Binding-in the Private Sector

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August 14, 2002

Abstract

Recent years have seen an intensification in the debate on how best to manage and resolve international financial crises. Many of the proposals on the table envisage a temporary standstill on debt repayments by the country, together with mechanisms for binding-in private sector creditors. Here we explore welfare implications of some of these proposals in a hybrid liquidity/solvency model of crisis. We show how mechanisms designed to aid debt restructuring in the event of an insolvency crisis may have a direct impact on the likelihood of liquidity crises - though they are not sufficient, by themselves, to eliminate fully the costs of liquidity crises. We also discuss some of the potential costs that adoption of a standstills-based regime might incur.

1 Introduction

Over recent years, there has been an intense debate on the reform of the international financial architecture. Several competing reform plans have been tabled. Some of these are "big ideas" requiring new, supra-national institutions – or at least an adaptation of existing institutions. For example,

*Threadneedle Street, London, EC2R 8AH. The views are not necessarily those of the Bank of England. We are grateful for the comments of Prasanna Gai, Charles Goodhart, Robert Kahn, Jean-Charles Rochet and participants at the Bank of England conference on "The Role of the Official and Private Sectors in Resolving Financial Crisis", 23-24 July 2002.

in 1999 Stanley Fischer, then first Deputy Managing Director of the IMF, set out a blueprint for an International Lender of Last Resort, with the IMF at its centrepiece (Fischer (1999)). Last year, Anne Krueger (2001), newly-appointed First Deputy Managing Director of the IMF, set out an alternative plan for a Sovereign Debt Restructuring Mechanism (SDRM), or surrogate international bankruptcy court. These big ideas would require far-reaching institutional and statutory change.

Alongside these "big ideas" are several smaller ones. For example, some have argued for the greater use of collective action clauses (CACs) in bond – and possibly other loan – contracts to facilitate debt restructuring (Eichengreen and Portes (1995), Rey (1996), Taylor (2002)). Others have proposed presumptive limits on official finance in combination with periodic suspensions of payments (Council on Foreign Relations (1999), Miller and Zhang (1999), Haldane and Kruger (2001)). These smaller ideas would typically require less far-reaching reform.

Many of these competing plans do, however, have at least one common feature – they envision a temporary standstill on debt repayments by the country and an accompanying binding-in of private sector creditors. To clarify terms up front, we define a "standstill regime" as comprising two generic features:

- a breach of the financial contractual terms of a debt contract between a debtor(s) and its creditors, typically the temporary suspension of payments;
- the binding-in of creditors during the period of that breach of contractual terms, to prevent individual creditors imposing externalities on other creditors and on the debtor.

Within this generic definition, there is considerable scope for differences in the precise form of a standstill regime and the circumstances in which it is invoked. Some examples illustrate.

At one end of the spectrum, the Krueger (2001, 2002) SDRM model envisages a temporary suspension of payments and associated stay on litigation during the process of agreeing to restructure sovereign debt. The model has three key features. First, it is a statutory mechanism. Second, it is designed to facilitate the writing-down of debt – relevant for so-called solvency cases. And third, it aims to guard against the externality of disruptive litigation, by binding-in hold-out creditors.

At the other end of the spectrum, the Haldane and Kruger (2001) model also envisages a temporary suspension of payments. But its key features differ. First, it is a non-statutory approach. Second, it is not designed for the writing-down of debt, but more as a means of enforcing rollover of short-term debt – relevant for so-called liquidity cases. Third, it aims to guard against the externality of a run on a sovereign's assets, by binding-in short-term creditors.

Some versions of the CAC approach (eg, Taylor (2002)) envisage clauses in bonds that also allow for a temporary standstill on payments[1]. This approach is contractual. It is designed either for the writing down (in solvency cases) or the reprofiling (in liquidity cases) of debt. And it aims principally to mitigate litigation risk, resulting from recalitrant hold-out creditors.

Although these three policy prescriptions differ in important respects, each can be rationalised using existing models of crisis. The next section considers the welfare-theoretic case for a regime of standstills in dealing with international financial crises. It develops a generic model of crisis, which nests liquidity and solvency crises as special cases. In all these cases, crisis is rooted in a collective action problem among creditors - although the precise collective action problem is different for different types of crises[2]. In the most general form of the model, both crises are possible and the crises themselves interact in important ways. We have "grey zone" crises. These externalities generate inefficiencies, which are damaging to creditors and debtors alike.

The model is then used to explore the welfare benefits of some of those policy proposals outlined above, which are designed to address these inefficiencies. Rather than "bailing-in" the private sector, the proposals are better described as an attempt to "bind-in" the private sector, to guard against collective action problems. This yields welfare benefits for all.

We demonstrate how policies for binding-in creditors can eliminate welfare losses in both liquidity and solvency crises. But our analysis also uncovers some interesting interactions between liquidity and solvency crises, which have important implications for the appropriate design of crisis management policy. A key result is that creditors' willingness to roll-over debt (and so the likelihood of a liquidity crisis) depends in part on their expected payoff should the debtor eventually be forced to default. If a disorderly debt re-

[1] See also Buiter and Siebert (1999).

[2] As Buchheit and Gulati (2002) point out, once a debtor comes under financial pressure, relations between creditors become important.

structuring process is perceived to damage creditor value, this increases the likelihood of a liquidity run even when the debtor is fundamentally solvent. Thus, there is an important sense in which mechanisms designed to aid debt restructuring may have a direct impact on the likelihood of liquidity crises. But we also argue that orderly restructuring *per se* is not sufficient to remove the possibility of a liquidity run. First, because liquidity crises still occur even if inefficiencies in the debt restructuring process are eliminated; there is then a case for payment suspensions to help deal with these crises. And second, because if creditors' bargaining hand is weakened by some feature of the workout process, their expected payoff might be lower even if the more orderly process leads to a higher level of output in total. This highlights the importance of having credible mechanisms for maintaining creditor value as part of any restructuring procedure. The latter may be more easily achieved through a formal SDRM approach than through changes to debt contracts.

Section 3 considers the other side of the coin. It assesses some of the arguments used against a standstill regime, using empirical and theoretical evidence. Section 4 concludes with some thoughts on next steps in redesign of the international financial architecture.

2 A Model of Sovereign Financial Crisis

We begin by sketching a canonical model of sovereign crisis, which nests "pure liquidity" and "pure solvency" crises as special cases[3]. Potential policy measures have been proposed which address these special cases. This paper demonstrates that the effects of policy intervention are more complex when there is some interaction between liquidity and solvency crises.

There is a single debtor and a continuum of creditors. The debtor can be thought of as a sovereign borrower and the creditors as a set of international lenders. The debtor invests in an investment project that takes two periods to complete. The project is financed with overseas borrowing, D, the quantity of which is fixed prior to the project commencing. The returns to the investment project depend on factor inputs (D) and on the outcome for some random productivity shock ($\theta \sim N(\mu, \sigma^2)$).

Two types of debt contract are available to the debtor: short-term debt, which offers creditors the option of withdrawing their funds after one period;

[3] The liquidity crisis component of the model is based on Chui, Gai and Haldane (2002).

and long-term debt which locks creditors into the project until its completion at the end of the second period. Denote the share of short and long-term debt in total debt as (p) and $(1-p)$ respectively, also exogenously determined. Each creditor receives a noisy private signal (γ) about the state of fundamentals ahead of the first period, which is different across creditors (indexed i):

$$\gamma_i = \theta + \varepsilon_i \tag{1}$$

where $\varepsilon_i \sim N(0, \eta^2)$. Having observed this signal, short-term creditors have the option to "roll-over" to the end of the second period, or to "flee". If creditors choose to "flee" they receive gross principal plus interest net of an exit tax, c – that is, they receive $(1+r_s)(1-c)$, where r_s is the short-term interest rate. For simplicity, short-term creditors who rollover are assumed to receive the same return as long-term creditors; so creditors rolling over receive $(1+r_l)$ where r_l is the long-term interest rate at the end of the second period.

Creditors who flee after the first period impose costs on the debtor. The debtor is forced to liquidate assets that would otherwise have usefully contributed to the investment project. This cost is larger, the higher is the proportion of short-term creditors who flee, denoted f. So liquidity crises in this model manifest themselves as a failure of short-term creditors to roll-over their loans into the second period. And this, in turn, has a cost for second-period output.

Given the above structure, the net return of the investment project (y^N) to the debtor at the end of the second period can be written generically as:

$$y^N = y^G(D, \theta, f) - R_L \tag{2}$$

where the first term denotes gross output (y^G) at the end of the second period, and the second term denotes gross repayments to creditors in the second period $(R_L \equiv (1+r_l)(1-fp)D)$[4]. Note that gross output from the project is an increasing function of borrowed inputs (D) and productivity (θ) and a decreasing function of the proportion of fleeing creditors (f).

We assume that default is triggered by the debtor's inability to pay, rather

[4]Payments to short-term creditors not rolling over after the first period are assumed to already be deducted from gross output realised in the second period.

than unwillingness[5]. So the solvency condition is $y^N > 0$. If that solvency condition is violated, the debtor and its creditors need to reach a restructuring agreement to write down the value of the debt. The precise form of the debt instrument will influence the expected returns to the creditors from the restructuring. We assume as a baseline that long term debt comprises bonds issued under New York Law, which we take as shorthand to describe a debt contract that upholds an individual creditor's right to sue for repayment, regardless of the actions or interests of other creditors. The restructuring game in this model begins with the debtor making an exchange offer to each creditor of (Θ), which would reduce the present value of the debtor's second period obligations by a fraction $(1 - \omega)$, where $0 < \omega < 1$, so:

$$\Theta = \omega(1 + r_l) \tag{3}$$

Creditors vote on this offer and decide whether to "accept" or to "holdout" and sue for full repayment. Denote the proportion of holdout creditors by h. We assume creditors that "holdout" from a restructuring offer impose a *direct* cost on net output and this cost is rising in the number of "holdouts". This can be thought of as the cost of creditor litigation against the sovereign following a default event.

Having learned the outcome of the vote, the debtor decides whether to expend adjustment effort (denoted a). Adjustment effort serves to increase net output following default[6]. But it also carries a cost to the debtor, $c(a)$, which is increasing in effort, $c'(a) > 0$. In effect, the debt exchange offer, if accepted, serves as a means of giving the debtor time to put in place remedial policy measures.

The timeline of moves in the game is shown in Figure 1. In effect, the model can be decomposed into two sub-games. The first part involves a rollover decision by (short-term) creditors, which gives rise to the potential for a "liquidity crisis". The second involves a restructuring decision by (long-term and non-fleeing short-term) creditors in the event that full contractual payments cannot be made, which gives rise to a "solvency crisis". As will be discussed below, the equilibrium in both sub-games is sub-optimal owing to collective action problems among creditors. These inefficiencies are

[5] We therefore rule out the prospect of a strategic default. This possibility is considered in Section 3.1.

[6] Alternatively, adjustment effort could be assumed to be exerted between periods one and two. That would not alter radically the dynamics of the game.

Figure 1: Timeline

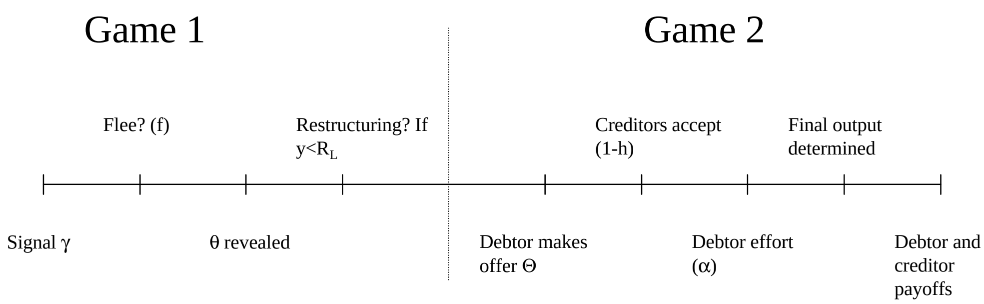


Figure 2: Payoff matrix to creditors

		Debtor		
		Repay	**Default**	
Creditor	**Flee**	$(1+r_s)(1-c)$	$(1+r_s)(1-c)$	
	Stay	$1+r_l$	**Accept**	Θ
			Holdout	$\mathrm{Min}\{(1+r_l)(y-(1-h)(1-fp)\Theta)/hD(1-fp))$

individually important but the interaction between these inefficiencies is as important for policy design.

The payoff matrix for creditors is summarised in Figure 2. Short-term creditors can choose to either "stay" or "flee" at period 1. If they "stay", then second period returns will depend on whether the debtor "repays" or "defaults". If the debtor defaults, the returns to the creditor depend on whether they "accept" the offer or "holdout". And if they "holdout", they receive a pro rated share of net output, after creditors accepting the offer have been paid off.

2.1 Liquidity crises

The main inefficiency in the "liquidity crisis" game is the cost of premature liquidation of projects. As outlined above, creditors receive a private signal γ_i about the future productivity of the project, θ. In some cases, future productivity will be so bad that the project will not be profitable even if all short-term creditors rollover. This "fundamental insolvency" point is denoted θ^*. At the other extreme, future productivity can be so high that the project is profitable even if all short-term creditors flee. This "fundamental solvency" point is denoted θ^{**}. If γ_i was a perfect signal, we would have multiple equlibria between θ^* and θ^{**}. If there is a noisy private signal but with sufficient precision, there is a unique trigger value of the fundamentals, $\hat{\theta}$, lying between θ^* and θ^{**}[7]. At $\hat{\theta}$, just enough creditors receive a signal that causes them to believe that a sufficient number of other creditors will flee to tip the debtor into insolvency. There is a welfare loss between $\hat{\theta}$ and θ^* because if all the creditors who flee could be made to stay, the project would still be profitable enough for all creditors to receive full payment.

2.2 Solvency crises

There can also be inefficiencies in the restructuring process, particularly with New York Law bonds[8]. These derive from the costs of holdout creditors who sue to extract any suplus and who in turn reduce the incentives for the debtor to exert adjustment effort. This reduces the volume of output in the second stage and, crucially, limits the size of the offer the debtor can feasibly make to creditors. In Annex 2 we demonstrate that there will always be some creditors who holdout in equilibrium under New York Law bonds. This will have accompanying welfare costs, measured by a suboptimally high number of hold-out creditors and a suboptimally low amount of adjustment effort by the debtor. Bonds with collective action clauses are potentially able to offset these restructuring inefficiencies.

2.3 "Grey zone" crises

Although the two stages of a financial crisis can be analysed separately, it is unlikely in reality that countries will experience either a pure liquidity or a pure solvency crisis. Moreover, even in cases where with hindsight it might be possible to draw such a conclusion, it is often difficult to make this assessment as the crisis is unfolding. Most crises appear to operate in the

[7]Annex 1 sketches the proof using a slightly modified version of Chui et al (2002).

[8]The impact of different legal arrangements on the incentives of creditors and the debtor and resulting inefficiencies are discussed in Annex 2.

"grey zone" between pure liquidity and pure insolvency. The source of this uncertainty is twofold.

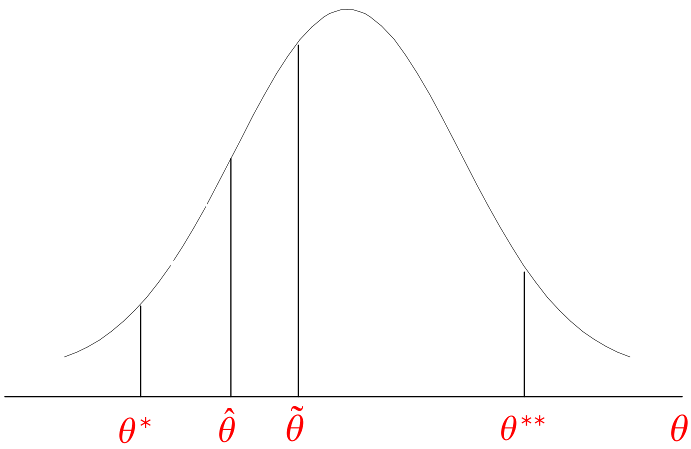
First, even liquidity crises are often rooted in concerns about potential solvency. The greater the uncertainty about future solvency, the greater the scope for a liquidity crisis. Second, potential recovery value for creditors in the event of default is often dependent on actions taken by the debtor country itself – for example, structural adjustment effort. But whether the debtor will put in that effort is unknown.

In the hybrid model, liquidity and solvency problems interact in important ways. The greater the potential for a liquidity crisis, with its attendant output costs, the greater the probability of the sovereign finding itself in a solvency crisis, with its associated costs. And the greater the potential cost of a restructuring agreement, the greater the likelihood of short-term investors wishing to flee. In other words, the two aspects of creditor co-ordination failure – the rollover friction (f) and the holdout friction (h) – now interact to aggravate the overall welfare loss. That accords with most empirical evidence, which tends to find strong evidence of a statistical link between liquidity crises and subsequent default and debt restructuring (eg, Detragiache and Spilimbergo (2001)).

Combining the solvency and liquidity dimensions to crisis alters the trigger point at which creditors flee in the first stage. Denote this trigger point in the hybrid model, $\tilde{\theta}$. In the New York Law scenario discussed above (and detailed in Annex 2), creditors receive a pro-rated share of no-effort output. The more inefficient the restructuring process, proxied by a higher number of holdout creditors, the lower the recovery value to creditors in the event of default. *If* a solvency crisis reduces the returns to creditors, it can be shown that $\tilde{\theta}$ lies to the right of $\hat{\theta}$ (the trigger value for fundamentals in a pure liquidity crisis) as illustrated in Figure 3. There are two behavioural channels driving this result. First, a lower expected return in the event of default alters the point at which the marginal cost and marginal benefit of fleeing are equilibrated for short-term investors[9]. Second, there is a strategic effect as investors, recognising that other investors are more likely to flee, adjust their own behaviour accordingly. Taken together, these two channels have the effect of making investors more trigger-happy: they will choose to flee at a higher level of fundamentals $(\tilde{\theta} - \hat{\theta})$ than they would have done if the solvency inefficiency did not exist.

[9] Annex 1 contains a proof for this in the case of a constant and known recovery rate.

Figure 3: Incidence of Crises



2.4 Welfare costs and policy discussion

We can now measure the welfare costs resulting from the co-ordination failures in the combined model of "grey-zone" crises. We use expected output as our measure of welfare. If short-term creditors only failed to rollover at the "fundamental insolvency" point and there were no restructuring inefficiency, then total output (our measure of welfare) would trace $y(\theta, 0, 0)$ until θ^* before dropping to $y(\theta, 1, 0)$. More formally, in a world with no co-ordination failures expected output is given by

$$E(Y)_{NCF} = \int_{-\infty}^{\theta^*(h=0)} y(\theta, 1, 0)\phi(.)d\theta + \int_{\theta^*(h=0)}^{+\infty} y(\theta, 0, 0)\phi(.)d\theta \tag{4}$$

where $\phi(.)$ is the density function of the fundamental variable θ. Expected output in an environment where there are co-ordination problems at both the rollover and at the restructuring phases is given by

$$E(Y)_{CF} = \int_{-\infty}^{\theta^*(h=h^*)} y(\theta, 1, h^*)\phi(.)d\theta + \int_{\theta^*(h=h^*)}^{\widetilde{\theta}} y(\theta, f(\theta), h^*)\phi(.)d\theta + \int_{\widetilde{\theta}}^{+\infty} y(\theta, 0, 0)\phi(.)d\theta \tag{5}$$

Notice that the fundamental insolvency point depends on the expected recovery rate in the event of restructuring. A lower expected recovery rate in the event of default pushes the fundamental insolvency point to the right of what it would have been absent co-ordination frictions at the restructuring phase. In terms of the notation used in (4) and (5), $\theta^*(h=0) < \theta^*(h=h^*)$.

A measure of the welfare cost of co-ordination failure is given by the difference between (4) and (5) which can be written as

$$\begin{aligned}
E(Y)_{NCF} - E(Y)_{CF} \quad = & \\
& \int_{-\infty}^{\theta^*(h=0)} [y(\theta,1,0) - y(\theta,1,h^*)]\phi(.)d\theta \\
& + \int_{\theta^*(h=0)}^{\theta^*(h=h^*)} [y(\theta,0,0) - y(\theta,1,h^*)]\phi(.)d\theta \\
& + \int_{\theta^*(h=h^*)}^{\widehat{\theta}} [y(\theta,0,0) - y(\theta,f(\theta),0)]\phi(.)d\theta \qquad (6) \\
& + \int_{\widehat{\theta}}^{\widetilde{\theta}} [y(\theta,0,0) - y(\theta,f(\theta),h^*)]\phi(.)d\theta + \\
& \int_{\theta^*(h=h^*)}^{\widehat{\theta}} [y(\theta,f(\theta),0) - y(\theta,f(\theta),h^*)]\phi(.)d\theta
\end{aligned}$$

The first two terms of the above equation reflect the expected loss from co-ordination failures at the restructuring phase (the risk that creditor returns will be lower in the event of restructuring due to holdout creditors); the third term reflects the expected loss from co-ordination failures at the roll-over stage (the risk that co-ordination problems would discourage investors to rollover, thus causing the debtor to default in states of the world where the debtor is not fundamentally insolvent); and the last two terms reflect expected losses from the interaction between co-ordination problems at the rollover and restructuring phases. These three types of welfare loss provide a justification for public policy intervention. Our next task is to look at policy measures that might address each of these types of loss. But before doing that, there are several general policy conclusions that can be drawn from the welfare decomposition in equation (6).

First, there is an important sense in which solvency-type policy proposals – such as CACs and the SDRM – have a direct bearing on the likelihood of liquidity crises. As we have discussed, fears of a disorderly restructuring and lower returns to creditors increase the likelihood of a liquidity crisis. In that sense, orderly debt restructuring proposals can help mitigate the costs of liquidity crisis. This is an important rationale for continuing with work on this front.

Second, orderly debt restructuring proposals, by themselves, will not fully remove the welfare costs of crisis. The costs of a pure liquidity run remain. Liquidity-based crisis resolution tools, such as temporary payments suspensions, would garner the welfare benefits defined by the first and the third terms in equation (6). The liquidity/solvency interaction terms can be addressed either by liquidity or solvency-based public policy measures. In that sense, liquidity-based crisis measures and solvency-based measures are substitutes. But they are not perfect substitutes. Both sets of crisis-resolution measures would need to be in place to mitigate, in a comprehensive fashion, the costs of crisis defined in equation (6). For that reason, the two sets of measure are better seen as complements than as substitutes.

Third, the relative weight to put on various crisis resolution mechanisms will depend on which of the welfare wedges in equation (6) is likely to be the most important in practice. Eichengreen (2000) argues that solvency crises are more prevalent than liquidity crises in practice. But this is ultimately an empirical question. And the model presented suggests that such a separation may in any case be difficult to make. A key parameter is the proportion of short-term debt, p. It can be shown that a rise in short-term debt has two effects. First, it shifts θ^*- the point of fundamental insolvency - to the right. From equation (6), this would tend to increase the costs of solvency crisis. Higher short-term debt increases the chance of country finding itself unable to meet contractual payments. But second, an increase in short-term debt also causes $\hat{\theta}$ to shift to the right and by a greater amount than θ^*. A higher proportion of short-term debt increases the vulnerability of a country to liquidity crisis, as we might expect. So the net effect of increasing short-term debt is to increase the aggregate costs of crisis, but in particular the costs of liquidity crisis. Or, put differently, the larger the proportion of short-term debt, the higher the premium that should be placed on measures to resolve liquidity, rather than solvency, crises (and the greater the importance of putting in place crisis resolution measures in general).

2.4.1 Dealing with liquidity crises

To forestall liquidity crises, domestically as well as internationally, three types of intervention are typically discussed. First, last-resort lending by some supra-national agency, such as the IMF (internationally) or a central bank (domestically). If there were a fully-credible expectation that the IMF would fill completely any financing gap resulting from a failure of short-term creditors to rollover, then a liquidity crisis would never materialise in the first place. All of the welfare loss of creditor co-ordination failure would be removed; the first-best would obtain (Chui et al (2002)). A sovereign liquidity crisis is then just like a bank run and can be tackled with the same instruments.

A second means of achieving the same end is a suspension of payments, or standstill, in the event of a failure by short-term creditors to rollover[10]. Provided it were fully credible, a forced rollover of debt would also defuse incentives to run and secure the first-best. A standstill is as efficient as last-resort lending in forestalling a sovereign liquidity crisis. This equivalence between last-resort lending and payments suspensions on ex-post efficiency grounds is well-known in a banking context (Diamond and Dybvig (1983), Rogoff (1999)). The same logic carries across in sovereign liquidity context (Chang and Velasco (1998)). There are two reasons for believing, however, that standstills may offer something over and above last-resort lending in the event of liquidity crisis.

First, this equivalence breaks down if the offer of potentially unlimited official lending is less than perfectly credible – for example, because there are limits on official lending. In that event, payments suspensions would be strictly preferred on efficiency grounds, provided they are applied time-consistently (Miller and Zhang (1999))[11]. In practice, official lending is limited. Official monies have less than fully filled the financing gaps facing even the larger, systemic countries. If there are expectations that last-resort lending is limited, then liquidity crises will not be forestalled – and could even

[10] In the model, this can be simulated by letting the exit tax, c, approach unity.

[11] Wallace (1988) also shows that standstills may be preferable to last-resort lending unless the authorities have superior information on the nature and extent of the banking crisis (see Giannini (2002)).

be induced. That would suggest the need to focus on other tools for dealing with liquidity crises, such as standstills.

Second, last-resort lending carries potential moral hazard risks, for both debtors and creditors. These risks should not be overstated. The empirical evidence on moral hazard is, at best, ambiguous. And, theoretically, lending at a market interest rate in the face of a liquidity crisis should not induce moral hazard (Haldane, Irwin and Saporta (2002)). If, however, IMF financing is at a subsidised rate, moral hazard becomes at least a possibility.

To date, payment suspensions have not been the preferred tool of the official sector. We have seen instances of partial suspensions, as with the rollover arrangements agreed with international banks in Korea in 1997 and Brazil in 1999. But these were only introduced after official monies had been put up. That reluctance to use standstills in liquidity cases may reflect concerns about their potentially adverse side-effects on capital markets, which are discussed in Section 3.

A third potential official-sector response is the accumulation of liquid foreign currency reserves by the country itself. For example, a number of Asian economies have accumulated substantial foreign currency reserves in the past few years and are consequently much less susceptible to the kind of liquidity crises some of them experienced in 1997. Such a policy basically means that a domestic authority (usually the central bank) can provide lender of last-resort funds in foreign currency. Chui et al (2002) demonstrate that a higher level of liquid reserves reduces the probability of both fundamentals and belief-driven liquidity crises, with associated improvements in welfare. But as Chui et al note, this welfare analysis does not take into account the potentially high opportunity cost of holding reserves (which are typically in the form of low-yielding assets). Also, this comparative static result does not capture the potential behaviour of debtors and creditors were a country to have an explicit *policy* of covering short-term foreign currency debt with official reserves. The latter would introduce moral hazard into the borrowing decisions of private domestic debtors, leading to excessive levels of short-term foreign currency debt and exacerbating the inefficiency. Self-insurance might be effective in preventing liquidity crises, but has the potential to be inefficient.

2.4.2 Dealing with solvency crises

We now consider public policy measures directed at the inefficiencies associated with restructuring - low adjustment effort by the debtor and an inefficiently high number of holdout creditors. We consider two measures: collective action clauses, which place restrictions on the number of holdout creditors; and an international bankruptcy court, which has some of the same features as the SDRM.

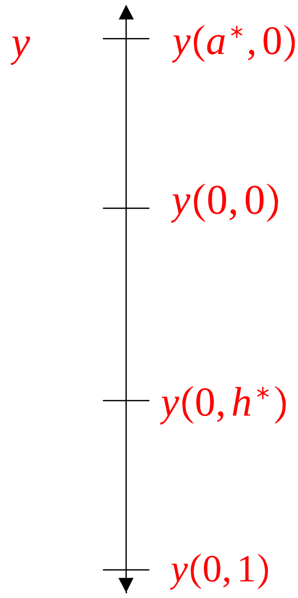
In Annex 2 we demonstrate that switching from New York Law bonds to English Law bonds with collective action clauses alters the incentives of the debtor to exert effort. Under New York Law, the debtor has no incentive to exert effort because even if a large proportion of creditors are prepared to accept a restructuring offer, holdout creditors can capture the results of this additional effort. In equilibrium, creditors receive an equal share of no-effort output. Under English Law bonds, provided the debtor makes an offer satisfactory to a sufficient number of creditors to exceed the collective action voting threshold, this becomes binding on all creditors. By fixing the amount of the new obligation, the debtor has an incentive to exert effort because it keeps the residual. As there is now more output to be shared, the debtor could feasibly offer creditors a higher recovery value than under New York Law.

Collective action clauses can generate a Pareto improvement by elininating the inefficiently high number of holdouts and inefficiently low level of effort. Figure 4 shows the range of feasible aggregate offers that could be made by the debtor to creditors. It is bounded above by $y(a^*, 0)$ and below by $y(0, 1)$[12]. Where the offer lies within this range - and hence the equilibrium sharing of the surplus - will depend on the relative bargaining strengths of the debtor and the creditors. Those bargaining powers will in turn depend on the relative costs facing the debtor and creditors in the event of the collective action clause threshold not being reached[13] and the level of the threshold itself. Annex 2 shows that switching to bonds with collective action clauses and a judicious choice of voting threshold can secure greater returns in the event of a solvency crisis to *both* creditors and the debtor.

[12] Where the two arguments are effort (a) and the proportion of holdouts (h).

[13] The higher the relative costs faced by debtors in this event, the lower their bargaining power and hence the higher the offer which would need to be made to creditors in equilibrium; and vice versa if the relative costs of a failed offer are felt most by creditors. These costs are not modelled explicitly here.

Figure 4: Output Post-Restructuring



But as Figure 4 also illustrates, it is possible that the expected offer and outcome for creditors is worse under collective action clauses than pre-restructuring output, $y(0,0)$ or output under New York Law, $y(0,h^*)$, if their bargaining strength is sufficiently weak. If creditors collectively have weak bargaining power, they may feel they are better off taking their chances and litigating individually. This may be one of the factors explaining the reluctance of some private creditors to countenance the inclusion of such clauses in international bonds; they may weaken their bargaining hand. This is despite the fact that the clauses themselves boost aggregate welfare.

One key design issue is the choice of an appropriate binding-in threshold in collective action clauses. This has recently been a point of debate between the private sector and the official sector, with some within the private sector favouring a higher majority restructuring threshold (eg EMCA (2002)). Although not modelled here, it is easy to see why this would be a point of contention between the private sector and debtors. For a given distribution of costs of not reaching a restructuring agreement, a higher voting theshold is likely to correspond to a higher offer to secure that theshold - and hence more of the surplus being taken by creditors versus debtors.

An international bankruptcy court through an SDRM could act as a central planner in the model. It could require that the debtor expend optimal effort, $a = a^*$ - for example, as a precondition of any IMF lending. And it could constrain creditors from holding out, $h = 0$ – for example, by preventing creditors litigating against the sovereign following an offer. Enforcement of these outcomes by a supranational agency could, at a minimum, replicate the results of switching to bonds with collective action clauses. Crucially, the SDRM adds one additional degree of freedom. The bargaining power of the debtor and creditors under collective action clauses is to a significant extent determined by the voting threshold. This is fixed *ex-ante* by what is written in the contract. But this threshold could be inefficient once the value of θ is realised. This is important for welfare in the hybrid - "grey-zone" - version of the model.

2.4.3 Dealing with 'grey-zone' crises

In a model of a pure solvency crisis, centralised (bankruptcy court) and decentralised (contractual) approaches to restructuring debt are in most cases isomorphic in their effects on social welfare (Annex 2). An appropriately-designed contract, defining a critical threshold of holdout creditors, could secure the first-best, as could a bankruptcy court. The precise division of this welfare gain or surplus was largely a distributional issue between debtors and creditors, provided the debtor could be induced to exert optimal effort.

That result changes in a model of hybrid liquidity and solvency crises. In this model, rules on the sharing of the surplus have a bearing on creditors' willingness to run. The greater the slice of the pie creditors can be assured in the event of a debt restructuring, the greater is their willingness to stay when confronted by an adverse shock – that is, the lower the probability of a liquidity crisis. Against these creditor incentives need to be balanced the incentives of the debtor. For if too great a share of the surplus is distributed to the creditors, their incentives to exert optimal effort may be blunted. In other words, there is a trade-off in the incentives facing debtors and creditors and in the liquidity and solvency parts of the game.

To see this more formally, let β be the share of the surplus, $s(a, h)$, taken by creditors in the event of restructuring, with the debtor receiving $(1 - \beta)$. The planning problem is then to maximise aggregate second-period output:

$$y^{N^*}(\theta, f; a, h) = y^{N^*}(\theta, f(\beta s(a, h)); a((1 - \beta)s(a, h)), h(\beta s(a, h))) \qquad (7)$$

by choice of β, the sharing parameter. Note now that this sharing parameter positively affects the incentives to rollover (f) on the part of the creditor, but (negatively) on the incentive to exert adjustment effort (a) on the part of the debtor. The optimal β will seek to balance these competing incentives of debtors and creditors so as to maximise aggregate output.

Whereas in the pure solvency game welfare was invariant to the precise sharing rule, in the general model this is no longer the case. The first-period incentives of the creditor need to be weighed. This strengthens the hand of those who argued for a centralised approach to the restructuring of debt, with some supranational agency – a bankruptcy court – overseeing the process. They could ensure an optimal splitting of the surplus to ensure welfare is maximised. The assurance that a bankruptcy court stood in the background, ensuring fair play in the event of default, would provide assurances to creditors in the first period. And the court would also ensure that, in the event of default in the second period, the debtor was offered enough to induce them to exert optimal effort.

It is unclear that the decentralised approach could deliver such an outcome. The division of the surplus is then determined by the debtor's and creditors' relative bargaining strengths. These need not necessarily accord with the balance of incentives necessary to maximise welfare. The same point, put more generically, is that debt contracts do not contract *ex ante* over the future adjustment effort. Even if this could be done, through some equity-like instrument, this *ex-ante* contract is unlikely to be *ex-post* efficient. So while decentralised solutions, such as collective action clauses, may help resolve a holdout problem, they may not be capable of securing a first-best.

This same issue arises in the context of the debate on the SDRM. Under that model, there is an unresolved issue about who decides whether a restructuring offer made by the debtor to the creditors is a fair one – that is, whether it is consistent with sustainability. The Fund-lite SDRM model of Krueger (2002) foresees a majority of creditors playing a determining role. Such an approach would run into the same problems as CACs. The framework presented here suggests that the Fund (or some other agency)-heavy SDRM model might be a preferred approach, as it guards against the potential ex post inefficiencies of a bargaining or contractual approach.

This conclusion does not follow inevitably. It relies on the bankruptcy court being able to arbitrate over a^* at least as well as creditors and debtors. If this is not the case, then the centralised solution may no longer be optimal.

For example, some have questioned whether the IMF can best play that role, given that it is both a preferred creditor and has the debtor as one of its members. These may lead it to understate a^* or the offer made to creditors. The model makes clear why private creditors were averse to the IMF-heavy SDRM model when it was first mooted.

3 Costs of Standstills

Standstill mechanisms are not without their critics (eg, Institute of International Finance (2002)). These criticisms are multi-faceted. But three of the more compelling arguments concern the potentially adverse side-effects of standstills on international capital markets (eg, Lipworth and Nystedt (2001)). Specifically, it has been argued that a standstills regime may: (a) prompt debtors to default strategically or perhaps even capriciously – a debtor moral hazard; (b) result in a rise in the cost of capital for emerging markets, with an associated contraction of capital flows; and (c) result in investors moving down the maturity spectrum, thereby increasing the probability of crisis – a "rush for the exits".

These criticisms should not be taken lightly. For example, by construction, these potentially adverse effects on emerging capital markets would not have shown up in the model developed in Section 2. That model focussed on the ex-post efficiency effects of policy intervention to resolve liquidity and solvency crises. It did not assess the *ex-ante* effects of these interventions on optimal capital structure. In particular, the model took the quantity of capital flows, the cost of capital and the mix between short and long-term lending as fixed. We now consider a (different) set of theoretical models and empirical evidence that relax in turn each of these restrictions.

3.1 Debtor Moral Hazard

As the model in Section 2 made clear, a standstills regime can improve the *ex-post* efficiency of debt workouts and hence lower the costs of crisis. Some have argued, however, that this is only one side of the welfare story. The reason is that the output costs of default can be interpreted as a market disciplining device, offsetting debtor's incentive to default strategically (Eaton and Gersovitz (1981)). In other words, costly default is quasi-collateral for the creditor (Cline (2000), Dooley (2000)). Architectural measures to reduce the cost of default erode this quasi-collateral backing lending, thereby reducing lenders' willingness to supply credit in the first place. So, there is an *ex-ante* efficiency loss – or debtor moral hazard - to set against the *ex-post* efficiency gain of standstills. In these models, the first effect often dominates the second, such that the net effect of standstills is negative from a welfare standpoint.

This trade-off between *ex-ante* moral hazard and *ex-post* efficiency is a neat framework within which to consider the welfare implications of various crisis management tools. But how far can we go in calibrating this trade-off? In particular, how great is debtor moral hazard risk? There are two reasons – one empirical, one theoretical - for thinking that debtor moral hazard may not be as acute as some have suggested.

Empirically, the costs of sovereign default appear in many recent cases to be high, sometimes punitively so. A recent IMF paper (IMF (2002)) assesses the recent sovereign defaults in Ukraine, Pakistan, Ecuador and Russia. The costs of these defaults, in terms of foregone output and the fiscal cost of recapitalising banks, were in most cases punitive. And in addition to these direct costs are the indirect costs of loss of market access, as none of the four restructuring countries have regained market access.

Sovereign default experience is consistent with this evidence. Figure 5 plots the number of sovereign bonds that have been in default annually since 1830. By historical standards, sovereign defaults are currently at very low levels – even more so if we were to control for the increasing number of countries over the period. Figure 6 plots sovereign defaults over the past 25 years, broken down by type of investment. The number of countries in default has been in decline since around 1990, despite the huge increase in the stock of international bonds and in the number of countries accessing international capital markets over this period. Taken together, this empirical evidence does not suggest that debtor moral hazard has been pervasive in the recent past.

But even if it were, there are good theoretical reasons for believing the default-as-quasi-collateral model may be a partial description of the real world. The reason is that it ignores the potential oversight role of the IMF or other independent surveillance agencies. They can help distinguish "bad luck" and "strategic" default and can punish those defaulting strategically. The punishment mechanisms for strategic default would be partly pecuniary (no IMF lending) and partly reputational (an adverse IMF signal). In this way, the IMF could exert discipline over the debtor. In this role, the IMF is

Figure 5: Incidence of Sovereign Default

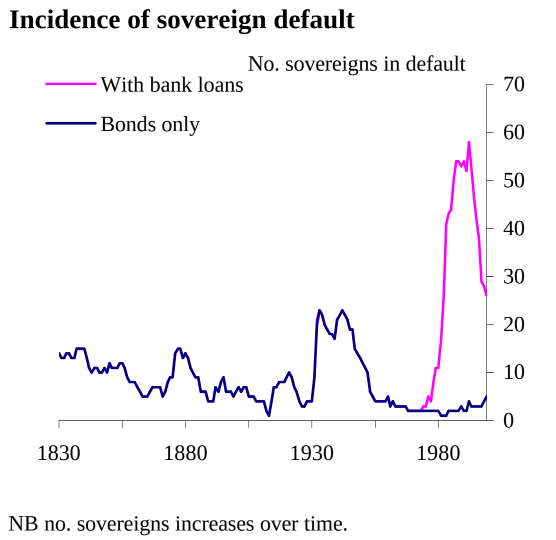
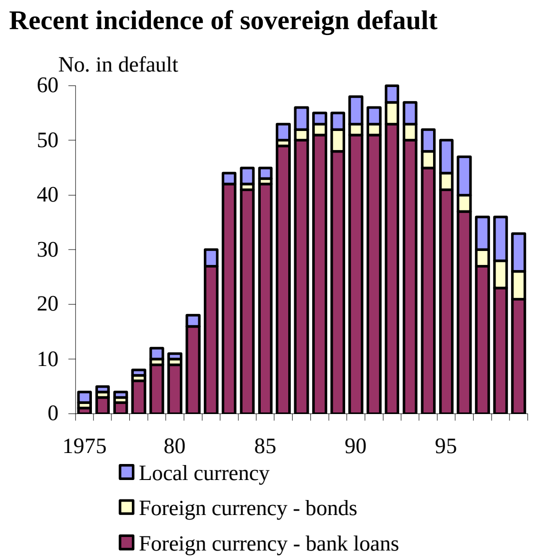


Figure 6: Recent Incidence of Sovereign Default



acting as "signalman", in addition to its conventional role as "fireman". It acts as a delegated monitor on the international capital market. The better the IMF's surveillance, the better able it is to play this monitoring role[14].

Gai, Hayes and Shin (2002) have recently formalised this game between profit-maximising creditors, strategically defaulting debtors and the IMF as a delegated monitor, building on the insights of Dooley (2000) and Bolton and Scharfstein (1996). They reach two illuminating conclusions. First, officially sanctioned standstills, which lower the ex-post costs of default, need not necessarily lower ex-ante lending. Why? Because official discipline can to some degree substitute for market discipline, provided the IMF are competent at distinguishing bad luck and strategic default. Second, even if lending is lower in a standstills regime, it is still possible – indeed likely - that aggregate *welfare* will be higher. In other words, gains in ex-post efficiency from standstills more than compensate for the loss of ex-ante discipline.

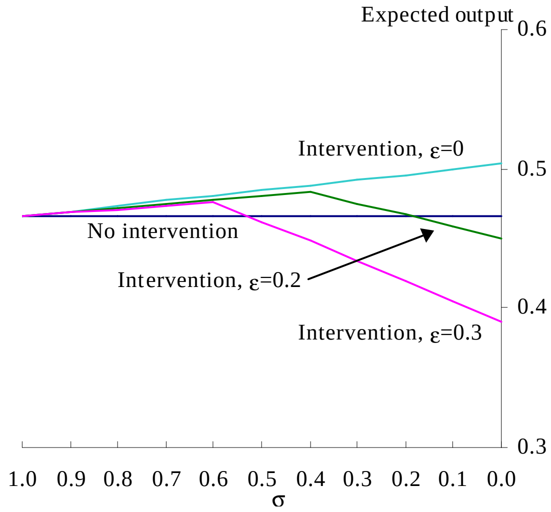
The second result is illustrated in Figure 7. This is based on a calibration of the Gai *et al* (2002) model[15]. Welfare is measured up the y-axis. Along the x-axis, σ measures the extent to which the IMF is able to mitigate the lump-sum efficiency costs of crisis – for example, by lending-into-arrears, enforcing debt work-out guidelines etc. So $\sigma = 1$ indicates that the IMF has no impact in mitigating these costs; and $\sigma = 0$ that the IMF is able to offset these costs completely. The rays in Figure 7 illustrate the effects of standstills on welfare for varying degrees of IMF competence in distinguishing bad luck and strategic default. Specifically, ε indexes the probability of the IMF sanctioning a strategic (rather than a bad luck) default – that is, making a mistake.

For low values of ε (high quality surveillance), standstills are unambiguously welfare enhancing, the more so the greater the extent to which the IMF is able to mitigate the ex-post efficiency costs of crisis. Official discipline substitutes for market discipline – ex-ante moral hazard is held in check – while debtors and creditors benefit from lower ex-post efficiency costs. At higher values of ε (lower quality surveillance), this result can flip over. Standstills may lower welfare. They are more likely to do so the better is the IMF at mitigating the efficiency costs of crisis. Why? Because a fallible IMF, which

[14] Spiegel (2000) develops a model in which an international lender of last resort has less information than private creditors but is able, through judicious use of the interest rate charged, to implement a separating equilibrium between good and bad outcomes and support welfare improving intervention.

[15] Other parameter values are discussed in Gai et al (2000).

Figure 7: Welfare gains from standstills



(a) Other parameter values are as follows: λ=0.5, ρ=0.05, θ=0.75, α=0.6.

is good at cutting the costs of crisis, takes us back to a Dooley (2000) world of frequent strategic default by debtors. Debtors will be more willing to cheat if the payoffs from cheating are high and the risk of being caught is low. It is clear from Figure 7, however, that the IMF needs to make significant sanctioning mistakes for standstills to reduce welfare - and only then for low values of σ. So overall, this simple calibrated model strongly suggests that standstills are likely to be welfare enhancing, provided the IMF serves as a competent default monitor. Debtor moral hazard is averted provided the IMF polices the international capital market.

3.2 Capital Flows

Any assessment of the impact of payments suspensions on the (price or quantity) of emerging market capital flows faces a basic identification problem: we have no clean counterfactual experience of a regime with periodic and predictable standstills. Notwithstanding those caveats, what empirical and theoretical evidence do we have?

On the empirical side, the Korean crisis in 1997 and the Brazilian crisis in

1999 provide two potential case studies of the effects of payments suspension. In both cases, a voluntary or quasi-voluntary agreements to rollover short-term interbank loans was made with international banks. In both cases, capital market confidence returned rapidly. Korean and Brazilian dollar debt spreads over US Treasuries fell by 177bp and 1085bp respectively over the subsequent twelve months.

Equally, the Korean and Brazilian cases offer only mixed support. The standstills were accompanied by large official sector packages and policy reform, each of which may have contributed as much or more than standstills to the resumption in confidence. Experience in Turkey during 2000-2001, where a similar rollover agreement was tried and failed, supports that alternative explanation.

Some of the concern about emerging market capital flows effects is no doubt motivated by 1980s experience. During that "lost decade", there was an effective lock-out of emerging markets from international capital markets following default. Most analyses seem to suggest that this was in part at least a reflection of the concentration of credit risk on commercial banks' balance sheets at that time (Lindert and Morton (1985)). Today, there is a much greater dispersion of credit risk across financial institutions, partly because of the growth in the international bond market. Indeed, in many respects the pattern of international intermediation today more closely resembles the 1930s than the 1980s. And interestingly, the evidence from the 1930s – a time of widespread sovereign default – offers some comfort. A number of studies have concluded that GDP, borrowing premia and future market access were little different between defaulters and no-defaulters following the 1930s debt crisis (Lindert and Morton (1985) and Eichengreen (1985)).

More recent econometric evidence, looking at the determination of international sovereign spreads, paints a similar picture. It finds no significant effect of previous default experience on the cost of emerging market borrowing (eg, Eichengreen (2000)). Moreover, it suggests that instruments that facilitate debt work-out tend to lower borrowing costs, rather than raising them. The best-known work is by Eichengreen and Mody (2000) and Becker, Richards and Thaichareon (2001), which assesses the effects of the introduction of collective action clauses. The second study suggests that these clauses tend to lower (or at least not raise) borrowing costs along the entire credit spectrum[16].

[16] Eichengreen and Mody (2000) suggest that CACs may lower borrowing costs for

In a less well-known piece, Eichengreen (2000) assesses the effects of contractual provisions for an automatic litigation stay on emerging market corporate bond prices. It finds that the inclusion of these stay provisions lowers significantly the cost of emerging market borrowing. In other words, investors value the safe harbour of a stay over the associated costs (loss of liquidity, debtor moral hazard etc). Of course, we need to be careful in reading across from contractual stays to statutory or informal ones, and from corporate to sovereign bonds. Nonetheless, the evidence is strongly suggestive that stays do not appear historically to have impacted negatively on the cost of emerging market borrowing – indeed, if anything the contrary.

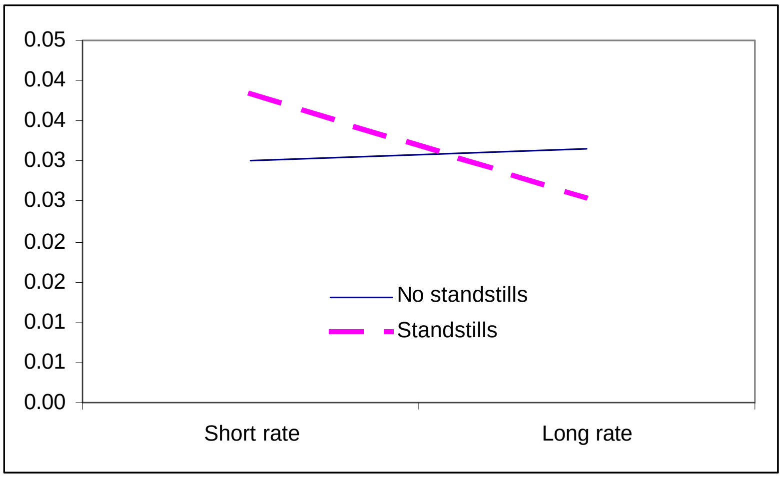
What light can theory shed on these pricing or capital flows effects? Two recent theoretical models have aimed to assess the potential effects of a forced rollover of short-term debt on debt prices (Shin (2001)) and debt quantities (Martin and Penalver (2002)), at long and short maturities. The second paper develops a model similar in spirit to that in Section 2. A debtor borrows to fund an investment project, using short and long-term loans. The determination of the quantity and price of short and long-term loans is now, however, endogenous to the regime, not fixed in advance. In particular, the cost and quantity of capital is affected by whether the regime permits standstills – that is, the orderly rolling over of short-term debt in the event of crisis.

Standstills have two effects. First, they deprive short-term creditors of liquidity on a temporary basis. Short-term creditors demand compensation through higher short-term interest rates. Second, they confer higher recovery values on debt in the event of default. This benefits longer-term investors, who in turn demand less compensation through lower long-term interest rates. The net effect is that standstills cause a disinversion – or "tilt" - of the yield curve, relative to the counterfactual no-standstills regime. Figure 8 illustrates this, for one parameterisation of the Martin and Penalver model.

In Shin (2001) a similar term-structure tilt occurs. But in addition there is the potential for an inward shift in the term structure, with short as well as long rates falling because of the amerliorating effect of standstills on creditor coordination problems. Taking these two papers together, it is unclear whether the cost of capital for the debtor would rise or fall in the standstills regime. Certainly, there is no reason theoretically to believe that the

higher-rated borrowers and raise them for lower-rated borrowers.

Figure 8: Effect of Standstills on Yield Curve



cost of capital for emerging markets will necessarily rise should payments suspensions become part of the furniture.

These term structure shifts may give rise to a third effect. They may result in a shift in the composition of capital flows, away from (more expensive) short-term debt and towards (cheaper) long-term debt. As with the price effect, the net impact of standstills on the total quantity of capital flows could go either way; theoretically, there should be no presumption that aggregate capital flows will fall. But the compositional effect will, by itself, have an impact in extending the duration of debt and thereby potentially reducing debtor's vulnerability to crisis[17]. Martin and Penalver (op.cit.) illustrate that, even if expected output is lower under a regime of standstills, welfare could well be higher as a result of the improved capital structure and the resulting lower incidence of crisis.

3.3 Rushes for the Exit

In the models above, standstills raise the cost and reduce the quantum of short-term capital. Some commentators have suggested, however, that stand-

[17] On the theory, see Chang and Velasco (1998); and on the empirical evidence, Bussiere and Mulder (1999).

stills may have the opposite effect, reducing the maturity of debt and bringing forward the timing of crises (Lipworth and Nystedt (2001)). The argument runs that investors may have an incentive to position themselves to flee if they fear being caught up in a payments suspension. Standstills may result in trigger-happy investors. Anecdotal evidence from the Korean, Brazilian, Argentinian and Turkish crises is sometimes invoked. In each case, the maturity of credit lines was cut in anticipation of payments problems.

This experience is far from compelling evidence against standstills, however, the essence of which is orderly suspension, rather than disorderly default. And, significantly, there has to our knowledge until recently been no formal modelling of the "rush for the exits" phenomenon. A recent paper by Gai and Shin (2002) attempts to fill that gap. They model the rush for the exits as a pre-emption game among creditors. A debtor undertakes an N-period investment project. Creditors choose where within the maturity spectrum, from periods 1 to N they would like to lie, with the longest maturity asset being equity. The fruits of the investment project, which are taken by equity-holders should the project survive the course, depend on the outcome of some fundamentals shock and on the maturity structure of debt – the shorter the maturity, the greater the probability of crisis. If a crisis occurs, creditors are forced to take a haircut.

Creditors in the game face two conflicting incentives. First, there are incentives to be first in the queue – the shortest possible debt maturity – as that allows creditors to escape the losses associated with crisis. But, against this, if all creditors move to the shortest possible maturity this maximises the chances of crisis, without any accompanying gain for any individual creditor. In this event, some creditors would choose a lengthier maturity – for example, by holding equity – and hope that fundamentals will turn out positive. The balance of these two effects gives rise to a non-degenerate term structure of debt.

What, in this model, is the impact of an orderly payments suspension? This has two effects on creditors' choice of debt maturity. First, it gives rise to a temporary liquidity loss to those caught by the suspension. Other things equal, this would lead them to shorten maturities – the "rush for the exits". But second, it serves to boost recovery values in the event of a crisis. This has both a direct effect in increasing incentives to hold longer-term debt, the returns to which are now higher. But also an indirect strategic effect, as higher recovery rates reduce the incentive to engage in pre-emption in the first place.

Calibration of the Gai and Shin model suggests the following implications of a regime of temporary payments suspension. First, if suspensions are short-lived and have a modest positive effect on recovery values, they are unlikely seriously to affect the maturity structure of debt. Second, longer-lived standstills do have the potential to affect debt maturities, with a hollowing-out of middle maturities as investors move either to the very short or the very long end of the term structure. Even in this worst-case, however, the effect of suspensions on the average duration of debt and on the probability of crisis is ambiguous. There should be no presumption that the "rushes for the exit" effect will always win out. There are important countervailing forces that need to be weighed which reduce incentives to flee and lower crisis probabilities. In a well-designed standstills regime – one with short duration and a significant boost to recoveries – these positive countervailing effects are very likely to dominate. Standstills would not induce a scramble for the door, but rather would provide assurances to investors that they stand to benefit by sitting still.

4 Where Next?

A number of recent architectural reform proposals envisage a standstill mechanism, to be invoked either prior to and/or immediately following default, together with accompanying measures to bind-in creditors. This paper has evaluated the conceptual case for some of these proposals. In a theoretical model of crisis, it finds that temporary payments suspensions plus binding-in have a potentially welfare-enhancing role to play, both pre- and post-default – that is, in both liquidity and solvency crises.

The welfare implications of liquidity-standstills and solvency-standstills depend on the specifics of the crisis in hand. Indeed, a standstill used in either a liquidity or solvency crisis helps importantly to mitigate some of the costs associated with the other type of crisis. This follows from the fact that, in the general case of the model, no crisis is strictly liquidity or solvency based. Rather, crises are a combination of the two effects. Standstills are a welfare-effective means of dealing with these "grey zone" crises.

Some of the criticisms typically made of standstills – in particular, their effects on the structure of capital markets – were also assessed. There are good reasons for believing that, appropriately-designed, the judicious use of payments suspensions would not have seriously adverse effects on capital markets.

In terms of practical policy implications, the paper points towards continuing to work actively on orderly standstill mechanisms, at both the illiquidity and insolvency stages. The official community has recently put its impetus behind the SDRM and the greater use of CACs. Both would help at the insolvency stage, with associated welfare benefits - though there may be inefficiencies associated with the bargaining dimension to the contractual approach. Rather less impetus has been put behind promoting the more widespread use of standstills in tackling liquidity or pseudo-liquidity crises. Since, arguably, most crises are "grey zone" rather than pure insolvency crises, this suggests the current division of official sector labour may not be optimal.

References

[1] **Becker, T, Richards, A and Y Thaicharoen (2001)**, "Bond Restructuring and Moral Hazard: Are Collective Action Clauses Costly?", *IMF Working Paper* 01/92;

[2] **Bolton, P and D Scharfstein (1996)**, "Optimal Debt Structure with Multiple Creditors", *Journal of Political Economy*, 104, 1–26.

[3] **Buiter, W and A Siebert (1999)**, "UDROP: A Small Contribution to the New International Financial Architecture", *International Finance*, 2, 227-48.

[4] **Buchheit, L and M Gulati (2002)**, "Sovereign Bonds and the Collective Will", mimeo.

[5] **Busierre, M and C Mulder (20??)**, "External Vulnerability in Emerging Markets: How High Liquidity Can Offset Weak Fundamentals and the Effects of Contagion, *IMF Working Paper* No.99/88.

[6] **Chang, R and A Velasco (1998)**, "Financial Crises in Emerging Markets – A Canonical Model", *NBER Working Paper* No.6606.

[7] **Cline, W (2000)**, "The Role of the Private Sector in Resolving Financial Crises in Emerging Markets", mimeo, Institute for International Finance.

[8] **Chui, M K, Gai, P S and A G Haldane (2002)**, "Sovereign Liquidity Crises: Analytics and Implications for Public Policy", *Journal of Banking and Finance*, 26, 519-46.

[9] **Council on Foreign Relations (1999)**, Safeguarding Prosperity in a Global Financial System: The Future International Financial Architecture, Report of an Independent Task Force, New York.

[10] **Detragiache, E and A Spilimbergo (2001)**, "Crises and Liquidity: Evidence and Interpretation", *IMF Working Paper*, WP/01/2.

[11] **Diamond, D and P Dybvig (1983)**, "Bank Runs, Deposit Insurance and Liquidity", *Journal of Political Economy*, 91, 401-19.

[12] **Dooley, M (2000)**, "Can Output Losses Following International Financial Crises be Avoided?", *NBER Working Paper* No.7531.

[13] **Eaton, J and Gersovitz, M (1981)**, "Debt with Potential Repudiation – Theory and Estimation", *Review of Economic Studies*, 48, 289-309.

[14] **EMCA (2002)**, "Model Covenants for New Sovereign Debt Issues".

[15] **Eichengreen, B (1985)**, "The US Capital Market and Foreign Lending, 1920-1955" in Developing Country Debt and Economic Performance, J Sachs (ed.), NBER.

[16] **Eichengreen, B (2000)**, "Can the Moral Hazard Caused by IMF Bailouts be Reduced?", CEPR/ICMB Geneva Reports on the Work Economy Special Report I.

[17] **Eichengreen, B and R Portes (1995)**, "Crisis What Crisis? Orderly Workouts for Sovereign Debtors", Centre for Economic Policy Research, London.

[18] **Eichengreen, B and A Mody (2000)**, "Would Collective Action Clauses Raise Borrowing Costs?", *NBER Working Paper* 7458

[19] **Fischer, S (1999)**, "On the Need for an International Lender of Last Resort", address to American Economics Association.

[20] **Gai, P S and H S Shin (2002), "**Debt maturity structure with preemptive creditors", mimeo.

[21] **Gai, P S, Hayes, S and H S Shin (2002)**, "Crisis Costs and Debtor Discipline: the Efficacy of Public Policy in Sovereing Debt Crises", *Bank of England Working Paper* No.136 and Journal of International Economics, forthcoming.

[22] **Giannini, C (2002)**, "On the Distinction between Unilateral Standstills and Formal Default: A Contribution", mimeo, Banca d'Italia.

[23] **Haldane, A.G, Irwin, G. and Saporta, V.S. (2002)**, "Bail-out or work-out? Theoretical considerations", mimeo.

[24] **Haldane, A G and M Kruger (2001)**, "The Resolution of International Financial Crises: Private Finance and Public Funds", *Bank of England Financial Stability Review*, November.

[25] **International Monetary Fund (2002)**, "The Effect of Sovereign Debt Restructuring on the Domestic Economies: Experience in Four Recent Cases".

[26] **Institute of International Finance (2002)**, "Action Plan: Strengthening Emerging Market Finance", prepared by the IIF Special Committee on Crisis Prevention and Resolution in Emerging Markets.

[27] **Krueger, A (2001)**, "International Financial Architecture for 2002: A New Approach to Sovereign Debt Restructuring", mimeo, IMF.

[28] **Krueger, A (2002)**, "A New Approach to Sovereign Debt Restructuring", IMF.

[29] **Lindert, P H and P J Morton (1985)**, "How Sovereign Debt Has Worked", in Developing Country Debt and Economic Performance, J Sachs (ed.), NBER.

[30] **Lipworth, G and J Nystedt (2001)**, "Crisis Resolution and Private Sector Adaptation", *IMF Staff Papers*, 47, 18-214.

[31] **Martin, B and A Penalver (2001)**, "The Effect of Payments Standstills on Yields and the Maturity Structure of International Debt", *Bank of England Working Paper*, forthcoming.

[32] **Miller, M H and L Zhang (1999)**, "Sovereign Liquidity Crises: the Strategic Case for a Payments Standstill", *Economic Journal*, Vol.110, 335-362.

[33] **Morris, S and H S Shin (1998)**, "Unique Equilibrium in a Model of Self-Fulfilling Currency Attacks", *American Economic Review*, Vol.88, 587-97.

[34] **Obstfeld, M (1996)**,"Models of Currency Crisis with Self-fulfilling Features", *European Economic Review*, 40, 1037-47.

[35] **Rey, J-J (1996)**, "The Resolution of Sovereign Liquidity Crises", Report to the Ministers and Governors of the Group of Ten.

[36] **Rogoff, K (1999)**, "Institutions for Reducing Global Financial Instability", *Journal of Economic Perspectives* 13, Fall 1999, 21-42.

[37] **Shin, H S (2001),** "Co-ordination and the Term Structure of Interest Rates For Defaultable Securities", mimeo, April 2001.

[38] **Spiegel, M (2001)**, "Solvency Runs, Sunspot Runs and International Bailouts", *Federal Reserve Bank of San Francisco Working Paper* #01-05.

[39] **Taylor, J (2002)**, "Sovereign Debt Restructuring – A US Perspective", US Treasury.

[40] **Wallace, N (1988)**, "Another Attempt to Explain an Illiquid Banking System", *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall.

5 Annexes

5.1 Annex 1: Liquidity Crises

To highlight the implications of a liquidity crisis, we consider a simplification of the basic model. First, we assume that all debt is short-term ($p = 1$). Second, we assume that in the event of a second-period default, the return to creditors is known with certainty *ex-ante.* We set this return to a constant non-negative rate $\delta \leq (1-c)(1+r_s)$.[18]

These assumptions serve to partial out the solvency sub-game. Nonetheless, it is useful expositionally to define the zone for fundamentals (θ) below which the debtor would find itself insolvent (solvent), irrespective of the actions of short-term creditors: what we might call "fundamental insolvency" ("fundamental solvency"). These threshold values for fundamentals solvency, θ^* (θ^{**}), are the solution to:

$$0 = y^G(D, \theta^*, 0) - (1 + r_l)D \tag{8}$$

$$0 = y^G(D, \theta^{**}, 1) - (1 + r_l)D \tag{9}$$

If θ is known with certainty, there are multiple equilibria within the fundamentals zone (θ^*,θ^{**}). This is then a second-generation crisis model in the spirit of Obstfeld (1996). One problem with models of this type is that is it impossible to conduct comparative static welfare analysis given the multiplicity of equilibria.

The set-up of our game side-steps that problem by assuming some degree of imperfection in the θ-signal reaching investors. As Morris and Shin (1998) have shown, if signals are sufficiently precise there then exists a unique equilibrium of the imperfect information game[19]. In fundamentals space, denote this unique equilibrium $\hat{\theta}$. This defines the value of fundamentals below which a liquidity run would commence and the debtor would be forced to default on its debt. It can be shown to lie between θ^* and θ^{**}, as illustrated in Figure 9.

In what follows we sketch out the derivation of this equilibrium (along similar lines to Chui et al (2002)) and we consider how it is affected by an exogenously-imposed change in the recovery rate δ. To keep the analysis tractable, we first assume that

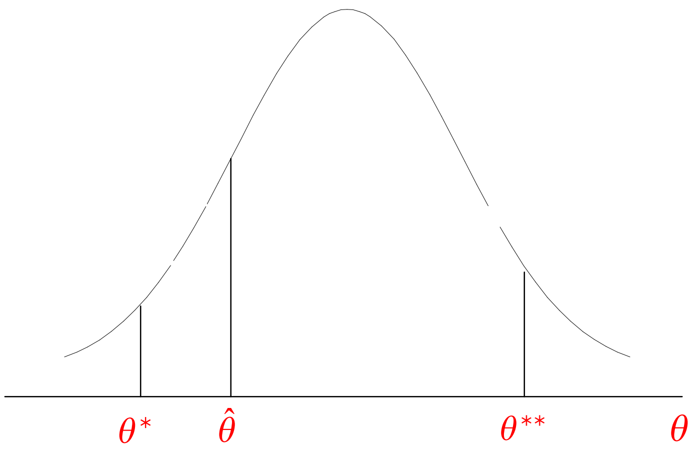
$$y^G = \theta D - fkD$$

in the event of default and $y^G = \theta D$ otherwise. We denote by f the proportion of creditors who flee and by $k > 0$ the marginal cost of destruction to output

[18] For the purposes of this example, it is also assumed that the amount recovered in the event of default is exogenous to the model, i.e. it is not funded by the country's available resources.

[19] Subject to some further restrictions on parameter values - see Chui et al (2002).

Figure 9: Welfare loss of liquidity run



caused by a single fleeing creditor (providing that enough investors flee to cause default in the first place).

Under these assumptions the fundamental insolvency and solvency thresholds defined generically in equations (8) and (9) above are now given by

$$\theta^* = (1 + r_l) \tag{10}$$

$$\theta^{**} = (1 + r_l) + k \tag{11}$$

As in Chui et al (2002), we posit that the aggregate strategy is a rule of action which depends on whether the signal of the fundamental is below a threshold level $\hat{\gamma}$. The aggregate strategy $v(\hat{\gamma})$ is an indicator function which takes the value of zero if $\gamma \geq \hat{\gamma}$ and takes the value of one, otherwise. This implies that the proportion of investors who flee given the aggregate strategy is given by

$$s[\theta, v(\hat{\gamma})] = \int_{-\infty}^{\hat{\gamma}} 1.\phi(\gamma \mid \theta) d\gamma = \Phi\left(\frac{\hat{\gamma} - \theta}{\eta}\right)$$

where $\Phi(.)$ denotes the cumulative density function for a standard normal random variable and $\phi(.)$ denotes the standard normal density function.

At the equilibrium switching point, two conditions need to be met.

First, the proportion of creditors who flee must be such that the solvency constraint binds. We refer to this condition as the "solvency condition". The solvency condition is given by

$$\widehat{\theta}D - s(\hat{\theta}, \hat{\gamma})kD = (1 + r_l)D \tag{12}$$

which can be rewritten as

$$\widehat{\theta} = (1 + r) - ks(\hat{\theta}, \hat{\gamma}) = \theta^* + (\theta^{**} - \theta^*)\Phi\left(\frac{\widehat{\gamma} - \widehat{\theta}}{\eta}\right) \tag{13}$$

The second condition is that at the switching point, the marginal creditor must be indifferent between fleeing and staying. We refer to this condition as the "indifference condition". This condition says that expected payoff from staying if a country defaults plus the expected payoff from staying if the country repays must equal the payoff from fleeing (which is known with certainty at the time). Formally, the indifference condition is given by

$$\delta \int_{-\infty}^{\widehat{\theta}} \phi(\theta \mid \hat{\gamma})d\theta + (1 + r_l)\int_{\hat{\theta}}^{\infty} \phi(\theta \mid \hat{\gamma})d\theta = (1 + r_s)(1 - c) \tag{14}$$

From the normality of the underlying random variables, we know that the distribution of θ conditional on the signal $\widehat{\gamma}$ is normal. Using Bayes rule, we can compute the mean and variance of θ conditional on $\widehat{\gamma}$ as

$$m_{\hat{\gamma}} = \frac{\mu\eta^2 + \hat{\gamma}\sigma^2}{\eta^2 + \sigma^2} \tag{15}$$

$$\sigma_{\gamma}^2 = \frac{\sigma_{\varepsilon}^2\sigma^2}{\eta^2 + \sigma^2} \tag{16}$$

respectively. We can therefore rewrite the indifference condition (14) as

$$\delta\Phi\left(\frac{\widehat{\theta} - m_{\widehat{\gamma}}}{\sigma_{\gamma}}\right) + (1 + r_l)\left[1 - \Phi\left(\frac{\widehat{\theta} - m_{\widehat{\gamma}}}{\sigma_{\gamma}}\right)\right] = (1 + r_s)(1 - c)$$

which in turn is equal to

$$\frac{\sqrt{\eta^2+\sigma^2}\left(\widehat{\theta}-m_{\widehat{\gamma}}\right)}{\sigma\eta}=\Phi^{-1}\left(\frac{(1+r_l)-(1+r_s)(1-c)}{(1+r_l)-\delta}\right) \tag{17}$$

Equations (13) and (17) are two equations in two unknowns: $\widehat{\theta}$ and $\widehat{\gamma}$. Writing (15) in terms of $\widehat{\gamma}$ and substituting the result in (13) we obtain

$$\widehat{\theta}=\theta^*+(\theta^{**}-\theta^*)\Phi\left[\frac{\eta}{\sigma}\left(\frac{\widehat{\theta}-\mu}{\sigma}\right)-\frac{\sigma^2+\eta^2}{\sigma^2\eta}\left(\widehat{\theta}-m_{\widehat{\gamma}}\right)\right] \tag{18}$$

Substituting (17) into (18) we obtain an expression

$$\widehat{\theta}=\theta^*+(\theta^{**}-\theta^*)\Phi\left[\frac{\eta}{\sigma}\left(\frac{\widehat{\theta}-\mu}{\sigma}\right)-\frac{\sqrt{\eta^2+\sigma^2}}{\sigma}\Phi^{-1}\left(\frac{(1+r_l)-(1+r_s)(1-c)}{(1+r_l)-\delta}\right)\right] \tag{19}$$

As signals become more informative, $\eta\to 0$ and

$$\widehat{\theta}\to\theta^*+(\theta^{**}-\theta^*)\left(\frac{(1+r_s)(1-c)-\delta}{(1+r_l)-\delta}\right) \tag{20}$$

From (20) it is easy to see that $\widehat{\theta}$ falls in the zone between θ^* and θ^{**} as illustrated in Figure 9.

Differentiating (20) with respect to δ we get

$$\frac{\partial\widehat{\theta}}{\partial\delta}\to(\theta^{**}-\theta^*)\left[\frac{(1+r_s)(1-c)-(1+r_l)}{((1+r_l)-\delta)^2}\right]\leq 0 \tag{21}$$

It is clear from (21) that for sufficiently informative signals, an increase in the recovery rate in the event of default, δ, shifts the equilibrium switching point, $\widehat{\theta}$, to the left, shrinking, therefore, the zone of fundamentals within which inefficient liquidity crises can occur.

5.2 Annex 2: Pure Solvency Crises

Here we study a pure solvency crisis by assuming that there is no short-term debt ($p=0$, so there is no roll-over part of the game) and that the debtor is unable to meet contractual payments ($y^N<0$). We consider two cases. First, we assume that there are no provisions - contractual or procedural -

that prevent an individual creditor from taking legal action to enforce their contractual claim, even if all other creditors reach agreement with the debtor on a restructuring deal - the 'New York Law' scenario. Second, we look at what happens if there exists some mechanism for binding-in minority creditors such that they are forced to accept a deal struck between the debtor and other creditors so long as a pre-specified super-majority of creditors is willing to accept the debtor's offer - the 'English Law' scenario.

5.2.1 The New York Law Scenario

Finding that available resources are insufficient to meet all contractual claims, the debtor offers to pay creditors an amount $\Theta \equiv \omega\ (1+r_l)$., where $0 < \omega < 1$. Those accepting the offer receive it in full. Those who hold out receive a pro-rated share of residual output – that is, output after accepting creditors have been paid - up to a maximum of their contractual claim. The payoff to holdout creditors is therefore

$$Min\{(1+r_l),(y^{N^*} - \omega(1+r_l)(1-h)D/hD)\} \tag{22}$$

The outcome of this restructuring game is socially inefficient. Specifically, it results in an inefficiently low amount of adjustment effort on the part of the debtor, and an inefficiently high number of holdout creditors. As a result, aggregate welfare is considerably lower than the first-best and indeed may be lower even than pre-structuring output.

To see these points, note that the payoffs to accepting and holding-out from the offer are equal when:

$$\omega(1+r_l) = (y^{N^*} - \omega(1+r_l)(1-h)D)/hD) \tag{23}$$

implying

$$\omega(1+r_l) = \frac{y^{N^*}}{D} \tag{24}$$

An important characteristic of this equilibrium is that all available output is distributed to creditors. That means that were the debtor to expend effort thus increasing the level of output, all of this increment would accrue to creditors. Because effort is costly ($c'(a) > 0$) in equilibrium the debtor will expend no effort.

Creditors will anticipate that debtor effort will be zero at the time they decide whether to holdout or accept an offer. So long as the debtor's offer is large enough to beat the worst-case scenario - where adjustment effort is zero and all creditors close out, $y(0,1) < \omega(1+r_l)$ - in equilibrium we must have $0 < h < 1$. $h = 0$ cannot be an equilibrium, since if all creditors were to accept the offer an individual creditor could obtain the full payout $(1+r_l)$ by holding out. Similarly, if all creditors were to hold out ($h = 1$), an individual creditor could do strictly better by accepting the offer of $\omega(1+r_l)$. Since h is non-zero in equilibrium, there will be some degree of output destruction.

The equilibrium incidence of holdouts (h) is given as the solution to:

$$\omega(1+r_l) = \frac{y^{N^*}(0,h)}{D} \tag{25}$$

The precise proportion of holdouts will depend on the choice of offer by the debtor, ω. In other words, equation (24) suggests a range of equilibria, described by $\{h, \omega\}$ pairs. Higher offers, ω, result in a lower incidence of holdouts in equilibrium, h. In all of these equilibria, however, there is an inefficiency because the debtor will expend no effort, (all of the output is acquired by creditors in equilibrium), and some output will be lost through the disruptive efforts of holdout creditors.

5.2.2 English Law scenario

Now consider a device, such as a collective action clause or similar provisions for binding in creditors when a sufficient proportion of the creditors have accepted the offer. In this case, the socially optimal outcome can be achieved.

Let $\hat{h}$ be the critical proportion in the binding-in clause, which we take to be exogenous. That is, if $h \leq \hat{h}$, then the offer by the debtor is imposed on all creditors, including those that have voted against it. Let $\hat{\omega}$ be the offer coefficent that solves

$$y\left(0, \hat{h}\right) = \hat{\omega}\left(1+r_l\right)$$

We then have the following propositions. First, if the debtor offers $\hat{\omega}\left(1+r_l\right)$ or more to each creditor, then the weakly dominant action for a creditor is to accept the offer. There is no equilibrium in which the offer fails to be implemented. Second, the equilibrium in which every creditor accepts the offer is coalition-proof.

In other words, if the offer is at least $\hat{\omega}\left(1+r_l\right)$, then a creditor can do no better than to accept the offer. To see this, consider the optimal choice across all levels of h. If $h > \hat{h}$, then the binding in clause does not apply, and the proposal fails. Since $\omega\,(1 + r_l) < (1 + r_l)$, the debtor anticipates that total output is used up in paying the creditors and so exerts zero adjustment effort. Thus, the payoff to a creditor who has voted against the offer is $y^{N^*} - \omega(1 + r_l)(1 - h)D/hD$. But, by construction, this is lower than $\hat{\omega}\,(1 + r_l)$. Thus, if $h > \hat{h}$, then a creditor would have done strictly better by accepting the offer. This also shows that there can be no equilibrium in which the offer does not garner the critical level of support to be implemented. Now, suppose that $h \leq \hat{h}$. Then the binding in clause kicks in, and the offer of $\hat{\omega}\,(1 + r_l)$ is imposed on all creditors. Hence, a creditor is indifferent between voting for or against the offer. Gathering all strands of the argument together, we have the conclusion that whatever is the value of h, a creditor cannot do worse than to vote in favour of the offer.

The fact that accepting the offer is a weakly dominant strategy indicates that the binding in clause is effective in eliciting the cooperative actions of the creditors. Strictly speaking, however, there are other equilibria than the one in which every creditor accepts the offer. This is because the cooperative outcome can be sustained even when a small proportion of the creditors reject the offer, provided that $h \leq \hat{h}$. On the other hand, this muliplicity of equilibria is innocuous, since the outcome in terms of allocation and adustment effort is identical across all equilibria.

The outcome in which the offer is implemented turns out to be more robust still. The notion of equilibrium is with reference to *individual* deviations. However, the outcome in which the offer is implemented turns out to be robust to any collective deviation by a sub-coalition of the creditors. In other words, it is *coalition-proof.* The argument is straightforward, since the equilibrium argument above has been in terms of the incidence of rejection h. Any coalition that deviates and rejects the offer will either make no difference to the outcome (when $\ell \leq \hat{\ell}$), or will make the coalition strictly worse off (when $h > \hat{h}$). Thus, the equilibrium in which everyone accepts the offer also turns out to be coalition-proof.

In any equilibrium, the offer receives enough support to be implemented. This means that any surplus from the adjustment effort by the debtor is received by the debtor. This elicits the socially efficient level of adjustment effort a^*. To see this more formally, note that the payoff to the debtor when the offer is implemented is

$$y\,(a, 0) - \omega\,(1 + r_l) - c\,(a)$$

This is maximized when $\frac{\partial}{\partial a} y\left(a, 0\right) = c'\left(a\right)$, which yields the socially efficient level of adjustment effort a^*.