig. 2.

Figure 2: Discounted expected payoff in period 1: The creditor co-ordination game (with normalised payoffs)



How is one to select between these equilibria? One possible answer is that the equilibrium is selected by *sunspots*. Sunspots are random, payoff-irrelevant states of nature which are publicly observed and are used by creditors to coordinate their expectations and actions (see, for instance, Jeanne, 2001, Peck and Shell, forthcoming). This approach implies that sovereign debt crisis occur with positive probability: but the probability is entirely independent of the underlying economic fundamentals – an aspect which Morris and Shin (1998) criticise.

A second approach might be to focus on equilibria in pure strategies and use *risk dominance* as the selection criterion used by creditors. Note that, in this context, quitting is risk

dominant when the gain to being the first mover is the creditor grab race is relatively large.[7] (Let α and $1-\alpha$ be the probabilities that player 1 attaches to the other player quitting and staying, respectively. Then expected payoffs to quitting and staying for player 1 are $\varepsilon(1-\alpha)$ and $1-(1-\delta)\alpha$. The condition for quitting to be strictly risk dominant (i.e. $\varepsilon(1-\alpha) > 1-(1-\delta)\alpha$) is that $|\delta| > 1-\varepsilon$.)

A more satisfactory theory of which equilibrium will be chosen lies, we believe, in the need to provide appropriate *incentives for the debtor*, which is what we examine in the next section. While the main body of the paper deals only with the case of two creditors, the Appendix examines the general case and shows that the key features – the existence of two pure strategy Nash equilibria and an other mixed strategy equilibrium– continue to hold with n identical creditors. Second issue discussed in the Appendix is the extension of the creditor coordination game to the case where the shock on the country's fundamentals is not temporary. Where, conditional on default, there is incomplete information and disagreement within creditors about whether the shock is temporary or permanent, it is possible to show that, at equilibrium, there is inefficient termination of the project as well.[8]

4 Sovereign borrowing with moral hazard

Selecting equilibrium without taking account of debtor's behaviour is inappropriate if different solutions to the creditor coordination problem alter incentives of the sovereign debtor. If the probability of project termination were reduce to zero, for instance, this could have the perverse consequence of actually increasing the possibility of sovereign debt crises, as the sovereign debtor uses the money borrowed from creditors unwisely, Barro (1998). It is possible, therefore, that a positive probability of termination may be needed to solve the moral hazard problem.

The model of debtors moral hazard developed here is of a small open economy where, as in Bulow and Rogoff (1989b), the interest rate at which the sovereign can borrow in world markets is fixed. (For simplicity, dynamic interactions between creditors and sovereign debtors such as those involved in models of reputation are ignored[9].) Assume as before that the sovereign issues debt in period 0 which promises an interest coupon in period 1 and repayment the capital sum together with a second interest coupon in period 2. But before the first coupon becomes due, there are two events that may lead to default. First the debtor

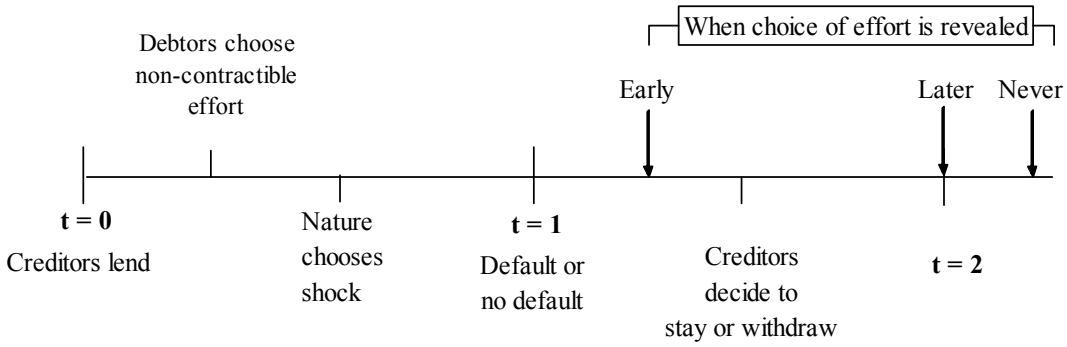
[7] With fixed legal fees and no sharing clauses, the strategy of quitting is risk dominant if recovery rates are higher than 20 percent of the total amount borrowed, i.e. $\overline{Q} > 0.4(1+r)b$. When $\overline{Q} = 0.4(1+r)b$, however, the two pure strategies have the same expected pay-offs, so the Harsanyi and Selten's criterion (1984) coincide with the mixed strategy equilibrium.

[8] Some commentators, Stiglitz (2002a) and Calvo et al (2002) for example, believe that *asymmetric information* between creditors is main reason for excessive default, rather than the problem of debtor's moral hazard. In a complete analysis, it should be possible to combine asymmetric information problems with those of debtors moral hazard.

[9] There is no loss of generality in doing so as Bulow and Rogoff (1990) have shown that reputation may not be renegotiation proof in models of sovereign debt in small open economies.

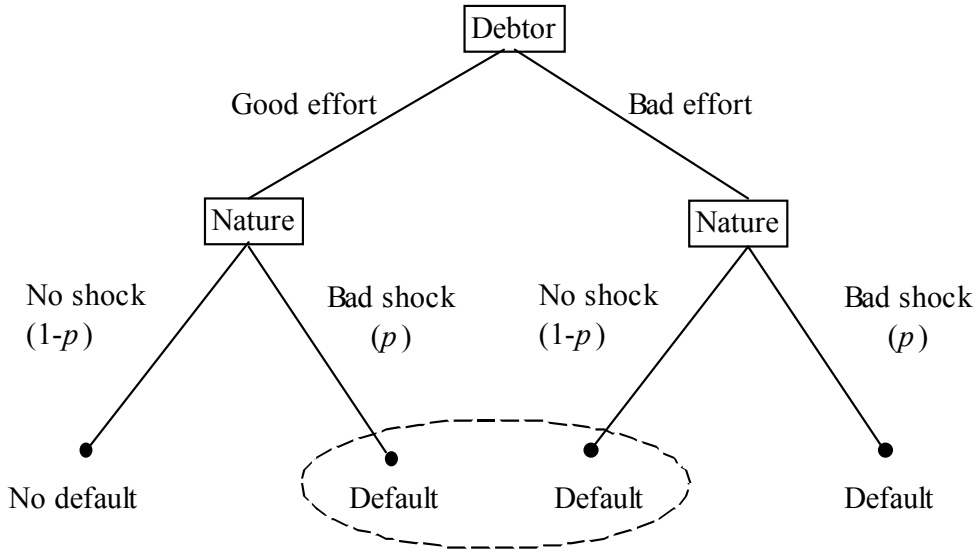
has to choose a level of effort, either good and bad; and second an independently-determined negative shock arrives with probability p. Since we are still looking at *liquidity crises*, bad effort in this context involves condoning (or causing) cash flows to be temporarily reduced so that debt interest due cannot be paid on time. (It might involve those in power shipping cash overseas in a flight of capital which leads to default, for example.) We assume that either bad effort or a negative exogenous shock is sufficient to cause default – but which of these is not immediately evident. If the cause of the technical default is revealed fairly soon ('early') i.e. before creditors decide to stay or withdraw, the delay is not significant. But the problem of debtor's moral hazard arises when creditors have to decide whether to stay or withdraw before revelation takes place, see Fig. 3 .

Figure 3: Timeline of events



There are four possible out-turns in period 1, as shown in Fig. 4 below, where it is assumed that with good effort *plus* good luck the coupon can be paid, but not otherwise. If coupon is paid on time, of course, creditors have no option to terminate the loan, and the project continues to completion. But when the coupon is not paid, creditors can accelerate.

Figure 4: Events prior to default or no default in period 1



It is assumed that creditors are able to distinguish between a default caused by bad luck *plus* bad effort and defaults due to only *one* of these factors; but that they are unable to distinguish between cases of the latter. So, as the circle in Fig. 4 indicates, they are unable to distinguish between default due to a bad shock (for example, a delay in receipt of payments due to the sovereign in period 1) combined with good effort, and one due to just bad effort - with no shock (capital flight , for example).

In the subgame following default, the co-ordination game facing the two creditors is shown in Table 4 below.

Table 4: How Payoffs depend on Creditor Co-ordination

Actions	2 QUITS		2 STAYS	
1 QUITS	$\overline{Q}/2 - L$	$\overline{Q}/2 - L$	$min\{(1+r)b, \overline{Q}\} - L$	$max\{\overline{Q} - (1+r)b, 0\}$
1 STAYS	$max\{\overline{Q} - (1+r)b, 0\}$	$min\{(1+r)b, \overline{Q}\} - L$	$(1+r)b - (1-p)h$	$(1+r)b - (1-p)h$

The only new elements are the continuation values if both creditors choose to stay. As before, we assume that unpaid interest is rolled-up and added to the coupon in period 2, so there is no loss of value to the bondholders from a temporary exogenous shock if the project continues. But creditors will not be paid in full if the sovereign does not put in good effort. Let p be the probability of a exogenous shock drawn by nature and h denote the hair-cut taken by creditors (due to bad effort by the debtor)[10]. With probability p, each debtor

[10] While we refer to good and bad effort, the model may be interpreted such that the debtor chooses low

obtains $(1+r)b$ at $t=2$ while with probability $1-p$, each creditor suffers a hair cut, h, at $t=2$; therefore, conditional on the default at $t=1$, the expected payoff to each creditor at $t=2$ is $(1+r)bp+[(1+r)b-h](1-p)=(1+r)b-h(1-p))$.

After normalisation, the payoff matrix will have the same structure as before; and therefore the set of equilibria remains unchanged. In this section, we will focus on the mixed strategy equilibrium where either creditor quits with probability q. Since either one leaving triggers disorderly default, the continuation probability is $1-\pi_c=(1-q)^2$ where π_c is the probability of disorderly default.

What if the need to provide incentives for the debtor to put in good effort is used as a principle for selecting equilibrium? Assume that the continuation outcome, where neither quits, cannot be the part of a sub-game perfect equilibrium where the debtor chooses to put in effort (i.e. assume that a debtor, whose funding is guaranteed, will inevitably be tempted to put in bad effort). By contrast, the outcome where creditors quit for sure will certainly give debtor an incentive to put in effort: but it is socially inefficient as any temporary exogenous shock will trigger a liquidity crisis. The mixed strategy equilibrium should provide some incentives the debtor: but will this be socially efficient?

4.1 Debtor moral hazard and incentive compatible randomisation

The source of moral hazard in our model is that the sovereign debtor has incentives that are not aligned with those of the creditors. Funded by resources borrowed in the international bond markets, we assume that the sovereign debtor receives 'private payoffs' when the project terminates at $t=1$ or at $t=2$. To begin with, we assume that these payoffs are essentially 'non-contractible', i.e. cannot be attached by the creditors in settlement of their claims nor can the sovereign debtor make a credible commitment to transfer these payoffs to the creditors. If funds are used to subsidise a public corporation, for example, the assets of the corporation are not attachable even though the sovereign has waived immunity: so these assets would count as private payoffs. Funds transferred to private citizens fall in the same category: the added popularity of the government is not something that creditors can attach either.

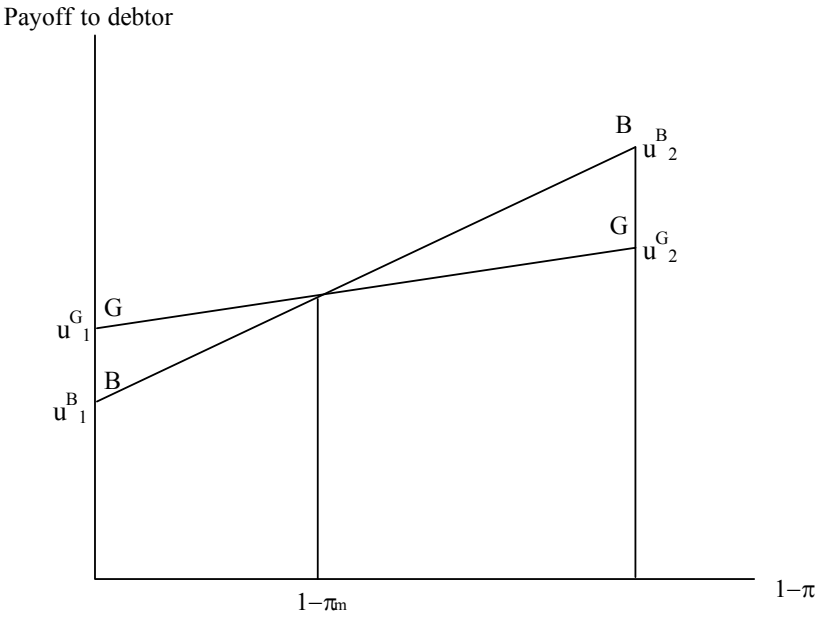
We further assume that the value of these debtor payoffs depends on whether 'effort' is good or bad, where good effort implies that default only occurs with the bad exogenous shock but bad effort implies that default is inevitable. Good effort could correspond to a situation where, for instance, money is borrowed and used to promote R&D in the export sector to help the country remain internationally competitive. Bad effort might correspond to transferring borrowed money to rich people who are free to put it in tax havens overseas, exposing the country to currency risk and the budget to a loss of tax revenue. (An alternative interpretation, suggested by James Tobin, would be that good effort corresponds to properly regulated liberalisation of domestic financial markets and bad effort corresponds to un-regulated financial liberalisation.[11])

and high risk growth strategies, for example where the latter poses the risk of a positive hair cut in period 2.

[11] "The central bank, committed to honor the peg and to maintain the country's terms of trade, has to protect its reserves. It cannot be indifferent to the claims on those reserves negotiated by private parties,

Let u_t^G and u_t^B denote the expected, discounted payoffs (measured at $t = 1$) for the sovereign debtor when the project is terminated at period t, $t = 1, 2$. We assume, for simplicity, that there is no residual value of the project after paying for debt service and repayment, so u_t^G and u_t^B consist of the non-contractible benefits to the sovereign. Suppose $u_t^G < u_t^B$ for all t. In that event, there is no solution to the debtor moral hazard problem without a bankruptcy procedure because, ex ante, the sovereign debtor will always choose the bad effort even if the project is terminated in period 1. The intermediary case, which we study below, is when $u_1^G > u_1^B$ but $u_2^G < u_2^B$. This is shown in Fig. 5 where BB, the schedule showing expected payoff to bad effort, is steeper than GG which gives the expected payoff to good effort. If the probability of continuation $1 - \pi$, was equal to 0, second-period payoff would of course be irrelevant. As $1 - \pi$ increases to one, however, the prospect of continuation with high private benefits makes bad effort ('shirking') more attractive.

Figure 5: Debtor moral hazard: The no-shirking constraint



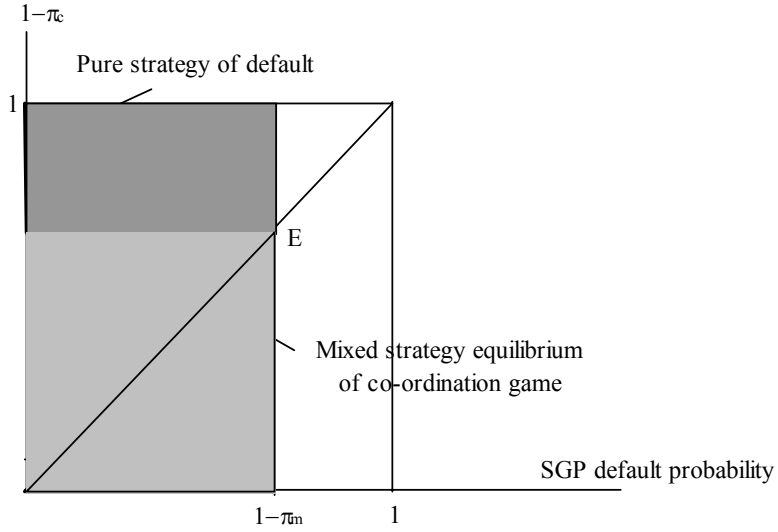
To ensure that the sovereign chooses good effort, the probability of continuation must not exceed $1 - \pi_m$ where the two schedules intersect in Fig. 5. It follows that the equilibrium selected in the creditor coordination game must satisfy a 'no shirking' constraint associated with debtor's moral hazard. Conditional on default, if creditors always choose to stay, the debtor's ex-ante incentives to choose good effort will never be satisfied. The other

domestic and foreign, who ignore the social risks. An obvious precaution is to limit even to zero the net indebtedness (particularly the short-term debt) in hard currency permitted any private bank." Tobin (1999, p.73)

extreme situation is when creditors always quit after default. This will solve the debtors incentive problem but is obviously socially inefficient as a debtor applying his best efforts would nevertheless face certain default in the presence of a unfavourable temporary shock. An intermediate solution is that creditors coordinate on the mixed strategy equilibrium. As the continuation probability at the mixed strategy equilibrium, $1-\pi_c$, is derived independently of debtor incentives, there is no reason why it should coincide with the continuation probability $1-\pi_m$ associated with the no-shirking constraint. Of course, the creditors could panic and choose the pure strategy of quitting: by assuming that, where it is incentive compatible, creditors coordinate on the mixed strategy equilibrium in the event of default biases, our analysis is biased in favour of the market solution.

These results are summarised in Fig. 6. On the vertical axis is plotted $1-\pi_c$, the probability of continuation given the mixed strategy equilibrium of the creditor co-ordination game, while on the horizontal is plotted $1-\pi_m$, the continuation probability required for time-consistency or 'subgame perfection' on the part of the debtor. The shaded part of the figure shows the excess default probabilities relative to second best.[12]

Figure 6: Excessive probability of disorderly default



Let NEC denote the Nash equilibrium continuation probability, where NEC $\equiv 1-\pi_c$ $= 1-q^2$ when $1-q^2 < 1-\pi_m$ and NEC $= 0$ otherwise; and let ICC denote the incentive

[12]The second best outcome, in this context, corresponds to the case where an international lender of last resort bails out both creditors for sure but only rescues the debtor with probability $1-\pi_m$, i.e. it practices a policy of 'constructive ambiguity' where the probabilities are defined by the need to solve the incentive problem.

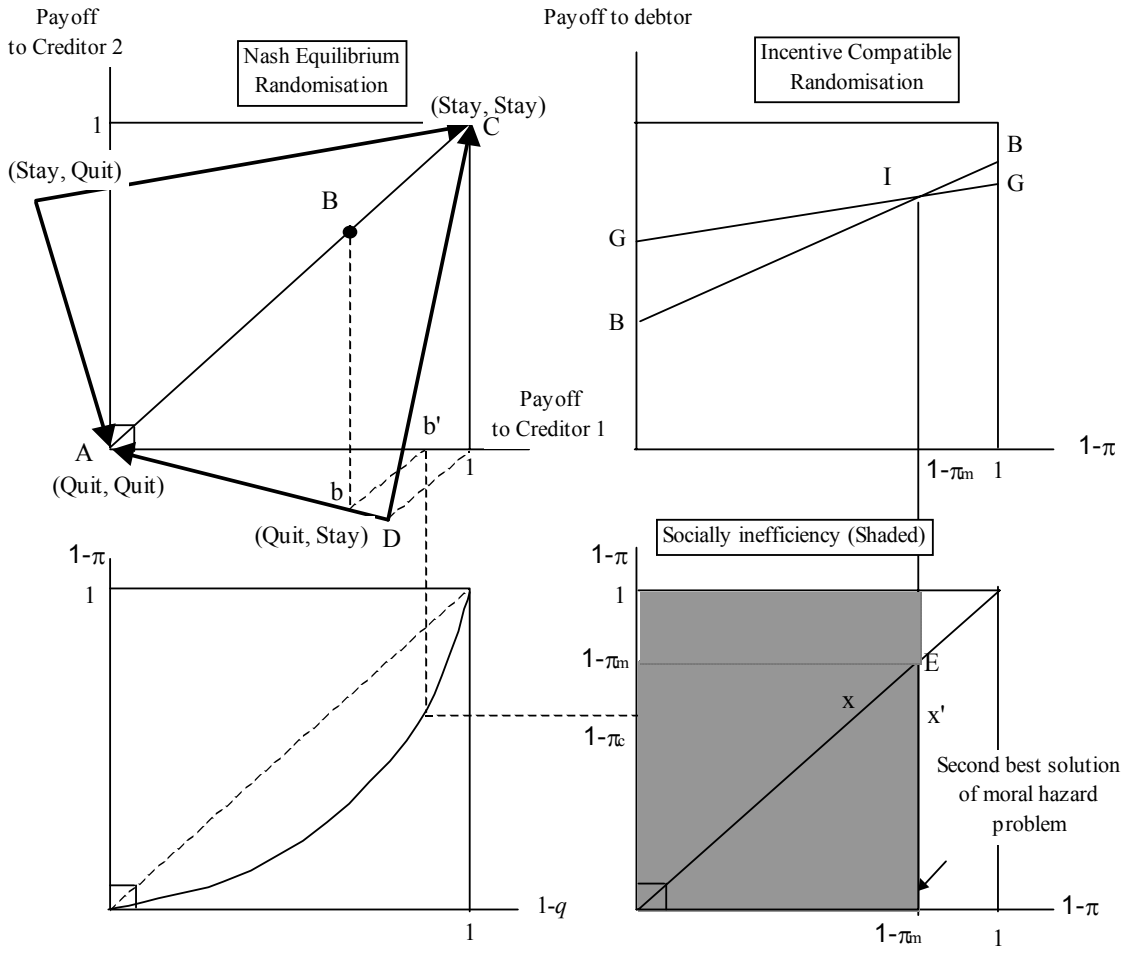
compatibility continuation probability, $1-\pi_m$. Then the above discussion can be summarised as:

Proposition 1 *Almost always, NEC > ICC.*

How providing the right incentives for the debtor almost always leads to excessive crises is shown graphically in Fig. 7. Creditor payoffs and the three Nash equilibria of the co-ordination game are shown in top left panel. The non-contractible payoffs to the debtor are shown in the top right panel and ICC, the maximum probability of continuation compatible with good effort, is shown as $1-\pi_m$ on the horizontal axis (below the intersection of GG and BB at I). How does this incentive compatibility constraint affect the selection of equilibrium for creditors? Clearly it rules out equilibrium at C (Stay, Stay). It is, however, consistent with the mixed strategy equilibrium at B. This can be seen (in the bottom right panel) by comparing the incentive compatibility constraint, $1-\pi_m$, with the continuation probability associated with the mixed strategy equilibrium, $1-\pi_c$. The latter is the square of the individual continuation probability $1-q$ (see lower left panel) where this, in turn, is derived[13] from the mixed strategy equilibrium B (as shown in the top right panel).

[13] The expected pay-off for Creditor 1 playing a pure strategy of quitting is shown by horizontal co-ordinate of B; so the ratio Ab to AD indicates the continuation probability of Creditor 2. By symmetry, this is also characteristic of Creditor 1; and so, by construction, Ab$'$ gives the numerical value of the common continuation probability.

Figure 7: Creditor co-ordination and debtor moral hazard



Although the level of randomisation in the mixed strategy equilibrium is consistent with the debtor putting in effort (as $1-\pi_m \geq 1-\pi_c$), there is 'too much' randomisation (measured by distance xx' in the figure) as a higher continuation probability among creditors would also be incentive compatible. It is in this sense that the mixed strategy equilibrium is inefficient and the excess randomisation is indicated by the shaded triangle in the diagram.

This inefficiency would greatly increase, however, if the continuation probability from the co-ordination game were to rise above $1-\pi_m$ (i.e. if point B were to approach sufficiently close to C). In that case, the only credible equilibrium consistent with debtor incentive is where both creditor quit as soon as default occurs. The excess randomisation in this case, $1-\pi_m$, is shown by the shaded box in the lower right panel.

Only at the point E is the Nash Equilibrium randomisation equal to the incentive compatible randomisation. *This is what leads to the conclusion that, in the absence of bankruptcy*

style procedures, there will almost always be excessive disorderly default in sovereign bond markets. This is true even when we make the favourable assumption that creditors choose the most efficient incentive compatible equilibrium.

4.2 Implications for sovereign spreads

To simplify the analysis, we have treated the interest rate as predetermined. In reality, however, sovereign spreads would be endogenous, varying with the equilibrium selected. Ideally[14], we would extend the theory to explain how interest rates are determined and test the predictions of the extended model on relevant data. For present purposes, we restrict ourselves to indicating briefly how our model might be calibrated to fit recent data. As discussed in the introduction, emerging market sovereign spreads over US Treasuries responded sharply to the Russian default. From a level of between 400 and 500 basis points earlier in 1998, they peaked at over 1600 after the Russian default in August and then fell to somewhere between 700 and 800 in 2000. In 2001, Argentine debt suffered spreads of 2000 basis points and above, as did Brazilian debt in the summer of 2002. (After leaving the currency peg, Argentina has recorded even higher spreads of around 7000 basis points.) In Table 5, illustrative parameters are chosen so as to generate sovereign spreads that vary over a range running from 300 to 7000 bps. Case 1 with low quit probability and high risk of bad shock, quitting is risk dominant and the mixed strategy is consistent with spread of 800 basis points. In case 2 with high quit probability and low risk of bad shock, neither quitting nor staying are risk dominant (see discussion in Section 3 above) and sovereign spreads can rise to 7000 basis points.

The sovereign spread, S, is calculated using the formula:

$$S = \pi p(1-R) \text{ and } 1-\pi = (1-q)^2, \text{so } S = [1-(1-q)^2]p(1-R)$$

where p is a probability of a bad shock, π is a conditional probability of termination given default, q is the individual quit probability in the mixed strategy equilibrium and R is the recovery rate on debt. In Eichengreen and Bordo (2001), it is reported that, from 1973-1997, a randomly-selected country (from a sample of 56 countries including OECD numbers) had probability of experiencing crisis of 12 % per annum. Given the higher incidence of crises in emerging market countries, we choose a figure of 0.16 to characterise the probability of crisis in the mixed strategy equilibrium for emerging markets. Setting πp at 0.16 and combining this with a value of 0.5 for $(1-R)$, Cline and Barnes (1997), this implies a sovereign spread of 800 basis points, or 8 percentage points at the *mixed strategy equilibrium*, see line 2 of Table 5, Case 1. Note that, in this case, the continuation probability conditional on default is set at 0.6 (in line with the earlier discussion in Section 3 above): this implies a value of 0.4 for π and a quit probability, q, of 0.23 as shown in bold in line 2. In Case 2, where the recovery rate is cut to 30 %, and q is set at 0.5, the continuation probability falls by more than half to 0.25, as shown in bold in the lower half of the table.

The sovereign spreads associated with the mixed strategy equilibrium will fall on the application of a *'second-best' strategy of Constructive Ambiguity.* Assume, for example, that

[14] as suggested by Renato Flores and Federico Sturzenegger.

the lowest rate of termination consistent with good effort is $\pi_m = 0.2$. This policy would reduce sovereign spreads to 400 bps or about 300 bps, depending on the value of p, see the first row of each case. If, on the other hand, moral hazard problems were sufficiently severe to shift the market equilibrium to the *pure strategy of quitting* whenever technical default occurred, sovereign spreads could rise sharply. In Case 1 where the increase in termination probability more than doubles, spreads widen to 2000 basis points: in Case 2 where termination is quite likely in any case, sovereign spreads rise to around 1500 basis points.

Given the moral hazard constraint, selecting the *pure equilibrium of stay/stay* would remove the incentive to put in effort and increase the probability of termination to 1 unconditionally. In this case, sovereign spreads rise to 5000 or 7000 as shown in the bottom line of each case.

Table 5: Sovereign Risk: Illustrative examples

	q	$1-q$	$1-\pi$	π	p	$1-R$	Spread in bps	Spread in %
Case 1: Low quit probability/high risk of bad shock								
Second Best CA	na	na	0.8	0.2	0.4	0.5	400	4
Mixed strategy	**0.23**	**0.77**	**0.6**	**0.4**	**0.4**	**0.5**	**800**	**8**
Quit/Quit	1	0	0	1	0.4	0.5	2000	20
Stay/Stay	0	1	1	0	na	0.5	5000	50
Case 2: High quit probability/low risk of bad shock								
Second Best CA	na	na	0.8	0.2	0.213	0.7	298	3
Mixed strategy	**0.5**	**0.5**	**0.25**	**0.75**	**0.213**	**0.7**	**1280**	13
Quit/Quit	1	0	0	1	0.213	0.7	1491	15
Stay/Stay	0	1	1	0	na	0.7	7000	70

Note that changes in interest rates as between the mixed strategy and the pure strategy of quitting are, in fact, likely to change the default probability. Taking into account of this could lead to models of self-fulfilling crises such as those of Aghion et al. (2000) and Sachs et al. (1996).

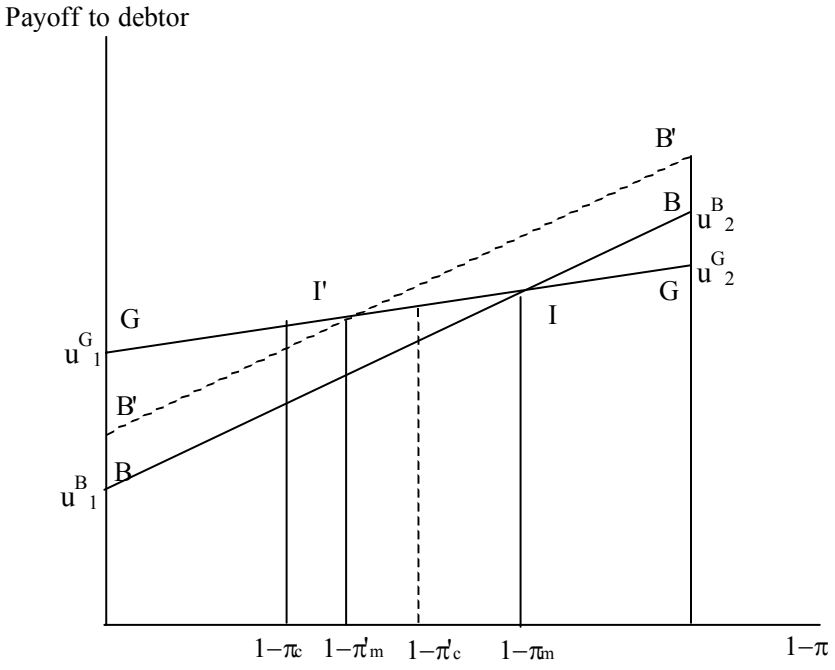
4.3 Possible perverse effects of un-regulated financial liberalisation

Financial liberalisation in the absence of appropriate regulation can increase the risk of financial crisis (Goldstein, 1997; Kaminsky and Reinhart, 1999). In the framework developed here, this can come about through a fall in $1-\pi_m$, together with an increase in $1-\pi_c$. The former, the tightening of the 'no-shirking constraint', could occur if liberalisation makes it more attractive to pursue the bad effort strategy – if it makes it easier to ship money out of the country to evade taxes, for example[15]. This increases the pay-offs to low effort and,

[15] "The very large measurement error in world current-account positions (a deficit larger than $100 billion for 1996), with recorded payments of capital income being much greater than recorded receipts, gives credence to the suggestion that a substantial portion of international capital movements is tax-avoiding in motive." (Cooper, 1998, p.14).

as shown by the upward shift from BB to B'B' in Fig. 8, shifts the intersection with GG to the left, which reduces the incentive compatible continuation probability (to $1-\pi'_m$). If the mixed strategy equilibrium of the co-ordination game remains at $1-\pi_c$, however, it may still satisfy the incentive compatibility condition and there will be no effect on equilibrium, see figure. But what if liberalisation also cuts the cost of exit in the co-ordination game? (A fall in legal costs makes quitting more attractive: so, in the mixed strategy equilibrium, the probability of staying must be increased to balance the expected pay-offs of quitting and staying – and this increases the continuation probability of the game.) The new mixed strategy equilibrium could then fall afoul of the no-shirking constraint, as shown by $1-\pi'_c$ in the figure: hence, in the face of default for any reason, only the threat of certain withdrawal will be sufficient to check debtor's moral hazard. The results could be dramatic: as shown in Line 2 and 3 of the table above, a shift from the mixed strategy equilibrium to the pure strategy equilibrium could raise the sovereign spread from 800 to 2000 bps.

Figure 8: Possible effects of badly-designed liberalisation



Is this more than a theoretical curiosome? As Tobin (1999, p.73) notes: "In the 'bailout' packages for East Asian economies, further cross-border financial liberalization was one of the conditions imposed by the IMF and the U.S. Treasury for official loans. This was a surprising requirement, given the evident facts that excessive private external short-term debt was, if not a cause of the crisis, a serious aggravation of it, and that banking and financial institutions seemed to need more regulations in several respects as well as fewer in

other respects." Pressure to increase competition in financial markets may also be counter-productive in the absence of appropriate financial regulation (Hellman et al., 2000).

5 Sovereign bankruptcy procedures as a commitment device

We have seen that, in the absence of institutional innovation, there will be excessive disorderly default in equilibrium. Can this be reduced by institutional change?

Where creditors can, in event of default, exercise some legal claim over the assets of the sovereign state or its citizens, there is a good case for a bankruptcy procedure. This might involve the following elements. Ex ante, the sovereign agrees to bargaining in good faith after default, and to this end, *establishes some 'contractibility' on assets in favour of the creditors*. This might involve waiving sovereign immunity and agreeing that some foreign interest payments and loans[16] could be diverted in favour of creditors as part of the bargaining process. Note that this enhanced 'contractibility' must also have the effect of reducing private payoffs to the sovereign; otherwise it will not have the desired incentive effects.

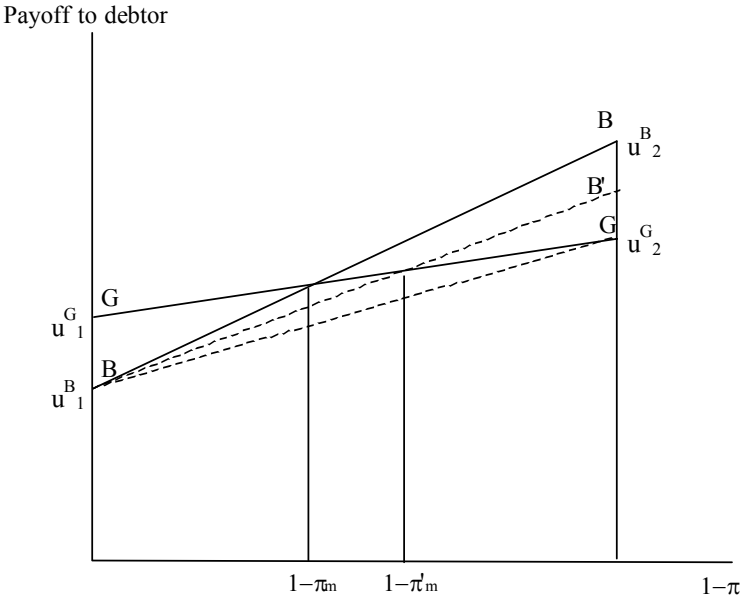
When a default occurs, however, the sovereign debtor is afforded *protection by a temporary stay on creditor litigation*. This legitimises the suspension of payments and also prevents litigation (by 'vultures') from inhibiting negotiations, Miller and Zhang (2000). Furthermore, it provides a breathing space for a *'discovery' process* where efforts are made to establish the underlying causes of default (and to determine whether it was due to a bad shock or poor effort). If this reveals the debtor to have made appropriate effort and to be suffering from an exogenous shock, bargaining would involve *debt restructuring* – the lengthening of debt maturities for temporary shock, and some write-down for a permanent shock known to be outside the control of the debtor. But if the debtor is revealed to have made little or no effort to arrange its financial and fiscal affairs, then *it will be penalised with payoffs changed ex post in ways that have been agreed ex ante*. (It is to make this possible that the debtor must have agreed to make some private payoffs contractible.)

Along similar lines, Eaton (2002, p.5) observes: "One role that an international bankruptcy court could play is in clarifying the extent of the sovereign's malfeasance in a default, and applying penalties appropriately." He goes on to note that: "Tougher sanctions in response to malfeasance that leads to default is ultimately in the interest of sovereign countries, as it enhances their access to credit". This can be shown in Fig. 9 where an ex ante agreement to transfer funds to the creditors in period 2 in event that default is discovered to be attributable to low effort reduces the private benefits, swivels the BB schedule clockwise and so increases the maximum continuation probability. If ex ante contracting ensures that u_2^B is less than or equal to u_2^G, as shown by the lower dotted line in the figure, then the maximum incentive-compatible continuation probability shifts to one and the creditors can safely roll over their lending without fear of moral hazard. Even if the moral hazard constraint does

[16] Eaton (2002, p. 13) discusses the idea that "a portion of any loan be held in escrow at the time that it is extended. The escrow account would be turned over to the sovereign as it repaid its loan according to schedule. Upon declaration of a standstill, however, funds would be paid instead to creditors."

not rise to one, but only to $1-\pi'_m$ as shown in the figure, bankruptcy procedures can reduce the termination probability without completely eliminating them.

Figure 9: Shifting the no-shirking constraint by ex ante contract



Before turning to the institutional implications, consider two special cases. First is where the reasons for default are known as soon as it occurs, i.e *without* a discovery phase. Here, there is no need for an extended bankruptcy procedure. If the default is due to an exogenous shock, liquidity can be provided right away. If the default is due to lack of effort, then the debtor's payoffs are changed ex post in ways that have been agreed ex ante. This is perspective taken by Olivier Jeanne (2001) who argues that "the institution that brings the economy the closest to the first-best is a 'crisis insurance fund' that bails out all governments with a rollover crisis *conditional on the fiscal adjustment*", (p.19, italics in the original). Under his proposed scheme, moral hazard is neutralized by denying bailouts to countries that have not implemented the fiscal adjustment. Jeanne notes, however, the crisis fund would probably have to be a rule-based public agency, first because of 'time to verify'[17] and second because private insurance contract for sovereigns cannot be made contingent on fiscal effort which is under their control.

At the other end of the spectrum is the special case where the discovery phase is completely unrevealing, so the indeterminacy as to the causes of default can never be resolved. In

[17] "A private insurer would have strong incentives to renege the contract ex post (by not lending in the event of bad news). Even if one assumes that the private insurer can be forced by a court to lend later, it would be too late", (Jeanne, 2001, p. 21).

these circumstances, the contractibility over private benefits cannot be exploited, and 'constructive ambiguity' appears to be the only solution – where all defaulting debtors are bailed out with probability $1 - \pi_m$, and the expected costs to creditors are reflected in sovereign spreads as discussed earlier.

6 Institutional implications

If financing development by issuing bonds exposes emerging markets to excessive crisis, one response is to limit the use of such debt instruments, Rodrik (1998). Some economists (e.g. Stiglitz, 1998; Williamson 1995, 1999) have discussed the use of explicit *inflow controls* such as those used in Chile intended to change the composition of flows in favour of longer term investment rather than hot money.[18] As Cordella (1998) points out, inflow controls which succeed in shifting the structure of external financing may increase rather than decrease the total volume of finance available for development: "taxes on short-term capital flows by avoiding rational panics, can improve the expected returns of investments in emerging markets, and thus increase the total volume of funds entering the country", (p.6). In time of crisis, however, the use of *outflow controls* may well be considered, both as a way of conserving scarce foreign currency and of lowering domestic interest rates, Krugman (1998).

Rogoff (1999, p.37-8) too has concluded that "the main problem with the present system is that it contains strong biases towards debt finance". To mitigate this bias, he argues for a reversal of legal trends which have enabled creditors to enforce emerging markets debt contracts in industrialised country courts – an argument for the restoration of sovereign immunity.[19] It is acknowledged that this recommendation would lead to a contraction in the issuance of sovereign market bonds; and he observes that "instituting an international bankruptcy court might be an alternative means to the same end".

The debate between John Taylor and Anne Krueger is, of course, premised on the widespread continuation of bond finance for emerging markets countries *without* sovereign immunity, as is our own discussion of the bankruptcy procedure – where we see an important role for a rule-governed public agency to supply a commitment mechanism which makes private payoffs accessible to the creditors ex post. It may be that the required control over the ex post behaviour of the debtor could be achieved by official "IMF conditionality" which governs the actions of the sovereign whose debt is being restructured. (Applicants for debt restructuring in the Paris Club are required as a matter of course to agree a programme with the IMF before negotiation with creditors begin.) Thus IMF programmes could play an important role in the international bankruptcy procedure described above.[20] To check

[18] China attracts massive FDI inflows but strictly limits other forms of external finance.

[19] He repeats a recommendation made earlier, in Bulow and Rogoff (1990), of "restricting countries' ability to waive sovereign immunity as a means of discouraging the mediation of debt contracts in industrialized country courts" (p.38).

[20] How does this differ from what happens with IMF "bail-outs" where private creditors who wish to exit can do so using emergency official funding and the IMF can impose conditionality so as to secure repayment? (Jeanne and Zettlemeyer, 2000 provide evidence that official funding is almost always repaid.) If this is known ex ante, is it not as if creditors can secure commitment from the debtor? Yes but, given the possibility of exit, they do not have the appropriate incentives: there is a problem of investor's moral hazard where private

moral hazard, of course, it would have to be known in advance that 'conditionality' would be used to achieve the contractibility of private payoffs, i.e. the 'rules' need to be clear.

As an alternative to an SDRM, Collective Action Clauses have the attraction that they are voluntary and market driven. As discussed earlier, however, there are two problems of implementation, first the need to replace outstanding contracts, by swaps for example, and second the need to aggregate across different instruments, possibly by two-stage debt swaps, see Table 6. Even supposing both can be solved, we believe that private bond contracts, which are typically incomplete and involve creditors deciding what to do ex post, are unable to deliver the required degree of protection and pre-commitment. Contracts incorporating Collective Action Clauses do not prevent creditors from suing provided a sufficient majority in favour, Thomas (2002). Moreover, contracts with majority action action clauses may fail to be renegotiation proof after a discovery phase in which the debtor is effort level is confirmed to be 'bad', as the debtor may renege on commitments to make ex-post transfers. In other words, a hold-up problem may ensue as now the sovereign debtor has all the bargaining power.[21] Anticipating this, even with majority action clauses, creditors may choose to terminate the project.

Table 6: CACs and SDRM: Some key issues

	Problems of Implementation	Problems of Operation
Collective Action Clauses (voluntary, market driven)	1. 'Transition' 2. 'Aggregation'	Not litigation proof Not renegotiation proof
SDRM (involuntary, statutory)	Change of IMF Articles needed	Subject to geo-political & ideological pressures

An SDRM backed by an international organisation, acting on behalf of the international community, can solve such a hold-up problem by making the sovereign's payoffs attachable ex-post. In other words, our analysis of the reason for excessive crisis leads us to choose an SDRM mechanism rather than private contracts. The implementation of the SDRM will, however, require a super-majority vote to change the Articles in the IMF, something that United States can block. Even assuming that the Articles can be changed, two delicate issues need to be considered: whose private payoffs should be attached ex post; and to whom should responsibility for overseeing such attachment be delegated?

The former is the matter of political economy. What if, in a crisis, those responsible can exit, leaving debt for others to pay? In extreme cases, sovereign debtors may appeal to the principle of 'odious debt' where a state may justifiably repudiate obligations incurred by tyrants no longer in power (Birdsall and Williamson, 2002, and Kremer and Jayachandran, 2001). But assuming that this does not apply, is it efficient or fair to punish those who could not exit? It appears that in Argentina, for example, rich and well-informed citizens were

creditors fail to monitor. The bankruptcy procedures advocated by Anne Krueger explicitly prevent creditor exit so as to avoid this problem.

[21] This situation arises in Kiyotaki and Moore's (1997) model of credit cycles where the hold-up problem can only be solved by the provision of collateral.

able to take their capital out of the country, thus avoiding the precipitate depreciation of the peso.[22] If rich private residents have made enormous capital gains in local currency by exporting dollars from the country – now in default for lack of dollars to service its debt – should they not participate in the cost of clearing up the ensuing chaos? Could the state not demand payment of capital gains tax on the assets "marked to market", for example; or *in extremis* enforce repatriation in order to ensure the realisation of capital gains (and a massive inflow of dollars)?

Even if one could think of such devices for making private payoffs contractible, what public agency should implement them? Stiglitz (2002b) argues that, being dominated by creditors' interests and having adopted the 'free market mantra of 1980s', the IMF is not well suited to devise and implement strategies for remedying capital market failures. In response to financial crises in East Asia and Latin America, the organisation has nevertheless shown itself willing to contemplate inflow controls and standstills as part of an SDRM – though recommending outflow controls (and enforced repatriation) would not be consistent with its normal practices and procedures.

7 Conclusion

Calvo's critique of the conventional wisdom – the Washington Consensus – is that market failures in emerging market finance are far too important to be ignored.[23] Tirole (2002, p. ix-x) evidently shares the same perspective: his recent book on financial crises begins by referring to the wide consensus that has emerged among economists that "capital account liberalisation ... was unambiguously good. Good for the debtor countries, good for the world economy" but goes on to note "that consensus have been shattered lately. A number of capital account liberalizations have been followed by spectacular foreign exchange and banking crises." Like Tirole, we have focussed on the problems that can arise from contracts which pose problems of creditor coordination. For simplicity we have assumed that creditors all share the same information: but the information asymmetries stressed by Calvo would (as the Appendix suggests) greatly enrich the analysis.

Solving creditor co-ordination problems in sovereign bond markets is, however, subject to a moral hazard constraint: that debtors must retain the incentive to service their debts. In a model of sovereign illiquidity with three Nash equilibria facing creditors, it is quite likely that this incentive constraint rules out the no-crisis equilibrium, and either the mixed strategy equilibrium or the pure strategy where all creditors quit will be selected, depending on how severe the incentive problem is. In general, however, the termination probability is higher than necessary for incentive purposes, i.e. there are too many crises.

[22] Writing in May 2001, Smalhout noted that "the net external interest burden is actually quite modest, external debt payments were $12.5 billion in 2000 or about 4% of GDP... But Argentines earned an estimated $6.4 billion or just over 2 % of GDP." In addition, there may have been private capital flight of $20 billion dollars in 2001 before the collapse of the peso.

[23] In presenting Calvo et al (2002) at the UTDT summer workshop in Buenos Aires August 2002, he suggested that whether or not a theory of sovereign debt crisis includes 'sudden stops' should be a crucial test for its empirical relevance for emerging market finance.

How can bond markets be made more efficient? We consider a bankruptcy procedure involving temporary stay on creditor litigation and discovery process for determining the underlying causes of default. A key element of the procedure is that when the sovereign debtor in default is found to have made little or no effort, its private payoffs will be reduced ex post. To provide the right incentives, it is crucial that the mechanism for doing this should have been agreed ex ante, as would be true if a ruled-governed public agency is involved. Moreover, as we have argued, privately issued bond contracts are unlikely to achieve the same result. We believe that the institutional approach to sovereign debt restructuring proposed by the IMF is, in principle, capable of increasing bond market efficiency. What the rules should be – and whether the IMF as currently constituted is the appropriate public agency to implement them – are policy issues that remain to be discussed.

The framework developed here could be used to look at contagion in capital markets.[24] Masson (1999, p. 267), for instance, argues that "pure contagion involves changes in expectations that is not related to country's macroeconomic fundamentals" and suggests that "by analogy to the literature on bank runs (Diamond and Dybvig, 1983), attacks on countries which involve a simultaneous move from a non-run to a run equilibrium seem to be relevant for recent experience in emerging market countries". To include contagion on this definition, we need only relax the assumption that the market selects the most efficient incentive compatible equilibrium between creditors: a move from a mixed strategy equilibrium to the pure strategy of quitting unconnected with any change in fundamentals would count as contagion on Masson's definition; and, as Table 5 indicates, could double sovereign spreads. In future research, we intend to include the determination of sovereign spreads within the analysis; and to combine creditor heterogeneity and insolvency shocks with debtor moral hazard. Another useful extension would be to take account of the politics of decision-making within a debtor country and how it interacts with the debt crises.

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