

**WORKING PAPER NO 23**  
**CREDIT DERIVATIVES**  
**AND SOVERIEGN DEBT CRISES**

**Benedikt Goderis & Wolf Wagner**

The Working Paper is intended as a means whereby researchers' thoughts and findings may be communicated to interested readers for their comments. The paper should be considered preliminary in nature and may require substantial revision. Accordingly, a Working Paper should not be quoted nor the data referred to without the written consent of the author. All rights reserved.

© 2005 Benedikt Goderis & Wolf Wagner  
Comments and suggestions would be welcomed by the authors

e-mail: [w.wagner@cerf.cam.ac.uk](mailto:w.wagner@cerf.cam.ac.uk)

# Credit Derivatives and Sovereign Debt Crises\*

Benedikt Goderis<sup>†</sup>

University of Cambridge

Wolf Wagner<sup>‡</sup>

University of Cambridge and Tilburg University

October 2005

## Abstract

We study the introduction of credit protection on sovereign debt. We find that such protection reduces debtor moral hazard by allowing a bondholder to improve his position in negotiations with the sovereign. Moreover, equilibrium credit protection does not reduce the efficiency of crisis resolution. We even identify situations where protection facilitates conditionality in crisis resolution. Nevertheless, we show that a bondholder's choice of protection is not always socially optimal. Crisis resolution can then be improved through increasing protection.

---

\*We thank Kern Alexander, Jose Scheinkman, Eva Terberger, and participants at the Princeton-Cambridge conference at the Bendheim Center of Finance, at the CFS conference on Credit Risk Transfer in Frankfurt and at the Deutsche Bundesbank for helpful comments. We thank in particular Pierre-Hugues Verdier for discussions on the legal issues posed by sovereign credit derivatives.

<sup>†</sup>Cambridge Endowment for Research in Finance, Judge Business School, University of Cambridge, Trumpington Street, Cambridge CB2 1AG, UK. Tel.: +44-1223-760 586; Fax: +44-1223-339701; Email: B.Goderis@cerf.cam.ac.uk

<sup>‡</sup>Cambridge Endowment for Research in Finance, Judge Business School, University of Cambridge, Trumpington Street, Cambridge CB2 1AG, UK. Tel.: +44-1223-764 115; Fax: +44-1223-339701; Email: W.Wagner@cerf.cam.ac.uk

# 1 Introduction

The recent wave of defaults in countries such as Argentina, Mexico and Russia has led to a renewed interest in sovereign debt crisis. Their resolution is difficult because in the absence of supranational bankruptcy procedures there are little legal guidelines for how to deal with them. In principal, this absence could be compensated by writing appropriate contracts ex-ante. However, countries only seem to be able to raise funds through debt, which is rather inflexible. Because of these, and other issues, many observers consider the current arrangements for resolving sovereign crises as being inefficient.<sup>1</sup>

The arrival of *credit derivatives* has added a new element to sovereign debt financing. Broadly speaking, credit derivatives are financial instruments that allow creditors to insure against losses on their debt.<sup>2</sup> Their use is growing rapidly: only introduced ten years ago, the total outstanding volume of credit derivatives is expected to reach U\$ 7 trillion by the end of 2005. The general expectation is that growth will continue at a similar pace. While most protection is traded for corporates, a significant part of the market covers sovereign debt, allowing, among others, to buy protection on countries such as Brazil, Mexico, Russia, Colombia, Venezuela, South Africa and the Philippines.<sup>3</sup>

Credit derivatives matter for sovereign debt crises because they change a bondholder's incentives to participate in a debt restructuring. A widespread concern is that they make restructuring more difficult since "credit derivatives may provide investors with incentives to hold out in the hope of forcing a default, thereby triggering a repayment under the terms of the derivative contract"<sup>4</sup> and are thus harmful for the resolution of crises. An alternative view would be that credit derivatives are beneficial for crisis resolution since they provide a new tool to structure debt relationships. In particular, credit derivatives

---

<sup>1</sup>Several proposals for its improvement are currently discussed. For an overview of the discussion, see Eichengreen (2003).

<sup>2</sup>In their most common form, the *credit default swap*, they work as follows: A bondholder makes periodic insurance payments to a protection seller; in return, when a default occurs, the protection seller makes a compensation payment to the bondholder. For a detailed overview of the various forms of credit derivatives, see Kiff, Michaud and Mitchell (2003).

<sup>3</sup>See BIS (2004), BBA (2004) and Fitch (2005). This development has received widespread attention among policymakers. In the sovereign context, see for example Ranciere (2001), Packer and Suthiphongchai (2003), Verdier (2004) and Federal Reserve Bank of New York (2005).

<sup>4</sup>Anne Krueger, the deputy managing director of the IMF, in a recent speech (Krueger, 2002).

have been praised for their flexibility since they allow a bondholder to choose to what extent and over what duration to buy protection. The answer to which of these views is likely to prevail, of course, ultimately depends on how a bondholder will use protection.

This paper tries to understand the consequences of credit protection for sovereign debt crises. We develop a simple model of sovereign debt financing. In this model, optimal crisis resolution depends on the country's productivity. The ex-post resolution of crises in the absence of credit protection is efficient, except for private costs that a country suffers in a default. These costs create a bias towards default. From an ex-ante perspective, the outcome of the restructuring negotiation is generally inefficient. This is because due to sovereign immunity the sovereign can renegotiate down the debt claim in a crisis, which leads to ex-ante debtor moral hazard.

We study the impact of credit protection that is chosen by a bondholder for strategic reasons, that is in order to influence his position in a potential crisis.<sup>5</sup> Perhaps surprisingly we find that crisis resolution is unaffected: even though the bondholder could fully insure against losses in a crisis and thus make it impossible for the sovereign to achieve restructuring, it is not in the bondholder's interest to do so. The reason is that the bondholder would then always exercise protection, making protection expensive. Still, there are welfare ramifications as the bondholder insures partially in order to improve the restructuring offer the sovereign has to make. This has the effect of reducing moral hazard by making crises more costly for the country.

We also study situations in which the bondholder has inferior knowledge about the repayment ability of the country. In the absence of protection this has the consequence that crisis resolution is not conditional on the productivity of the project as the sovereign always has an incentive to pretend to have high productivity. We show that there is a role for credit protection in restoring conditionality, which arises because credit protection changes the bondholder's litigation threat.

---

<sup>5</sup>For dispersed debt this requires the existence of bondholders that have a potential influence over the overall restructuring process. For instance, for restructuring through the London Club (which deals with commercial bank debt) these may be members of the *steering committee* that handles negotiations with the sovereign. For non-commercial private debt, large creditors have an influence over the restructuring process through the consultation period that typically precedes the public exchange offer (this may be either formally, as notably in Uruguay and the Dominican Republic in recent years, or informally).

Our results thus broadly suggest that credit derivatives are beneficial for sovereign debt financing, once taking into account bondholder's strategic incentives to buy protection. Besides potentially improving crisis resolution ex-post, this is because protection allows a bondholder to improve his outside option in a crisis. The increased outside option neutralizes the renegotiation problem that arises from sovereign immunity and reduces debtor moral hazard.<sup>6</sup> It should be emphasized that potential adverse effects of credit derivatives are only avoided precisely because protection is chosen with strategic awareness. If this is not the case, a role for government policy arises.

We also find that the bondholder's strategic choice of protection is not always socially optimal in terms of crisis resolution. In such cases, *increasing* protection improves crisis resolution. In particular, we show that the inefficient defaults that arise due to private costs can be fully avoided by using protection with a long rather than short duration. Intuitively, this is because under such protection the bondholder is *more* inclined to accept a restructuring offer as he is then also protected against situations where the country cannot make the repayments on the restructured bond. This suggests that if debtor countries and/or supranational institutions believe that the current restructuring procedure exhibits a bias towards delivering defaults, they can correct this bias through the appropriate use of credit derivatives. This may for example take the form of protection that is attached to the initial bond and guaranteed by a third party.

The remainder of this paper is organized as follows. The next section briefly reviews related literature on credit derivatives. Section 3 presents the basic model in the absence of protection. Section 4 studies then the impact of protection. Section 5 extends to the analysis to situations where the bondholder is not fully informed about the productivity of the country. The final section concludes.

## 2 Credit Derivatives in the Literature

Many contributions to the burgeoning literature on credit derivatives have focused on their impact on the borrower-lender relationship. Duffee and Zhou (2001), for example, show how the flexibility of credit derivative instruments can be used to mitigate adverse selection

---

<sup>6</sup>Credit derivatives may thus be an alternative to proposals that aim at reducing such moral hazard (e.g., the international bankruptcy court, see Ghosal and Miller, 2003).

problems. Morrison (2005) has shown that credit derivative markets can reduce banks' incentives to monitor, which can erode the certification value of bank loans. Closely related to the present paper, Arping (2005) shows in the context of corporates that credit protection improves the liquidation threat of lenders. This increases their relationship surplus and thus their incentives to monitor. As in our paper, there can also be a disciplining effect on the borrower. Despite the focus on sovereigns, the present paper differs in that we also study the impact of credit protection on the resolution of a crisis itself (i.e., whether or not there is 'liquidation').<sup>7</sup>

Only few papers have focused on sovereign debt markets yet. General overviews are provided in Ranciere (2001), Packer and Suthiphongchai (2003), and Federal Reserve Bank of New York (2005). Verdier (2004) provides an extensive analysis of the legal aspects, which played a large role in recent settlements of protection. Pan and Singleton (2005) and Cossin and Jung (2005) use sovereign credit derivatives to extract market expectations about sovereign risk.

### 3 A Simple Model of Sovereign Debt Restructuring

We consider a sovereign country and a bondholder, who are both risk-neutral and maximize their expected payoffs. There are three periods and there is no discounting. In period 0, the sovereign borrows funds from the bondholder. Repayment takes place in period 1 and in period 2, where total repayment is normalized to one. At the beginning of period 1 a 'debt crisis' occurs because the country's funds are zero and thus debt payment cannot be met (below we endogenize the occurrence of debt crises as a consequence of debtor moral hazard). The country has an ongoing project at this time (possibly financed by the funds raised in period 0), generating output  $f$  in period 2.

In order to avoid default, the sovereign can make a *take-it-or-leave-it* restructuring offer to the bondholder.<sup>8</sup> A restructuring offer promises a period 2 return in exchange for the total outstanding debt. If the bondholder accepts (i.e., the offer is successful), production in the project continues, yielding output in period 2. If the bondholder rejects,

---

<sup>7</sup>One consequence of this is that, in contrast to Arping, debtor moral hazard is not always improved as this may interfere with an efficient crisis resolution ex-post.

<sup>8</sup>Such *pre-default* restructuring has become common since the mid 1990s.

the country is in default (equivalently, in such cases the sovereign could default outright rather than making a restructuring offer).<sup>9</sup> The project can then not be continued anymore (for example, because it requires foreign resources that are unavailable in a default). The bondholder then obtains the liquidation value of the project  $k$ , with  $k < 1$ . (in Section 5.1 we consider that the bondholder has to litigate in order to obtain  $k$ ).<sup>10</sup> The disruption of the project causes additional private default costs  $c > 0$  to the country, such as from lower domestic consumption.<sup>11</sup>

Appendix 1 shows that welfare in this economy is determined by two aspects: the efficiency of crisis resolution (ex-post efficiency) and debtor moral hazard in avoiding crises (ex-ante efficiency). An efficient resolution requires that the joint payoffs of bondholder and sovereign in a crisis are maximized (the distribution of the payoffs between sovereign and bondholder does not affect ex-post efficiency as in competitive bond markets the sovereign fully participates in the bondholder's losses in a crisis through a higher interest rate). Hence, from an ex-post perspective there should be restructuring whenever the output of the project is at least its liquidation value net of default costs (i.e.,  $f \geq k - c$ ), and default otherwise.<sup>12</sup> As to ex-ante efficiency, Appendix 1 endogenizes the occurrence of crisis as being the result of insufficient incentives for the sovereign to avoid them. These incentives depend on the sovereign's payoff in a crisis. Welfare, *ceteris paribus*, therefore decreases

---

<sup>9</sup>Our model abstracts from strategic 'holdouts'. In a world of multiple creditors this presumes that there is some form of creditor coordination such as through collection action clauses (CAC), creditor committees, or restructuring via the London or the Paris Club (recent restructuring experiences also suggest that the holdout problem is perhaps overstated; see for example De Brun and Della Mea (2003) who show that in the Uruguay case restructuring was implemented within a short time on debt that did not include CACs).

<sup>10</sup>The assumption that the bondholder fully obtains the liquidation value may seem extreme; however, our main results hold also when the bondholder can only secure a fraction of the country's funds. Furthermore, it should be noted that the possibilities for creditors to enforce their claims against sovereigns have improved substantially recently as bondholders can now threaten to disrupt future financing: in 2000 Elliott Associates succeeded in stopping the distribution of Peru's payments to new bondholders, forcing Peru to fully pay Elliott's pre-brady loans.

<sup>11</sup>More broadly, these costs can also be interpreted as being due to reputational losses (e.g., Eaton and Gersovitz, 1981) or sanctions (e.g., Bulow and Rogoff, 1989).

<sup>12</sup>An alternative interpretation of the optimality of default when output is low is that the country can carry out a reform that increases the productivity of the project but may choose not to do so under restructuring because of the outstanding debt (debt overhang problem).

with the sovereign's payoff in a crisis, as higher payoffs increase moral hazard.<sup>13</sup>

### 3.1 Equilibrium Crisis Resolution

Table 1, column 1, summarizes for a restructuring offer of  $r$  the payoffs for the sovereign and the bondholder. When the offer is accepted, the bondholder's payoff is  $r$ , or  $f$  whenever the project's output falls short of  $r$ . The sovereign obtains whatever there may be left of output after having paid the bondholder:  $\max(f - r, 0)$ . When the offer is rejected, the bondholder obtains the liquidation value  $k$  and the sovereign suffers default costs  $-c$ .

Proposition 1 derives the equilibrium outcome of the restructuring process, which is also summarized in Table 2.

Table 1: Payoffs for a Restructuring Offer  $r$

		No protection	Short protection $q$	Long protection $q$
Sovereign	Accept	$\max(f - r, 0)$	$\max(f - r, 0)$	$\max(f - r, 0)$
	Reject	$-c$	$-c$	$-c$
Bondholder	Accept	$\min(r, f)$	$\min(r, f)$	if $r \leq f : r$ if $r > f : q + (1 - q)f$
	Reject	$k$	$q + (1 - q)k$	$q + (1 - q)k$

**Proposition 1** *In the absence of protection there is restructuring with  $r = k$  whenever  $f \geq k$  and default otherwise.*

**Proof.** *Note first that the sovereign's payoff under restructuring ( $\max(f - r, 0) \geq 0$ ) is larger than under default ( $-c < 0$ ). Thus the sovereign always prefers restructuring. Given that the bondholder's payoff under default is  $k$ , the sovereign needs to credibly promise a return of  $k$  to obtain restructuring. When  $f \geq k$ , this is feasible by offering  $r = k$  and hence there is restructuring with  $r = k$ . When  $f < k$ , the sovereign cannot credibly promise a return that is at least equal to the bondholder's payoff under default (in particular,  $r > f$  is*

<sup>13</sup>The potential friction between ex-post efficiency of crisis resolution and ex-ante incentives is now central to the sovereign restructuring debate, see Bolton and Jeanne (2005) for a recent example.



not credible; the bondholder realizes then that his pay-off will only be  $f$ ). Any restructuring offer is hence rejected and there is default. ■

Crisis resolution is thus efficient, except when we have  $k > f > k - c$ . In this case, there is default (as  $f < k$ ) but the sovereign's and bondholder's joint payoff would be higher under restructuring (as  $f > k - c$ ). The reason for why the sovereign cannot achieve restructuring in this case (even though he would like to because of private costs  $c$ ) is that he cannot credibly promise a return that is at least equal to the bondholder's outside option  $k$ . The proposition also shows that moral hazard is not minimized because the sovereign can keep  $f - r = f - k \geq 0$  when there is restructuring, even though the bondholder is not fully repaid ( $r = k < 1$ ). This is because, once being in a crisis, the sovereign renegotiates down the bondholder's claim according to the bondholder's outside option  $k$  (in contrast, when there is no crisis the sovereign does not find it optimal to renegotiate because of costs of doing so, see Appendix 1).

Table 2: Equilibrium Crisis Resolution (R=Restructuring, D=Default)

	No protection		Protection	
	$f \geq k$	$f < k$	$f \geq k$	$f < k$
Resolution of Crisis	R with $r = k$	D	R with $r = f$	D
Sovereign's Payoff	$f - k$	$-c$	0	$-c$
Bondholder's Payoff	$k$	$k$	$f$	$k$

## 4 Credit Protection

We now allow the bondholder to buy protection on his debt. As with standard credit derivatives (such as credit default swaps), this protection insures the bondholder against a so-called *credit event*. A credit event is defined as a situation where the debtor no longer makes the agreed repayments to the bondholder and where the bondholder has not voluntarily accepted a change in the repayment terms. Since the restructuring offer in our model is accepted on a voluntary basis, it does not qualify as a credit event.<sup>14</sup>

<sup>14</sup>This is consistent with the ruling of the Southern District of New York that Argentina's 2001 voluntary exchange offer did not constitute a credit event (Verdier, 2004).

However, when the debtor does not deliver on the restructured debt, the credit event is still triggered, assuming that the non-delivery falls within the period for which protection has been bought. When a credit event occurs, the bondholder is paid  $q \cdot 1 = q$  by the protection seller, where  $q$  ( $0 \leq q \leq 1$ ) is the fraction of debt the bondholder buys protection on. Interpreting the debt as consisting of a (large) number of bonds, we can also refer to  $q$  as the fraction of insured bonds. In return, the bondholder delivers the insured bonds to the protection seller (such *physical settlement* is predominant for sovereign credit derivatives, see Ranciere, 2001). We consider two different maturities of credit protection. Under *short protection*, the bondholder is only insured throughout period 1, while under *long protection* the bondholder is also insured throughout period 2. Thus, in contrast to short protection, long protection also insures the bondholder against non-delivery on the restructured bonds.<sup>15</sup>

Protection is bought once the crisis has materialized (although this assumption is not essential for our results). We assume that the protection seller is a risk neutral agent who behaves competitively. This implies that the price of protection,  $p(q)$ , equals the expected payments the protection seller has to make to the bondholder, net of the value of the restructured bonds he may obtain. Note that there is no role for the protection seller to renegotiate with the sovereign, as he only receives the bonds after default has occurred and the project is then already in liquidation. Note, furthermore, that the protection seller can be ignored in the welfare analysis, as he breaks even on average.

Columns 2 and 3 in Table 1 summarize the payoffs for a level  $q$  of either short or long protection. For comparability with the no protection case, the table presents *gross* payoffs for the bondholder, which do not include the price of protection  $p$  (the protection price, however, does not affect the resolution process as it is sunk at the time of the restructuring offer). There are two changes relative to the situation without protection. First, under both short and long protection the bondholder's payoff in a default is now  $q + (1 - q)k$ , which is larger than  $k$  when  $q > 0$ . This is because default constitutes a credit event, allowing the bondholder to fully secure the nominal repayment on his uninsured bonds ( $q \cdot 1$ ). On the

---

<sup>15</sup>Such differences in maturities proved relevant during the Argentinian default: on November 1, 2001, Argentina made a voluntarily exchange offer, which was announced to be successful on November 19. On December 24, Argentina suspended payments on its debt, which triggered many default swaps. However, some protection had expired between those dates (Verdier, 2004).

uninsured bonds, the bondholder receives their share in the liquidation value  $((1-q)k)$  (the remainder of the liquidation value  $(qk)$  is received by the protection seller as he obtains the insured bonds from the bondholder). Second, under long protection the bondholder's payoff if the sovereign does not deliver on the restructured bond is  $q + (1-q)f$ , as he can then still exercise protection in period 2.

Proposition 2 derives next the equilibrium crisis resolution that arises from the bondholder's optimal choice of protection (also summarized in Table 2). Note that since the bondholder is risk neutral, he only buys protection for strategic reasons, that is in order to improve his outside option in negotiations with the sovereign.

**Proposition 2** *The introduction of protection does not change crisis resolution but reduces moral hazard; in particular there is restructuring with  $r = f$  whenever  $f \geq k$  and default otherwise.*

**Proof.** *Suppose that the bondholder buys an amount of short protection  $q^*$  such that his payoff under default becomes  $q^* + (1-q^*)k = f$  (i.e.,  $q^* = (f-k)/(1-k)$ ) when  $f \geq k$  and buys no protection ( $q^* = 0$ ) otherwise. When  $f \geq k$ , there is thus acceptance with  $r = q^* + (1-q^*)k = f$ , as the sovereign still always prefers acceptance and has to promise at least the bondholder's default payoff to obtain restructuring. The bondholder's net payoff (net of the price of protection) is then  $f$  since the price of protection is zero as protection is not exercised. When  $f < k$ , Proposition 1 can be readily applied as  $q^* = 0$ , implying that there is rejection and the bondholder's payoff is then  $k$ . It follows that for each  $f$  the bondholder obtains the maximum available payoff:  $f$  when  $f \geq k$  and  $k$  when  $f < k$ .  $q^*$  is therefore the bondholder's optimal protection (other forms of protection may at most give the same payoff). Since for  $q^*$  there is restructuring when  $f \geq k$  and default otherwise, we have that equilibrium crisis resolution is unchanged. However, the sovereign's payoff when  $f \geq k$  is now zero (when  $f < k$  it is still  $-c$ ). Hence, for  $f > k$  moral hazard is lowered.*

■

Thus, even though credit protection can potentially reduce the efficiency of restructuring (as protection may raise the bondholder's outside option,  $q + (1-q)k$ , beyond  $f$  even when  $f > k$  and thus lead to inefficient defaults), it is not in the bondholder's interest to choose such levels of protection. This is because, since the protection seller breaks even, the bondholder's net payoff (i.e., net of the price of protection) always equals the payout

of the sovereign to both bondholder and protection seller in a crisis. In particular, the bondholder fully internalizes a lower payoff for the protection seller via a higher price of protection ex-ante. Obtaining protection that causes default when  $f > k$  is therefore not optimal, as the total payout the sovereign makes in a default is only  $k$ , while the bondholder through protection that does not lead to default can extract up to  $f$  from the sovereign. Hence, even though the bondholder's gross payoff in a default may be larger than under restructuring (for  $q = 1$  the bondholder could even fully recover his debt), the bondholder's net payoff is smaller.

As the proposition has shown, the availability of protection is even beneficial for welfare because it improves ex-ante incentives. This is because it allows the bondholder to increase his outside option in restructuring negotiations and thus reduces the sovereign's payoff in a crisis.<sup>16</sup> The question arises of whether the bondholder's choice of protection is even welfare optimal. As the next proposition shows, this is not the case from the perspective of crisis resolution.

**Proposition 3** *The bondholder's choice of protection is not always socially optimal in terms of crisis resolution. Crisis resolution can then be improved through appropriate short and long protection; however, this comes at the cost of increased moral hazard.*

**Proof.** *Suppose that when  $f < 1$  the bondholder holds long protection with  $q_{LP} = c/(1 - f)$  and short protection with  $q_{SP} = -c/(1 - f)$  (note that although  $q_{SP} < 0$ ,  $q_{SP} + q_{LP} \geq 0$  is still fulfilled). As  $q_{LP} = -q_{SP}$ , the bondholder is not protected in period 1 (effectively, there is now protection that only starts in period 2). Compared to the case of no protection, bondholder's payoff has only changed in that under restructuring he obtains now  $q_{LP} + (1 - q_{LP})f = f + c$  when  $r > f$ . Analogous to Proposition 1 it follows that there is restructuring with  $r = k$  whenever  $f + c \geq k$  and default otherwise, implying that crisis resolution is now efficient (when  $f \geq 1$  crisis resolution has already been efficient in the absence of protection). However, the sovereign's payoff (and thus moral hazard) increases compared to the bondholder's optimal protection. This is because the joint payoffs for the*

---

<sup>16</sup>We have assumed that the bondholder can fully obtain the liquidation value of the project. If this were not the case, the renegotiation problem in the absence of protection would be more pronounced, making the effect of credit derivatives in terms of improving bondholder's outside option even stronger. Note also that while reducing renegotiation is unambiguously beneficial in our model, there also arguments for why this may be costly (see, for example, Weinschelbaum and Wynne, 2005).

*sovereign and the bondholder have increased (as crisis resolution becomes more efficient and recalling that the protection seller breaks even) but the bondholder's payoff has not increased (otherwise, bondholder's optimal protection  $q^*$  from Proposition 2 would not maximize his payoffs).* ■

Thus, there is a potential case for intervention. The reason for why the bondholder does not choose protection that achieves optimal resolution is that when  $k > f > k - c$  the payout the sovereign makes to bondholder and protection seller under default ( $k$ ) is larger than the maximum attainable payout under restructuring ( $f$ ).<sup>17</sup>

#### 4.1 Protection That is Not Chosen Strategically

That credit protection does not reduce the efficiency of the restructuring process relies on the bondholder being aware of the potential impact of his protection on the resolution process. If this were not the case, he may ‘overprotect’ by purchasing a level of protection that could lead to inefficient defaults. For the current market situation, such strategic awareness seems a plausible presumption as sovereign credit derivative markets are dominated by few large institutional investors (e.g., Ranciere, 2001), who should rationally anticipate any potential implications of their protection choice. However, participation may increase as the credit derivatives markets continue to grow and thus also the influence of small investors who take the resolution process as given and buy protection purely for hedging reasons. Still, the experience with other mature derivatives markets shows that participation ratios are typically small,<sup>18</sup> suggesting that the overall influence of protection that is chosen without strategic awareness may remain limited.

The presence of players that choose protection for other than strategic reasons has interesting implications for the design of bonds with collective action clauses (CACs). Setting participation thresholds in bonds with CACs higher than the share of investors in the market that do not have strategic incentives would give the strategic investors full control over the restructuring process (beyond their role in the pre-offer consultation

---

<sup>17</sup>Proposition 3 also suggests that credit protection can overcome the inefficiencies that arise because the sovereign's default costs are private. Thus, credit derivatives may be a substitute for policies that aim at increasing the pledgeable income of sovereigns (e.g., Tirole, 2002, and Ghosal and Miller, 2003).

<sup>18</sup>For example, Faulkender (2005) finds that firms hedge only 6.5% of their (fixed rate) bond issuances (and zero percent of their bank loans) through interest rate swaps.

process), presuming that small investors alone are unlikely to overprotect and thus make a restructuring offer fail. As our analysis suggests, this would help to avoid potential adverse affects of credit derivatives.

## 5 Informational Problems

The efficient resolution of crises is likely to be complicated in practice because a sovereign may have superior information about the productivity of the project.<sup>19</sup> The bondholder does then not know whether the sovereign will be able to deliver on the restructuring offer, which the sovereign may use to his advantage. We next analyze issues arising from such informational problems by considering a situation in which the bondholder at the time of the crisis only has priors about the productivity of the project (while the sovereign still fully knows the productivity). More specifically, we assume now that there are two states of nature, high and low, occurring with positive probabilities  $\pi$  and  $1 - \pi$ , respectively. Output of the project in the high state is  $f^H > k$ , while in the low state output is  $f^L < k - c$ . An efficient crisis resolution would thus require restructuring in the high state and default in the low state.

**Lemma 1** *Equilibrium crisis resolution cannot be conditional on the state of the project (no separating equilibria).*

**Proof.** *Suppose that there were a separating equilibrium, where without loss of generality the sovereign offers  $r^L$  in the low state and  $r^H$  in the high state with  $r^L \neq r^H$ . The bondholder learns then about the state of the project from the offer, implying that we are back in the case of no informational problems. It follows from Proposition 1 that in the low state there is default and the sovereign's payoff is  $-c < 0$ , while in the high state there is restructuring and the sovereign's payoff is at least zero. The sovereign could then strictly improve his payoff by offering  $r^H$  in the low state and thus achieve restructuring. Therefore, a separating equilibrium cannot exist. ■*

---

<sup>19</sup>Spiegel (2005) also emphasizes such informational asymmetries but focuses on differences in the information set between creditor and sovereign on one side, and international organizations, such as the IMF, on the other side.

Lemma 1 holds because in a separating equilibrium the sovereign always has an incentive to pretend to be in the high state. Therefore, there can only be pooling equilibria, in which the sovereign makes a restructuring offer that is independent of the state. Proposition 4 derives next the equilibrium crisis resolution in the absence of protection, where for convenience we define with  $\tilde{f} := \pi f^H + (1 - \pi)f^L$  the (prior) expected value of output and with  $\widetilde{\min}(r, f) := \pi \min(r, f^H) + (1 - \pi) \min(r, f^L)$  the expected repayment on a restructuring offer  $r$ .

**Proposition 4** *In the absence of protection there is restructuring with  $r$  such that  $\widetilde{\min}(r, f) = k$  whenever  $\tilde{f} \geq k$  and default otherwise.*

**Proof.** *Analogous to Proposition 1: the sovereign still always prefers restructuring, while the bondholder needs a repayment fulfilling  $\widetilde{\min}(r, f) = k$  to accept. For  $\tilde{f} \geq k$  a restructuring offer that guarantees such a repayment is feasible as then for  $r = f^H$  we have that  $\widetilde{\min}(f^H, f) = \tilde{f} \geq k$ , while for  $\tilde{f} < k$  it is not. ■*

Note that there are now two types of inefficiencies in the crisis resolution. First, there are only pooling equilibria, while an efficient outcome requires conditional crisis resolution (i.e., restructuring in the high state and default in the low state). Second, the equilibrium crisis resolution is inefficient even within the class of pooling equilibria. This inefficiency is similar to the one obtained when informational problems are absent: when  $k > \tilde{f} > k - c$  there is default (since  $\tilde{f} < k$ ) although the joint expected payoff under restructuring is higher (since  $\tilde{f} > k - c$ ).

The next proposition shows that the impact of credit protection is as in the absence of informational problems:

**Proposition 5** *The introduction of protection does not change crisis resolution but reduces moral hazard; in particular there is restructuring with  $r = f^H$  whenever  $\tilde{f} \geq k$  and default otherwise.*

**Proof.** *See Appendix 2. ■*

Similar to the previous section, the inefficient default equilibrium that arises for  $k > \tilde{f} > k - c$  can be avoided through a different choice of protection:

**Proposition 6** *The bondholder's choice of protection is not always socially optimal in terms of crisis resolution. Crisis resolution can then be improved through appropriate short and long protection; however, this comes at the cost of increased moral hazard.*

*Proof.* See Appendix 2. ■

## 5.1 Costly Litigation

In the following we show that there is also a role for credit protection in overcoming the first inefficiency, that is to achieve conditionality in crisis resolution. This role arises when there are imperfections that make obtaining the liquidation value costly for the bondholder, for example because of legal fees.<sup>20</sup> To this end we assume that in order to force the government to pay out the liquidation value in a default, the bondholder would need to engage in litigation that incurs costs  $l > 0$ . Consequently, the bondholder finds it optimal to litigate only if  $(1 - q)k \geq l$ , that is if his share in the liquidation value (arising from the unprotected bonds) exceeds the litigation costs. We assume that in the absence of protection the bondholder would litigate, i.e.,  $k \geq l$ . We also assume that litigation merely acts as a threat: whenever  $(1 - q)k \geq l$  (i.e., the bondholder finds it optimal to litigate), the sovereign prefers to avoid being litigated by paying right away. However, when this condition is not fulfilled the sovereign can keep the liquidation value, as he knows that the bondholder will not litigate. We presume that the protection seller remains passive in that he does not litigate for his share in the liquidation value, which may be because his claim is not large enough to justify incurring the legal fees (at the end of this section we discuss the possibility of the protection seller litigating himself).

The next lemma shows that there are now situations in which credit protection can achieve conditional crisis resolution. The reason is that credit protection reduces the bondholder's benefits from litigation and thus may render the litigation threat uncredible. As a consequence, the sovereign may keep the liquidation value in a default, which reduces his incentives to pretend to be in the high state in order to obtain restructuring.

---

<sup>20</sup>Such litigation costs have, for example, been emphasized in Haldane et. al., 2005. Interestingly, in our analysis litigation costs can be welfare improving, as in their absence crisis resolution may not be conditional.



**Lemma 2** *When litigation is costly, credit protection may lead to conditional crisis resolution.*

**Proof.** Consider short protection  $q$  that fulfills (i)  $(1 - q)k < l$  and (ii)  $f^L \leq q \leq f^H - (k - c)$  and assume moreover (iii)  $k - c > 0$  ((i)-(ii) are, for instance, fulfilled for  $q = 1$  and  $f^H \geq 1 + (k - c)$ ). From (i) we know that litigation is not credible. The sovereign can therefore keep the capital stock in a default, making his default payoff  $k - c$ . In order to obtain acceptance in a separating equilibrium the sovereign has to credibly offer  $r = q$  as the bondholder's gross payoff under default is now only  $q$  (since he does not obtain a share in the liquidation value anymore). The sovereign's payoff from restructuring is hence  $\max(f^L - q, 0) = 0$  in the low state and  $\max(f^H - q, 0) = f^H - q \geq k - c$  in the high state (from (ii)). It follows that the sovereign prefers to default in the low state but to have restructuring in the high state. ■

We show next that there are also situations in which the bondholder indeed finds it optimal to choose a level of protection that achieves conditionality.

**Proposition 7** *The introduction of protection may lead to conditional crisis resolution in the presence of litigation costs.*

**Proof.** See Appendix 2. ■

However, as the next proposition shows, there are also situations where the bondholder does not choose protection that leads to conditionality, even if this is feasible and also socially desirable in terms of crisis resolution. Intuitively, this is because conditional crisis resolution only arises for levels of protection that render the litigation threat uncredible. The resulting loss of the liquidation value for the bondholder may outweigh the additional payoffs the bondholder may achieve due to the improved crisis resolution. The bondholder's choice of protection is therefore not necessarily efficient, creating an additional role for government intervention.

**Proposition 8** *The bondholder may not choose a level of protection that leads to conditional crisis resolution even when this is socially desirable in terms of crisis resolution.*

**Proof.** See Appendix 2. ■

Throughout this section we have assumed that the protection seller does not litigate himself. This seems plausible as long as the degree of protection is not very high: the

protection seller's incentives to litigate are then limited as he only receives the insured part of the bonds in a default. Nevertheless, for large levels of protection he may find it optimal to litigate. This may be particularly relevant for protection sellers that have low litigation costs, which presumably is the case for *vulture funds*. Such funds are specialized in litigation and may also be less concerned about reputational issues, such as adverse implications for the relationship with sovereign lenders.<sup>21</sup> However, while complicating the analysis, this does not change the role of protection in achieving conditionality: when bondholder litigation becomes uncredible (i.e., for  $(1-q)k < l$ ), the sovereign can still keep the bondholder's share in the liquidation value in a default, which reduces the sovereign's incentives to seek restructuring compared to the situation without protection.

## 6 Summary and Conclusions

This paper has analyzed the implications of credit derivatives for sovereign debt crises. We find that in most cases they reduce debtor moral hazard by allowing a bondholder to increase his outside option. Furthermore, credit derivatives do not reduce the efficiency of crisis resolution, as the bondholder internalizes potential inefficiencies through a higher price for protection. When the bondholder is not fully informed about the future repayment abilities of the sovereign, they may even facilitate conditionality in crisis resolution. Hence, our analysis broadly suggests that credit derivatives are beneficial for sovereign debt financing.

However, there is a role for government policy. First, a bondholder's strategic choice of protection is not always socially efficient. This is, in particular, because he does not internalize the country's private benefits from not having to go through a default. Interestingly, the role for policy arises because the bondholder does not buy 'enough' protection, either in terms of the extent or in the duration of protection. As credit derivatives markets

---

<sup>21</sup>Low litigation costs for protection sellers suggest another role for protection: when litigation costs are so high that the bondholder's litigation threat is not credible in the absence of protection ( $k < l$ ), protection may be used to make the litigation threat credible by transferring litigation to a more effective party (the protection seller). Credit derivatives, in that view, can be efficiency improving by allowing for the sharing of tasks between the bondholder (with a comparative advantage in investing in bonds) and the protection seller (with an advantage in litigation).

are decentralized markets, direct regulation is unlikely to be effective. However, sovereigns (or supranational organizations) may sponsor certain forms of protection (for example by subsidizing protection sellers). Alternatively, they may issue bonds that have protection attached to it, which is guaranteed by a third party.

Second, private incentives for providing protection for strategic reasons may be insufficient. This may be, for instance, because there are not enough strategic bondholders or because of transaction costs. When this leads to ‘too little’ protection, sovereigns may sponsor protection to encourage protection levels that are optimal for bondholders. As this reduces the renegotiation problem (and thus debtor moral hazard), sovereigns should find their financing costs lowered.

## Appendix 1: Endogenous Crises and Welfare

Assume that the funds borrowed in period 0 have been fully used up in period 1, for example to finance the project. Assume, furthermore, that the sovereign has to incur costs  $a > 0$  if he wants to raise the funds that would allow to make the repayment in period 1 and thus to avoid a crisis. These costs would arise, for instance, because of an increased domestic tax burden. If the sovereign does not incur the costs, funds remain zero. Avoiding the crisis brings benefits of  $b > 0$  to the country. These benefits are unrelated to the potential default costs  $c$  and are due to inefficiencies that would otherwise arise from a crisis, such as from going through a restructuring and/or negotiating with the bondholder (e.g. exclusion from capital markets during negotiations).

Given this setup, the sovereign chooses to incur costs  $a$  and thus to avoid the crisis iff

$$P_S^{NC} + b - a > P_S^C$$

where  $P_S^{NC}$  and  $P_S^C$  are the sovereign's payoffs (gross of  $b$  and  $a$ ) in the absence of a crisis and in a crisis, respectively. Hence, for appropriately defined  $a_{\min}$  and  $a_{\max}$  ( $a_{\min} < a_{\max}$ ), there is a cut-off value  $\bar{a} \in [a_{\min}, a_{\max}]$  such that for  $a \in [a_{\min}, \bar{a})$  the sovereign incurs the costs, while for  $a \in [\bar{a}, a_{\max}]$  he does not, where  $\bar{a}$  is given by

$$\bar{a} := P_S^{NC} - P_S^C + b$$

Note that the crisis is fully under control of the sovereign. However, this could be easily modified by assuming an upper limit on the size of the costs  $a$  the sovereign can incur (for example, because of limited domestic tax capacity).

Assume next that the costs  $a$  are distributed on  $[a_{\min}, a_{\max}]$  with a density  $\phi(a)$  that has full support (i.e.,  $\phi(a) > 0$  for  $a \in [a_{\min}, a_{\max}]$ ). Denoting with  $D$  the amount of funds raised in period 0, we have that the bondholder's expected return is  $D$ . This is because he is assumed to behave competitively and because there is no discounting (note that the agreed repayment will generally differ from  $D$  since it also has to compensate the bondholder for expected losses in crises). This condition can be written as

$$\int_{a_{\min}}^{\bar{a}} P_B^{NC} \phi(a) da + \int_{\bar{a}}^{a_{\max}} P_B^C \phi(a) da = D$$

where  $P_B^{NC}$  and  $P_B^C$  denote the bondholder's payoffs when there is no crisis and when there

is a crisis, respectively. It follows that

$$dP_B^{NC}/dP_B^C < 0$$

implying that a lower payoff for the bondholder in a crisis has to be compensated by a higher payoff when there is no crisis.

Define, furthermore, with  $P^{NC} := P_B^{NC} + P_S^{NC}$  ( $= f$ ) and  $P^C := P_B^C + P_S^C$  the joint payoffs for the sovereign and the bondholder. Since the bondholder breaks even on average we can ignore him in the welfare analysis. Welfare,  $W$ , is hence solely characterized by the sovereign's expected utility, which consists of the sum of the joint payoffs plus net benefits  $b - a$  when there is no crisis ( $a < \bar{a}$ ) and the joint payoffs when there is a crisis ( $a \geq \bar{a}$ ), minus the bondholder's required return  $D$

$$W = \int_{a_{\min}}^{\bar{a}} (P^{NC} + b - a)\phi(a)da + \int_{\bar{a}}^{a_{\max}} P^C \phi(a)da - D$$

Totally differentiating  $W(P^C, \bar{P}_S^C)$  wrt. to  $P^C$  (i.e., holding  $P_S^C$  constant) gives

$$\begin{aligned} \frac{dW(P^C, \bar{P}_S^C)}{dP^C} &= \frac{\partial W}{\partial P^C} + \frac{\partial W}{\partial \bar{a}} \frac{d\bar{a}}{dP^C} = \frac{\partial W}{\partial P^C} + \frac{\partial W}{\partial \bar{a}} \frac{\partial \bar{a}}{\partial P_S^{NC}} \frac{dP_S^{NC}}{dP^C} \\ &= \int_{\bar{a}}^{a_{\max}} \phi(a)da + (P_B^{NC} - P_B^C)\phi(\bar{a}) \frac{\partial \bar{a}}{\partial P_S^{NC}} \frac{dP_S^{NC}}{dP^C} \end{aligned}$$

Since  $dP_B^C/dP^C = 1$  for  $P_S^C = \bar{P}_S^C$  we have thus  $dP_S^{NC}/dP^C = d(P^{NC} - P_B^{NC})/dP_B^C = -dP_B^{NC}/dP_B^C > 0$ . From  $\partial \bar{a}/\partial P_S^{NC} = 1$  and  $P_B^{NC} - P_B^C \geq 0$  (i.e., in expectation, bondholder's payoff when there is no crisis is at least as high as when there is a crisis), it follows that  $dW(P^C, \bar{P}_S^C)/dP^C > 0$ .

Totally differentiating  $W(\bar{P}^C, P_S^C)$  wrt. to  $P_S^C$  gives

$$\begin{aligned} \frac{dW(\bar{P}^C, P_S^C)}{dP_S^C} &= \frac{\partial W}{\partial P_S^C} + \frac{\partial W}{\partial \bar{a}} \frac{d\bar{a}}{dP_S^C} = \frac{\partial W}{\partial P_S^C} + \frac{\partial W}{\partial \bar{a}} \left( \frac{\partial \bar{a}}{\partial P_S^{NC}} \frac{dP_S^{NC}}{dP_S^C} + \frac{\partial \bar{a}}{\partial P_S^C} \right) \\ &= 0 + (P_B^{NC} - P_B^C)\phi(\bar{a}) \left( \frac{dP_S^{NC}}{dP_S^C} - 1 \right) < 0 \end{aligned}$$

where the inequality follows because of  $dP_B^C/dP_S^C = -1$  for  $P^C = \bar{P}^C$  we have  $dP_S^{NC}/dP_S^C = d(P^{NC} - P_B^{NC})/d(-P_S^B) = dP_B^{NC}/dP_B^C < 0$ . Hence, welfare in the economy is increasing in the joint payoff in a crisis  $P^C$  but decreasing in the sovereign's payoff in a crisis  $P_S^C$ .

## Appendix 2: Proofs

**Proof of Proposition 5.** Note first that also in the presence of protection there are only pooling equilibria (the proof of Lemma 1 can be readily applied by replacing reference to Proposition 1 with Proposition 2). Suppose that the bondholder buys an amount of short protection  $q^*$  such that his payoff under default becomes  $q^* + (1 - q^*)k = \tilde{f}$  (i.e.,  $q^* = (\tilde{f} - k)/(1 - k)$ ) when  $\tilde{f} \geq k$  and buys no protection ( $q^* = 0$ ) otherwise. When  $\tilde{f} \geq k$  there is then acceptance with  $r = f^H$  as this  $r$  makes the bondholder's expected payoff from acceptance just equal to his outside option:  $\widetilde{\min}(r, f) = \widetilde{\min}(f^H, f) = \pi f^H + (1 - \pi)f^L = \tilde{f}$ . The bondholder's net payoff is then  $\tilde{f}$  as protection is not exercised. When  $\tilde{f} < k$  there is rejection as  $q = 0$  (from Proposition 4) and the bondholder's net payoff is  $k$ . Thus, in each case the bondholder obtains the maximum available payoff that is available in a pooling equilibrium:  $\tilde{f}$  when  $\tilde{f} \geq k$  and  $k$  when  $\tilde{f} < k$ .  $q^*$  is therefore the bondholder's optimal protection. From the above we have then that equilibrium crisis resolution is unchanged. However, the sovereign's payoff when  $\tilde{f} \geq k$  is now only zero (for  $\tilde{f} < k$  it is still  $-c$ ). Thus, when  $\tilde{f} > k$  moral hazard is lowered. ■

**Proof of Proposition 6.** Suppose that the bondholder holds long protection with  $q_{LP} = c/[(1 - \pi)(1 - f^L)] > 0$  and short protection with  $q_{SP} = -q_{LP}$ . Since  $q_{SP} = -q_{LP}$ , the bondholder is not protected in period 1. Bondholder's payoff from default is thus  $k$  under default. A restructuring offer of  $r = f^H$  gives the bondholder a return of  $f^H$  in the high state and  $\max(f^L, q_{LP} + (1 - q_{LP})f^L) = q_{LP} + (1 - q_{LP})f^L$  in the low state (as then  $r > f^L$  and he can exercise his protection). Hence his expected return is  $\pi f^H + (1 - \pi)(q_{LP} + (1 - q_{LP})f^L) = \tilde{f} + c$ . Analogous to Proposition 4 it follows that there is restructuring whenever  $\tilde{f} + c \geq k$  and default otherwise, implying that crisis resolution is improved whenever  $k > \tilde{f} \geq k - c$ . However, the sovereign's payoff (and thus moral hazard) increases compared to the bondholder's optimal protection. This is because the joint payoffs of the sovereign and the bondholder have increased (as crisis resolution becomes more efficient) but the bondholder's payoff has not increased (otherwise, bondholder's optimal protection would not maximize his payoffs). ■

**Proof of Proposition 7.** Assume (i)  $k = l$ , (ii)  $f^L \leq f^H - (k - c)$  and (iii)  $k - c > 0$ . Note that (i) implies that litigation is credible for  $q = 0$  but not for  $q > 0$ . Consider short protection with  $q = f^H - (k - c)$ , which is larger than zero by (ii). Hence the litigation

threat is uncredible. The conditions (i)-(iii) from Lemma 2 are then fulfilled. Therefore, we have a separating equilibrium with  $r = q = f^H - (k - c)$  in the high state and default in the low state. The bondholder's net expected payoff is  $\pi q = \pi(f^H - (k - c))$  as  $q = f^H - (k - c)$  is the payout that the sovereign makes in the high state, while there is no payout in the low state (note that this is also the maximum expected payoff the bondholder can achieve in a separating equilibrium as he has to guarantee the sovereign at least  $k - c$  in the high state in order not to make the sovereign default).

Pooling equilibria can only obtain for levels of protection that do not fulfill condition (i) or (ii) in Lemma 2. There are three cases to consider: a)  $q > f^H - (k - c)$ , b)  $0 < q < f^L$  and c)  $q = 0$ . Under a) litigation is uncredible. In order to achieve restructuring in a pooling, the sovereign would have to promise an expected return of  $q$  to the bondholder, thus making the sovereign's payoff under restructuring  $\min(f^H - q, 0) < k - c$  in the high state and  $\min(f^L - q, 0) = 0$  in the low state. Those pay-offs are smaller than the payoff under rejection  $k - c > 0$ . Thus, the sovereign prefers rejection, making the bondholder's net payoff zero as then there is no payout at all. Under b) litigation is also uncredible. If there is rejection, the bondholder's payoff is still zero, while if there is (pooling) acceptance, bondholder's net payoff is  $q$ . Hence bondholder's payoff is at most  $f^L$  as  $q < f^L$ . Under c) litigation costs play no role and we can use Proposition 4 to obtain that the bondholder's net payoff is  $k$ . Hence, since  $0 < f^L < k$ , the bondholder would choose case c) ( $q = 0$ ) in a pooling. As shown above, a bondholder can secure himself  $\pi(f^H - (k - c))$  in a separating equilibrium. Thus, the bondholder chooses a separating equilibrium whenever  $\pi(f^H - (k - c)) \geq k$ , which can be fulfilled, for example, for sufficiently large  $f^H$ . ■

**Proof of Proposition 8.** Assume that conditions (i)-(iii) in the proof of Proposition 7 hold and that  $\pi(f^H - (k - c)) < k$ , i.e., the bondholder's net payoff in a separating equilibrium is less than in a pooling equilibrium (from Proposition 7). The bondholder hence chooses pooling. Assume furthermore that  $\tilde{f} < k$ . Recalling that the bondholder chooses  $q = 0$  under pooling, it follows from Proposition 4 that there is default under pooling; hence the joint net payoffs of the bondholder and the sovereign are  $k - c$ . By contrast, the joint payoff in a separating equilibrium is  $\pi f^H + (1 - \pi)(k - c)$ , which is larger than  $k - c$  by  $f^H > k$ . Thus, although the bondholder chooses a pooling equilibrium, crisis resolution is more efficient in a separating equilibrium. ■

## References

- [1] Arping, S.: 2005, 'Credit Protection and Lending Relationships'. *mimeo, University of Amsterdam*.
- [2] Basel Committee on Banking Supervision: October 2004, 'Credit Risk Transfer'.
- [3] Bolton, P. and O. Jeanne: 2005, 'Structuring and Restructuring Sovereign Debt: The Role of Seniority'. *NBER working paper no. 11071*.
- [4] British Bankers Association: 2004, 'Credit Derivatives Report 2003/2004'.
- [5] Bulow, J. and K. Rogoff: 1989, 'Sovereign Debt: Is to Forgive to Forget?'. *American Economic Review* **79**, 43–50.
- [6] Cossin, D. and G. Jung: 2005, 'Do Major Financial Crises Provide Information on Sovereign Risk to the Rest of the World? A Look at Credit Default Swap Markets'. *mimeo, HEC Lausanne*.
- [7] de Brun, J. and U. D. Mea: 2003, 'Una Aproximación de Mercado a la Reestructuración de la Deuda Soberana: Lecciones de la Experiencia Uruguaya'. *Revista de Economía* **10**, 97–142.
- [8] Duffee, G. R. and C. Zhou: 2001, 'Credit Derivatives in Banking: Useful Tools for Managing Risk?'. *Journal of Monetary Economics* **48**, 25–54.
- [9] Eaton, J. and M. Gersovitz: 1981, 'Debt with Potential Repudiation: Theoretical and Empirical Analysis'. *Review of Economic Studies* **48**, 289–309.
- [10] Eichengreen, B.: 2003, 'Restructuring Sovereign Debt'. *Journal of Economic Perspectives* **17**, 75–98.
- [11] Faulkender, M.: 2005, 'Hedging or Market Timing? Selecting the Interest Rate Exposure of Corporate Debt'. *Journal of Finance* **60**, 931–962.
- [12] Federal Reserve Bank of New York: 2005, 'An Overview of the Emerging Market Credit Derivatives Market'.
- [13] FitchRatings: September 2003, 'Global Credit Derivatives: A Qualified Success'.



- [14] Ghosal, S. and M. Miller: 2003, ‘Co-Ordination Failure, Moral Hazard and Sovereign Bankruptcy Procedures’. *The Economic Journal* **113**, 276–304.
- [15] Haldane, A. G., A. Penalver, V. Saporta, and H. S. Shin: 2005, ‘Analytics of Sovereign Debt Restructuring’. *Journal of International Economics* **65**, 315–333.
- [16] Kiff, J., F.-L. Michaud, and J. Mitchell: 2003, ‘An Analytical Review of Credit Risk Transfer Instruments’. *Banque de France FSR* pp. 106–131.
- [17] Krueger, A.: 2002, ‘New Approaches to Sovereign Debt Restructuring: An Update on our Thinking’. *Adress before the Institute of International Economics (April 1, 2002)*.
- [18] Morrison, A. D.: 2005, ‘Credit Derivatives, Disintermediation and Investment Decisions’. *Journal of Business* **78**, 621–648.
- [19] Packer, F. and C. Suthiphongchai: 2003, ‘Sovereign Credit Default Swaps’. *Bank for International Settlements Quarterly Review* pp. 79–88.
- [20] Pan, J. and K. Singleton: 2005, ‘Default and Recovery Implicit in the Term Structure of Sovereign CDS Spreads’. *mimeo, Stanford University*.
- [21] Ranciere, R. G.: 2001, ‘Credit Derivatives in Emerging Markets’. *IMF Policy Discussion Paper*.
- [22] Spiegel, M. M.: 2005, ‘Solvency Runs, Sunspot Runs, and International Bailout’. *Journal of International Economics* **65**, 203–219.
- [23] Tirole, J.: 2002, *Financial Crises, Liquidity, and the International Monetary System*. Princeton: Princeton University Press.
- [24] Verdier, P.-H.: 2004, ‘Credit Derivatives and the Sovereign Debt Restructuring Process’. *mimeo, Harvard Law School*.
- [25] Weinschelbaum, F. and J. Wynne: 2005, ‘Renegotiation, Collective Action Clauses and Sovereign Debt Markets’. *Journal of International Economics* **67**, 47–72.



# Working Papers

No	Published	Title	Author(s)
1	May	2002 On Strategic Default and Liquidity Risk	Demosthenes N. Tambakis
2	June	2002 The Supervisory Approach: A Critique	Jonathan Ward
3	August	2002 Depreciation Bias, Financial-Sector Fragility and Currency Risk	Demosthenes N. Tambakis
4	December	2002 The New Basel Accord and Developing Countries: Problems and Alternatives	Jonathan Ward
6	January	2003 Economic Slowdown in the U.S., - The Revitalisation of Fiscal Policy and the Case for a Co-Ordinated Global Reflation	Alex Izurieta
7	December	2003 Establishing a European Securities Regulator: Is the European Union an Optimal Economic Area for a Single Securities Regulator?	Kern Alexander
8	October	2003 Empirical Modeeling of Contagion: A Review of Methodologies	Mardi Dungey, Renée Fry, Brenda González-Hermosillo & Vance L. Martin
9	October	2003 International Financial Contagion: What Do We Know?	Mardi Dungey & Demosthenes N. Tambakis
10	November	2003 Two-Country Stock-Flow-Consistent Macroeconomics Using a Closed Model Within a Dollar Exchange Regime	Wynne Godley & Marc Lavoie
11	November	2003 Testing for Changing Persistence in U.S. Treasury On/Off Spreads Under Weighted-Symmetric Estimation	L. Vanessa Smith & Demosthenes N. Tambakis
12	February	2004 Features of a Realistic Banking System Within a Post-Keynesian Stock-flow Consistent Model	Wynne Godley & Marc Lavoie
13	February	2004 Credit-Risk Transfer and Financial Sector Performance	Wolf Wagner and Ian Marsh
14	March	2004 Finance and Technical Change: A Neo-Schumpeterian Perspective	Carlota Perez
15	April	2004 Simple Open Economy Macro with Comprehensive Accounting - A Radical Alternative to the Mundell Fleming Model	Wynne Godley & Marc Lavoie
16	May	2004 Towards a Reconstruction of Macroeconomics Using a Stock Flow Consistent (SFC) Model	Wynne Godley
17	July	2004 Corporate Governance and Bank Regulation: The Regulator as Stakeholder	Kern Alexander
18	January	2005 Credit Derivatives, the Liquidity of Bank Assets, and Banking Stability	Wolf Wagner
19	February	2005 A Simple Model of Three Economies with Two Currencies - The "Eurozone" and "The USA"	Wynne Godley & Marc Lavoie
20	February	2005 Simple Open Economy Macro with Comprehensive Accounting - A Two Country Model	Wynne Godley & Marc Lavoie
21	October	2005 Aggregate Liquidity Shortages, Idiosyncratic Liquidity Smoothing and Banking Regulation	Wolf Wagner
22	October	2005 Synchronisation of Financial Crises	Mardi Dungey, Jan P.A.M. Jacobs & Lestano
23	October	2005 Credit Derivatives and Sovereign Debt Crises	Benedikt Goderis & Wolf Wagner
24	October	2005 The US Treasury Market in August 1998: Untangling the Effects of Hong Kong and Russia with High Frequency Data	Mardi Dungey, Charles Goodhart, Demosthenes Tambakis

*Please address enquiries about the series to:*

*The Administrator, Cambridge Endowment for Research in Finance, Judge Business School,  
Trumpington Street, Cambridge CB2 1AG, UK, Tel: +44(0) 1223 764 115, E-Mail: [admin@cerf.cam.ac.uk](mailto:admin@cerf.cam.ac.uk), <http://www.cerf.cam.ac.uk>*