THE MOTIVES FOR INTERNATIONAL BANK DEBT RESCHEDULING, 1978-1983: THEORY AND EVIDENCE

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I. Introduction

Private banks have become an increasingly important source of funds for developing countries over the last decade. During the second half of this period, the frequency with which such countries failed to make timely payments on outstanding debt showed a marked increase. Typically, such delinquencies lead to IMF mediated negotiations with the creditor banks over the terms for the unpaid debt and the extension of further credit. Successful negotiations culminate in debt rescheduling agreements. An average of only four countries per year signed agreements during 1978-1981; this number doubled to eight in 1982 alone, and from January 1983 through July 1984 twenty four countries signed agreements.[1] Why has there been a transition to more frequent reschedulings? Is this transition accompanied with a systematic change in the motives of borrowers in requesting reschedulings? What do reschedulings imply for the health of the banking community and for the future credit worthiness of borrower countries? Our concern in this paper is to provide a framework for analyzing these questions and investigate its empirical implications.

A model of debt rescheduling that identifies illiquidity and favorable revision of loan contracts as the two distinct sources or motives for reschedulings is presented in Section II. In this model a country borrows from a competitive banking community. When loans come due, the country either pays, repudiates, or reschedules. Timely repayment guarantees future access to world credit markets at competitive terms, whereas repudiation excludes the borrower from further access to world credit markets and precipitates punishment of the borrower by the world community. Rescheduling, which is intermediated by the IMF, is modelled as a bilateral monopoly situation between the borrower and the cartel of lenders formed at the occurrence of non-payment. The outcome of bargaining is determined by the consequences of abandoning negotiations. Should the talks break down, the country may either reschedule unilaterally, or, as before, repudiate. Both actions preclude further access to credit markets, but repudiation also incurs the punishment of the world community. Thus, the threat point is determined by the world community's ability to punish a recalcitrant country. At the time loans are made, the extent of the ability to punish and output are uncertain; thus, the threat point is uncertain.

In this model countries never actually repudiate. Nevertheless, the threat of repudiation is important in determining the outcome of rescheduling. If repudiation punishments are harsh, the country will reschedule only if she encounters liquidity problems, in which case rescheduling increases the profits of banks. On the other hand, if punishments are lenient, the country will always reschedule, primarily due to the perceived ability to favorably revise earlier lending agreements since repudiation becomes a viable threat. Rescheduling will then decrease the profits of banks.

In Section III we marshall empirical evidence to distinguish between these hypotheses. In particular, we conduct an econometric investigation using an event-study framework to determine if rescheduling events have come as good or bad news to banks (in terms of stock prices) and how this has changed in recent years. We find that before 1981, such events came as good news, while after 1981, they came as bad news. This evidence suggests that reschedulings prior to 1981 were primarily due to liquidity problems (and therefore beneficial to banks). In contrast, the perceived ability to punish LDCs seems to have diminished after 1981, making repudiation a more viable option, and resulting in a rash of rescheduling by countries to strike more favorable agreements with banks.

The importance of rescheduling in modern capital markets and its implications has yet to be fully reflected in the international lending literature. Sachs (1982) provides a historical analysis that suggests that the IMF may play a key role in guiding creditor and debtor nations to reach cooperative solutions. Sachs and Cohen (1982), and Sachs and Cooper (1984) provide a framework for analyzing rescheduling. Even though repudiation, illiquidity and insolvency are all examined as sources of non-payment problems, repudiation is the only one subsumed in their rescheduling framework, rendering it too restrictive for an investigation of the questions addressed in this paper.

II. Conceptual Framework

The model presented below is based on certain stylized facts of the international credit markets, such as the possibility of repudiation as one of the reasons for the violation of debt contracts and the institutional framework in which these violations are resolved. We will begin by discussing these issues. A sovereign borrower may violate a debt contract because of insolvency, illiquidity, or a desire to repudiate.[2] Repudiation of a loan is an explicit refusal by the borrower to pay any interest or principal as originally agreed. In the absence of an international forum that ensures repayment by sovereign borrowers, willingness to pay is critically determined by the costs of the sanctions that can be imposed on the borrower in case of repudiation.[3] Among the principal sanctions are embargoes on future borrowing, disruptions of normal trade patterns, and seizure of assets by creditors. A country is defined to be insolvent if the present value of debt service due exceeds the present value of her resources.[4] Illiquidity is analogous to insolvency except that it is based on cash flows rather than present discounted values.

Nonfulfillment of the terms of the original contract have resulted in debt reschedulings. Negotiations typically involve the borrower government, the banks and the IMF.[5] Developing country bank debt is mostly from syndicated Eurocurrency markets which are highly competitive. In reschedulings, however, a coordinator or a steering committee of banks has been established to act as an advisory and liaison group with all bank creditors, and to discuss the coverage and terms of rescheduling with the borrower governments, through IMF intermediation. Although the IMF does not have power to enforce agreements or repayment of loans directly, the position it occupies in the international capital markets is uniquely favorable to enforce rewards and penalties to the parties involved.[6] Accordingly, the model discussed below is based on this stylized fact, though the institution is not explicitly modelled as a strategic player.[7]

A. The Model

The model has two periods. In each period lenders borrow deposits at a fixed rate of interest, r_c, repaid with certainty. All the agents in the model have complete and perfect information about the decisions that will be faced at later stages, as well as on relevant risks. In the first period, the country borrows an amount N_1, at a competitively determined interest rate, r_1. Loans mature in one period; thus the debt service, DS, which equals $(1 + r_1)N_1$ is due at the end of period one. Output from a given amount of borrowing is obtained one period after the investment is made. The first period output, $y(N_1)$, is a random variable. We further specify output as nonstorable, so that current consumption equals output minus debt service payments.

At the end of period one the borrower may choose to pay, to repudiate or to negotiate. The borrower who repays will continue to enjoy access to credit markets at competitive terms, r_c, since no uncertainty is assumed in the future period, to simplify the model. Should this occur, net resources of $\gamma(N^*)$ are created from further borrowing. The borrower who repudiates is denied access to further credit and is punished by the world community. This punishment, z, may be interpreted as the cost of trade embargoes and assets seized. The lender is able to recover only a fraction of these resources. At the time the loans are made, z, as well as output is unknown, but they are realized before the borrower decides whether or not to make timely repayment. The future resources of the borrower without access to credit markets are denoted by $\gamma(0)$, where $\gamma(0) < \gamma(N^*)$. The third option of the borrower is to negotiate. The negotiations concern the extent and terms of future credit relations as well as the resolution of the original contract. Their outcome is determined by the consequences of walking away from the bargaining table, when the borrower may either repudiate, or reschedule unilaterally. In both cases it is assumed that no new loans are made. As before, repudiation by the borrower results in a penalty of z. In the second case, which we will refer to as autarky, the borrower reschedules unilaterally, preserving the present value of loans. Thus, $(1 + r_c)DS$ is repaid according to a timetable tailored to the current resources, $y(N_1)$, and future resources, $\gamma(0)$.

All the agents in the model are risk neutral and maximize the present discounted value of flows. In reality, one function of bank lending may be to provide insurance for consumption fluctuations, however, our central results, are robust to the assumption of risk aversion.[8] The borrower has an exogenously specified minimum level of consumption. We further assume that the borrower is solvent, that is, $\gamma(0) \geq (1+r_c)DS$. Insolvency is not considered, because, in general, long before countries cannot repay their debt, they will choose not to do so. Finally, lenders are perfect competitors at the first stage, and a cohesive bargaining unit at the second stage.

An equilibrium is a complete dynamic description of the financial arrangements and real decisions which satisfy the following properties:
1) all agents have rational expectations about the entire process;
2) choices are dynamically consistent (in the sense that the actions specified under every contingency are optimal under that contingency);[9] and
3) the resolution of the bargaining problem in period two is given by the Nash bargaining solution (Nash (1950)).

B. Equilibrium

Suppose the first period output, $y(N_1)$, and repudiation cost, z, have been realized and the loans have matured. If the borrower repays on time, funds are available at the risk free rate, r_c, in period 2. Following the standard marginal rule of investment, the socially efficient level of debt is accumulated. As a result, the net future resources of the borrower from having access to credit markets, $\gamma(N^*)$ is:

$$\gamma(N^*) = f_2(N^*) - (1+r_c)N^*,$$

where f_2 is the second period production function with properties $f_2' > 0$, $f_2'' < 0$, and N^* is the socially efficient level of borrowing (i.e., $f_2'(N^*) = (1+r_c)$).

To consider the outcome of bargaining, the Nash bargaining solution is employed. As explained before there are two possible threat points. At the first, the "autarkic" threat point, the borrower reschedules unilaterally by preserving the present value of loans; that is, if $DS = (1+r_1)N_1$ is the current debt service due, the borrower repays $(1+r_c)DS$ next period, with no access to new loans. The second is the "repudiation" threat point, where the debtor incurs repudiation costs z, and is excluded from credit markets. The lender recovers $z_L < z$ (where $z_L = \alpha(z)$ and $\alpha' < 1$). Algebraically, the threat points yield payoffs as follows:

	Creditor	Borrower
Autarky:	DS,	$y + \frac{\gamma(0) - (1+r_c)DS}{1 + r_c}$
Repudiation:	$\frac{z_L}{1+r_c}$,	$y + \frac{\gamma(0) - z}{1 + r_c}$

To keep the analysis simple, the borrower and the lenders are assumed to use the same discount factor, r_c. Since at all times the borrower behaves in her own best interest, the actual threat point will be determined by: $\min((1+r_c)DS,z)$. Let $z^R = (1+r_c)DS$. If the realization of z is at $z = z^R$, the borrower is indifferent between unilateral rescheduling and repudiation should bargaining break down. Since the amounts the lender can recover in each case are different, the operative threat point is discontinuous at $z = z^R$.

The gains from agreement are found by calculating the total surplus from continued exchange. When autarky is the threat point, i.e., $z > z^R$, the total efficiency gain results from the continued access to credit markets. If repudiation is the threat point, i.e. $z < z^R$, the total gain involves the elimination of costs of repudiation to both parties in addition to continued access to credit markets. With risk neutrality, the Nash bargaining solution involves equal division of the total gain.[10]

In discussing the properties of the equilibrium we will refer to Figure 1 which illustrates alternative threat points and the associated Nash bargaining solutions. Formal proofs are presented in the Appendix.

Repudiation never takes place in this model.[11] This result follows from the assumption of efficient bargaining. Nevertheless, the threat of repudiation is important in determining the operative threat point, hence the outcome of rescheduling. If the cost of repudiation is high enough, repudiation is not a viable option and autarky becomes the threat point. Bargaining then concerns only the extent and terms of the future credit relations. Since a borrower who repays on a timely basis gets all of the efficiency gain, only the "illiquid" borrowers will undertake negotiations. If debt is not repaid promptly, the lenders gain market power and take a share of the future surplus. Hence the opening of negotiations comes as good news for the banks. In Figure 1 the threat point is at point A, the associated bargaining solution is at point 1, and timely repayment is at point P. This result is formally stated in Proposition 1.

<u>Proposition 1</u>: Given DS and y there exists z^R such that

a) Autarky is the threat point if and only if $z \geqq z^R$.

b) $z \geqq z^R$ implies that

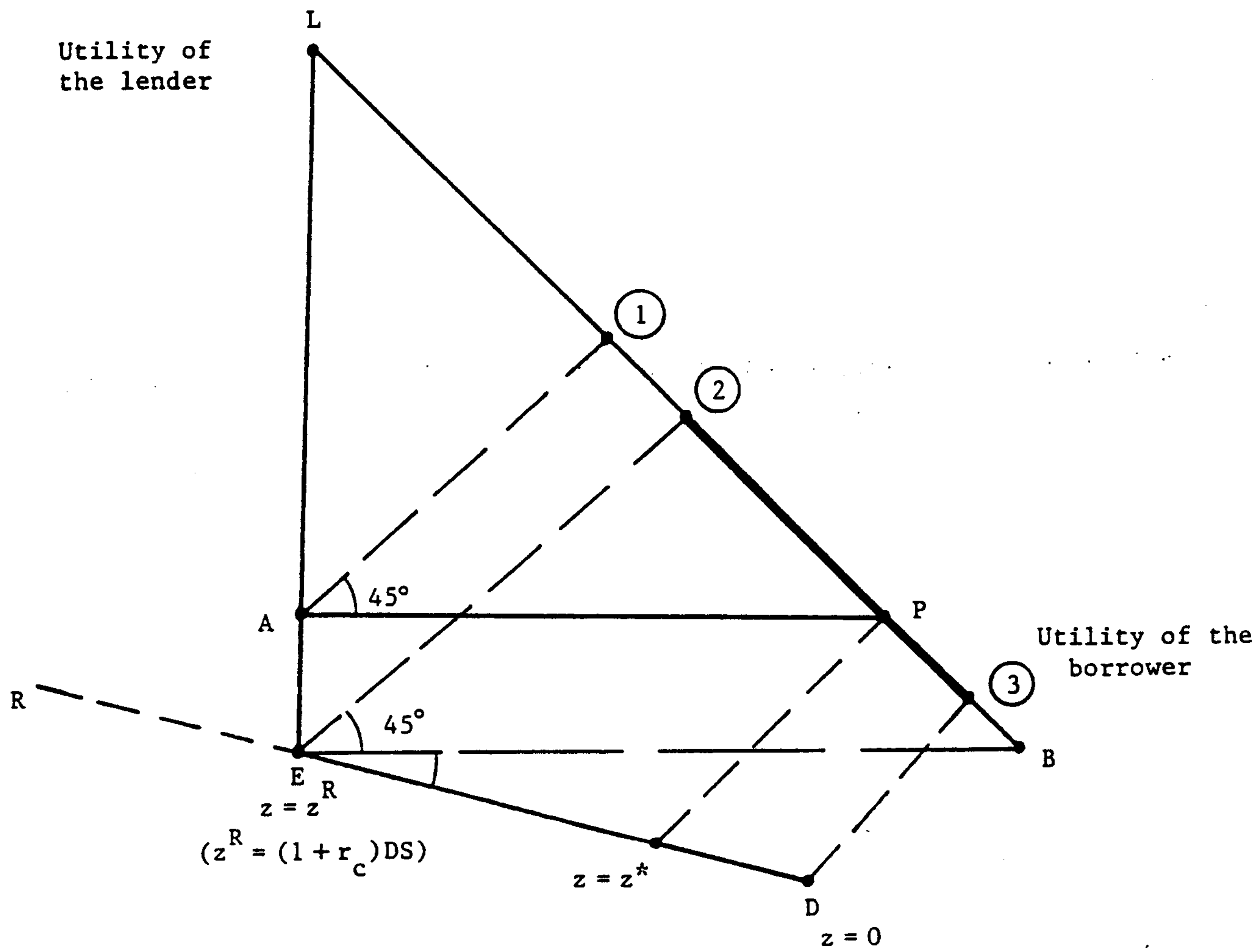
  i) Borrowers negotiate if and only if $y < DS$.

  ii) Negotiation is better than timely repayment for the banks.

If repudiation becomes the operative threat point, however, rescheduling may no longer be good news for the bank. As can be seen in Figure 1, repudiation becomes a viable option at $z = z^R$. This gives rise to a discrete jump of the threat point from A to E. While the utility of the borrower remains constant the lender loses the difference between $DS(1+r_c)$ and z_L. The

Figure 1

Bargaining Solution



A: Autarky threat point

RED: Repudiation point

LB: Efficient Frontier

corresponding decline in the lender's utility from negotiations is indicated on the efficiency frontier, as the bargaining solution moves from point 1 to 2 in Figure 1. Yet, the rents that will accrue from future credit relations may be large enough to compensate for this loss. If z is sufficiently low ($< z^*$), negotiations will also be motivated by the desire of borrowers to strike a more favorable bargain rather than only by problems with liquidity.[12] Further, as can be seen in Figure 1, for $z < z^*$ the payoff to the lender is lower than it is under timely repayment. (In Figure 1, the associated bargaining solution lies to the right of P.) Enforceable repudiation costs are not large enough to compensate for current repayment losses. In this case the news of negotiations comes as a sign of lower future profits.

<u>Proposition 2</u>: Given DS and y there exists $z^* \leqq z^R$ such that

a) $z > z^*$ implies that:

   i) Borrowers negotiate if and only if $y < DS$.

   ii) Negotiation is better than timely repayment for the banks.

b) $z < z^*$ implies that:

   i) Borrowers always negotiate.

   ii) Negotiation is worse than timely repayment for the banks.

Next assume that, after the initial loans are made, new information concerning the distribution of y's and z's became available. The following propositions describe the implications of such developments for the probabilities of reschedulings and the associated expected profits from reschedulings.

Either increases in the likelihood of illiquidity or in the viability of repudiation raise the probability of bargaining. The first part of Proposition 3 states that if the prior distribution of repudiation costs changes in such a way as to put more weight on the lower realizations, holding the conditional distribution of income given repudiation costs fixed, then the probability of bargaining increases. The second part states that if the prior distribution of the borrower's income changes in a way to put more weight on lower realizations, holding the conditional distribution of repudiation costs given income fixed, then the probability of bargaining increases. Assume that y and z are jointly distributed continuous random variables. We can write the probability of bargaining as follows:

(2.1) $$p(B) = p(z < z^*) + p(z > z^*,\ y < DS)$$

<u>Proposition 3</u>:

1) If $p^1(z<z^*) < p^2(z<z^*)$ for given $p(y>DS|z)$, then $p(B)\Big|_{p^1} < p(B)\Big|_{p^2}$

2) If $p^1(y<DS) < p^2(y<DS)$ for given $p(z<z^*|y)$, then $p(B)\Big|_{p^1} < p(B)\Big|_{p^2}$.

The two sources of increasing frequency of reschedulings have very different implications for the expected profits of lenders, as stated in the next proposition. In the first period lenders compute anticipated returns on their loans knowing that the borrower behaves in her best interest at all times. This expected return must meet the competitive standard. Increases in the probability of low realizations of repudiation costs, given the distribution of output conditional on z, decrease the expected profits of lenders. In particular, expected profits decline and turn negative, since they were equated to zero at the time the loans were made. However, as illiquidity becomes more likely, lenders revise their expectations of the return upward. Algebraically the market equilibrium condition is the following:

$$(2.2) \quad E\Pi = \int_{z>z^*} \int_{y>DS} PM\, f_{y,z}(y,z)dydz + \int_{z>z^R} \int_{y<DS} B^A f_{y,z}(y,z)dydz$$

$$+ \int_{z^R>z>z^*} \int_{y<DS} B^R(z) f_{y,z}(y,z)dydz + \int_{z^*>z} B^R(z)\, g_z(z)dz - (1+r_c)N_1 = 0$$

where

$f_{y,z}(y,z)$ is the joint density function for y and z,

$g_z(z)$ is the marginal density function of z's,

and PM, B^A, B^R denote the payoff functions for the lender from payment, bargaining when autarky and repudiation, respectively, are the threat points.

Proposition 4:

1) If $p^1(z<z^*) < p^2(z<z^*)$ for given $p(y>DS|z)$, then $E\Pi\Big|_{p^1} > E\Pi\Big|_{p^2}$.

2) If $p^1(y<DS) < p^2(y<DS)$ for given $p(z<z^*|y)$, then $E\Pi\Big|_{p^1} < E\Pi\Big|_{p^2}$.

This is a crucial result because of its testable implications. The increased number of reschedulings of the early 1980s may be due to illiquidity, or to the changing viability of repudiation. One method of empirically distinguishing between these hypotheses, accordingly, is to analyze the market valuation of reschedulings for the banks.

Another method of assessing the two explanations of rescheduling would require information on the movement of interest rates. If the perceived probability of illiquidity were to rise, lending rates on new loans should fall relative to the rates on the original loans since lenders expect to collect rents in the future and there is competition for these rents. In contrast, one should observe higher rates on the new loans if expectations were to change so as to judge repudiation to be a more viable option. This result is formally stated in Proposition 5.

<u>Proposition 5</u>:

1) If $p(z < z^*)$ is sufficiently <u>low</u> then $r_l < r_c$,

   If $p(z < z^*)$ is sufficiently <u>high</u> then $r_l > r_c$,

2) If $p(y < DS)$ is sufficiently <u>low</u> then $r_l > r_c$,

   If $p(y < DS)$ is sufficiently <u>high</u> then $r_l < r_c$ in equilibrium.

Moreover, the interest rate on rescheduled loans (as opposed to new loans) is higher when autarky is the threat point than when repudiation is, due to the inability of the lenders to recover the full value of currently outstanding loans once repudiation becomes a viable option. Unfortunately the limited availability of such data makes empirical investigation of these movements in interest rates infeasible, but Proposition 4 can be effectively studied as discussed in Section III.

III. Valuation of Rescheduled Bank Loans: An Event Study Approach

Is there any evidence contained in the economic indicators of developing country borrowers that may help distinguish between the two hypotheses posed?[13] The record indicates that due to the changes in the world economic environment, the costs imposed by trade embargoes seem to have fallen in the early 1980s. Because of the recession in the industrialized countries, developing countries experienced a significant deterioration in terms of trade and stagnation in the volume of real exports.[14] The terms of trade loss for non-oil developing countries in 1981-82 has been calculated at $79 billion and the estimated export volume loss is $21 billion.[15] Even the world recovery in 1983-84 did not significantly alter the overall situation, mainly due to the slow progress of the expansion and protectionist measures in the industrial economies. Access to credit markets also seems to have been limited. The ratio of interest payments to new borrowing increased to 1.39% by 1983 from its level of .33% in 1978 for non-oil developing countries.[16]

On the other hand many of these same developments may have raised the likelihood of illiquidity, and the data provide some support for this alternative view of why reschedulings increased in number. For example, the real costs of servicing debt increased dramatically in 1981-1982 due to the movements of world interest rates and inflation rates. LIBOR (London Inter-bank Offer Rate) on U.S. dollar deposits minus the U.S. wholesale price increase produced an average real interest rate of -0.8 percent for 1971-1980. The corresponding real rate of interest was as high as 7.5 percent in 1981 and 11 percent in 1982.[17] Among the traditional liquidity indicators the interest to exports ratio increased to 8.2% in 1981, 10.1% in 1982 from its average of 6.8 in 1979-80 for developing countries.[18] Similarly, the debt service ratio shows a marked deterioration in the same period.[19]

At this level of observation it is clear that the evidence does not allow one to distinguish generally between the illiquidity and repudiation cost hypotheses.[20] A very detailed analysis of each rescheduling case could probably differentiate them at that individual case level. A more informative approach to the global issue, however, is to implement an empirical procedure designed to determine whether rescheduling events have come as "good news" or "bad news" to banks. Proposition 4 suggests that this will enable us to distinguish between the two hypotheses.

The indicators examined above imply a structural change in the economic environment in the early 1980s. Accordingly, in the following empirical investigation, besides distinguishing between illiquidity and repudiation hypotheses, we will also investigate whether there has been a shift in the motives of borrowers in requesting reschedulings.

A. Theoretical Framework

To determine how markets revalued the assets of the banks in response to information about rescheduling events the security price performance of private banks is examined using an event study approach. Accordingly, we assume that the capital asset pricing model reflected in the following equation holds (see Black (1972)):

$$(3.1) \qquad E(R_{jt}|\phi_t) = E(R_{zt}|\phi_t) + \beta_j[E(R_{mt}|\phi_t) - E(R_{zt}|\phi_t)]$$

where

R_{jt} = return on asset j at time t,

R_{zt} = return on an asset whose returns are uncorrelated with R_{mt} at time t,

R_{mt} = return on the market portfolio at time t,

β_j = relative risk of asset j, and

ϕ_t = the information set at time t,

E = expectations operator.

Let $E(R_{mt}|\phi_t) = R_{mt} - \varepsilon_{mt}$, and $E(R_{jt}|\phi_t) = R_{jt} - \varepsilon_{jt}$ where ε_{mt} and ε_{jt} are random variables with zero expected values. Assuming that there exists a risk free asset, and that the investors can borrow and lend at the single risk free rate, equation (3.1) can now be rewritten as:

$$(3.2) \qquad R_{jt} = R_{zt} + \beta_j[R_{mt}-R_{zt}] - \varepsilon_{mt} + \varepsilon_{jt}.$$

If capital markets are efficient,[21] ε_{jt} in equation (3.2) can be interpreted as the ratio of the change in the value of the firm from new information released at time t, to the value of the firm in period $t-1$ (i.e., $\varepsilon_{jt} = V_{jt} - E(V_{jt}/\phi_t)/V_{jt-1}$, where V_{jt} is the market value of firm j at time t).[22] Accordingly, let $I(\Phi_t)$, be a function which maps new information at time t into a change in the value of the firm:

$$I(\Phi_t) = V_{jt} - E(V_{jt}|\phi_t).$$

New information available at time t is $\Phi_t = \phi_t - \phi_{t-1}$, where ϕ_{t-1} is the information set at $t-1$, and as before, ϕ_t is the information set at time t. Suppose Φ_t has two components Φ_t^1, Φ_t^2 and these two components have separable effects on income, i.e., $I(\Phi_t) = I^1(\Phi_t^1) + I^2(\Phi_t^2))$. Further suppose that we wish to focus on Φ_t^1 and that we can compute the function $I^1(\Phi_t^1)$. Then we can write equation (3.2) as:

$$R_{jt} = R_{zt} + \beta_j[R_{mt}-R_{zt}] + \lambda \frac{I^1(\Phi_t^1)}{V_{jt-1}} + u_{jt} \tag{3.3}$$

where $u_{jt} = \frac{I^2(\Phi_t^2)}{V_{jt-1}} - \varepsilon_{mt}$. λ is interpreted as a measure of how much of the income from new information is capitalized. For consistent estimates of equation (3.3), R_{mt} must not be correlated with ε_{mt}, and $I^1(\Phi_t^1)$ must be independent of ε_{mt}, and $I^2(\Phi_t^2)$.

B. Econometric Specification

The standard way of implementing the procedure described above is to use an event as a proxy for $I^1(\Phi_t^1)/V_{jt-1}$. Whether the events are good news or bad news for the firms will be implicit in the sign of the parameter estimate associated with this proxy. In the rest of this section an empirical implementation of this framework to evaluate the rescheduled bank loans will be discussed.

By examining news accounts of international lending issues, it is possible to identify months in which information relevant to altering expectations of future cash flows on outstanding loans was released. We choose two types of events: 1) default, here defined as failure to comply with the terms on original loan contracts, and 2) rescheduling, defined as the signing of a rescheduling agreement with creditor banks. The definitions of these events are discussed more fully in Section C. If no new information is released between the default and agreement events, the agreement event should not alter expectations. This simply follows from the efficient market hypothesis, in the sense that at the time the default announcement is made, we would anticipate all the expected future gains (losses) to be reflected in the security prices. In practice, however, the announcement variable may well pick up the effects of omitted information between the default date and signing of the agreement. Restricting attention to these two types of events is, of course, a crude way to capture information effects since many relevant events may be omitted.

Using these two events as proxies for $I^1(\phi_t^1)/V_{jt-1}$ equation (3.3) can be rewritten as:

$$R_{jt} = R_{zt} + \beta_j(R_{mt}-R_{zt}) + d(DF_{jt}) + \gamma(AG_{jt}) + u_{jt} \tag{3.4}$$

where

DF_{jt} is a default announcement variable for bank j in period t.

AG_{jt} is a rescheduling agreement variable for bank j in period t.

In equation (3.4) parameter d measures the change in the market value of the firm in response to default announcements. Similarly, γ reflects the response of the firm's valuation to agreement announcements. If the events do affect security returns, then the signs of these parameters should accord with the direction in which expectations have changed. "Bad news" would be indicated by negative coefficients; "good news" by positive coefficients.

Estimation of equation (3.4) is based on certain assumptions regarding the parameters R_{zt} and β_j. In many previous studies, R_{zt} is simply taken as a vector of treasury bill rates of return or interest rates on short-term high-grade bonds. However, the real yield on such assets is not free of variance. In this paper we use the treasury bill rate but capture inflation risk (following Gordon and Bradford (1980)) by setting $R_{zt} = A + HR_{ft}$, where R_{ft} is the treasury bill rate. Since the relation between R_{zt} and R_{ft} may change over time, A is specified as a linear function of time (i.e., $A = A_o + KT$, where T is a time vector). β_j is estimated simultaneously with the other parameters allowing it also to be a linear function of time. In contrast, the standard approach of estimating capital pricing models is first to estimate β_j from the previous five years or so of the data by employing regressions of the form $R_{jt} - R_{ft} = \beta_j(R_{mt}-R_{ft}) + \varepsilon_{jt}$. Then $\hat{\beta}_j$ is used as an independent variable in the final regression which produces estimates of the other coefficients. This approach, however, may introduce inconsistency and bias in parameter estimates and lead to efficiency loss. Our procedure implies the following regression specification to be employed:

$$R_{jt} = (A_o+KT) + HR_{ft} + (\beta_{oj}+T_jT)\,(R_{mt} - (A_o+KT) + HR_{ft}) + dDF_{jt} + \gamma AG_{jt} + u_{jt}. \tag{3.5}$$

In estimating equation (3.5) cross-section time-series data is pooled. The specification is nonlinear in the parameters β, H, and A; thus nonlinear estimation techniques are employed. If it is assumed that $\mathrm{var}(\varepsilon_{jt}) = \sigma_j^2$ and $\mathrm{cov}(\varepsilon_{it},\varepsilon_{j\tau}) = 0$ for $i \neq j$ or $t \neq \tau$, then nonlinear least squares estimation is the appropriate estimation method.[23] The assumption of $\mathrm{cov}(\varepsilon_{it},\varepsilon_{j\tau}) = 0$ for $t \neq \tau$ can be justified on the grounds of rational expectations. If there is correlation across equations, nonlinear least squares estimates of the parameters are not efficient, but they are consistent.

C. Rescheduling Events and Data Construction

In this paper the term "default" indicates failure to comply with a loan contract.[24] Accordingly, any news release indicating that a country has:

(1) fallen behind payments to its bank creditors; (2) asked her creditor banks to arrange debt rescheduling; (3) asked the IMF to arrange debt rescheduling with its creditor banks; (4) stopped payment; or (5) been declared in default by its creditors, is regarded as an announcement of default. Since security prices are assumed to capitalize the expected future rents (or losses) associated with any event, the first event indicating that rescheduling is likely presumably conveys the most information. Thus we attempted to identify the first report that default had occurred.[25] No other information prior to default, such as indicators of general economic or political conditions in a country or rumors about the banks' worries, is incorporated. This omission of potentially relevant information is a general defect of the event study methodology. Data on default dates was obtained through an exhaustive search of the Wall Street Journal, The London Times and The Banker for 1978-1983. The identified default months of countries are presented in Table B.1 in Appendix B. Identification of agreement months is straightforward. The IMF (1983, 1984a) provides information on all debt rescheduling agreements that have been signed between January 1978-June 1984. Table B.2 in Appendix B lists the dates of these agreements.

The default (DF) and agreement (AG) variables take the value of zero in months which have not been identified as event months. One way of investigating the impacts of DF and AG would be to use variables that take on the value of one during an event month. This would imply that all events of the same kind have a uniform effect on returns, a condition that is certainly contradicted by the fact that the amount of outstanding loans generally varies across countries, and that banks' foreign exposures do as well. Thus, AG and DF are constructed to represent the share of a bank's assets that is revalued in response to default and agreement announcements respectively.

Algebraically,

$$DF_{jt} = \frac{DEF_{jt}}{V_{jt-1}} \quad \text{and} \quad AG_{jt} = \frac{AGR_{jt}}{V_{jt-1}},$$

where DEF_{jt} represents a measure of the amount of loans owed to bank j by the country that defaults at time t, and AGR_{jt} represents the amount of debt relief provided by bank j to the country which reaches an agreement with creditors at time t.[26] Further details are provided in Appendix B.

Other variables are constructed as follows: R_{jt} is a monthly series of returns to the securities of the banks which come from the monthly returns file compiled at the Center for Research in Securities Prices (CRISP) at the University of Chicago. R_{mt} is the rate of return on the market portfolio. As in most previous studies, we use the value weighted average return for just NYSE securities. R_{ft} is a monthly series of rate of return on treasury bills. V_{jt} is a monthly series of value of total outstanding shares. The price and share series used in the calculation of V_{jt} come from the CRISP tapes.

D. Results

In estimating equation (3.5), monthly data for January 1978-December 1983 have been used. The sample of firms includes the largest twenty-one U.S. banks,[27] but the results presented in the text will draw only on the information pertaining to the top nine U.S. banks. Since the larger banks have a greater exposure,[28] the events under study would be expected to have a more substantial impact on their securities prices. Similar results hold however for the entire sample. Given that chief concern is to distinguish between the illiquidity and repudiation hypotheses as explanations of the increased number of reschedulings during the early 1980s, we divide our sample into two periods: 1978-1980, and 1981-1983. This division allows us to determine not only which hypothesis for the increase in rescheduling during the early 1980s is more consistent with the data but also whether there was a change in regimes between the two sample periods. As discussed above, many indicators suggest that the structure of international bank debt may have been altered markedly in 1981 by developments associated with the onset of the world economic downturn.

The estimated values of the default and agreement parameters from the estimation of equation (3.5) are reported in Table 3.1 (results concerning the other parameters appear in Appendix B, Table B.3). Standard errors appear within the parentheses.

Table 3.1

Estimation of Equation (3.10)

Parameter	1978-80	1981-83
d	0.086 (0.031)	-0.033 (0.016)
γ	1.67 (0.066)	-0.092 (0.067)

Both d and γ are positive in the first sample period and negative in the second.[29] Using a "t-test" the null hypotheses of $d = 0$ and that of $\gamma = 0$ are both rejected at .001 significance level for the early period. For the 1981-1983 period, however, the hypothesis of $\gamma = 0$ cannot be rejected at any reasonable significance level. The results regarding d indicate that defaults were good news for banks prior to 1981, supporting the illiquidity hypothesis and bad news during 1981-83, supporting the repudiation hypothesis.[30] To determine whether these results are sensitive to our sample of banks, we also used data for the next twelve largest U.S. banks.[31] We tested the following hypothesis: The regression parameters for the nine-bank and other twelve-bank groups are the same during each sample period. Conducting an F-test we could not reject this hypothesis at any reasonable level of statistical significance. If one conducts an F-test to test the hypothesis that the regression parameters have not changed in the two periods, it is rejected at .001 significance level. This implies that the underlying structural parameters of the two periods are different.

Movements of stock prices prior to the identified default date were also explored. This might be relevant if the market capitalized the value of information prior to the event chosen. One way of considering such movements is to introduce leads. First one, two and three month leads were introduced one at a time for the default variable. One month leads, for example, impose the restriction that each default was anticipated a month in advance (similarly for two and three month leads). The results of estimating this specification are presented in Table 3.2.A. Overall, the statistically significant parameter estimate of the two month leads suggest that there was anticipatory movement in the market, prior to the announcement of default in both periods. What is somewhat troubling, however, is the discrepancy between the signs on the actual default and on the two month lead in the 1981-1983 period. This disparity may be due to the capturing of other information effects, or it may suggest that the sign of the default effect is uncertain. However, if a less restrictive lead structure is imposed by estimating various lead parameters simultaneously, as presented in Table 3.2.B, the discrepancy in signs is no longer statistically significant.

One result observed in all specifications is that γ, the agreement parameter, is significantly different from zero and quite large in absolute value during the 1978-80 period. In the second sample period γ is negative, but typically insignificant. As stated before, $\gamma = 0$ would be expected if no new information were revealed between the default and agreement events. To see how sensitive γ is to information releases in the interim period, the

Table 3.2

Equation (3.5) With Leads

A

Parameter	1978-80	1981-83	
d_1	.011 (.029)	-0.06 (.014)	one month
d_2	.064 (.027)	.056 (.014)	two months
d_3	.038 (.027)	.018 (.015)	three months

B

$d_1 + d_2$	0.84 (0.142)	-.005 (.43)
$d_2 + d_3$	0.109 (0.14)	0.072 (0.20)
$d_1 + d_2 + d_3$	.133 (0.17)	.016 (0.57)

Table 3.3

Equation (3.5) With IMF Agreements

Parameter	1978-80	1981-83
d	.081 (.031)	-.024 (.016)
Y	1.45 (0.673)	-0.018 (0.065)
S	.012 (.007)	0.018 (0.008)

impact of IMF agreements is investigated by including a dummy variable for a country reaching a conditionality agreement with the IMF between the default and agreement dates. In the early period, the inclusion of this variable (as reported in Table 3.3) reduced the parameter estimate of γ; S itself (the IMF agreement parameter) is positive but insignificant. In the later period both default and agreements remain negative, while S is positive and significantly different from zero at .005 level of confidence. The approximate 28% decline in the value of γ suggests that γ captures the effects of new information flows which come after the default date, and prior to the agreement. Another interesting aspect of the results is the positive impact of IMF agreements. In our theoretical model we assume that all future uncertainty is resolved at the time of default and that the future repudiation costs are known by all agents. In the real world, however lenders may not know whether the sanctions available through the IMF are sufficient to deter costly reschedulings; the agreement with the IMF may convey this information. It may also raise expectations that the country will adhere to an austerity program, and therefore repay future loans at some point.

IV. Conclusions

In this paper we developed a framework to investigate the rescheduling process. Lack of liquidity and desire to revise loan contracts favorably are two motives of borrowers in requesting reschedulings which are subsumed in this framework. Increases in the frequency of reschedulings can be explained by both. However, the framework presented provides testable hypotheses to distinguish between the two motives. Reschedulings motivated by illiquid borrowers imply an increase in the expected profits of the lenders. On the other hand, viability of repudiation as an option to the borrower implies a decrease in the expected profits. Our econometric analysis based on an event study methodology showed that for the 1978-80 period, defaults were good news for the banks whereas for the 1981-83 period, defaults were bad news for the banks. This evidence suggests that developing countries requested reschedulings due to illiquidity problems during 1978-1980; between 1981 and 1983 however, reschedulings were motivated by the desire of countries to strike more favorable agreements with banks.

Any interpretation of the empirical results should acknowledge the possibility of error stemming from the defects of event study methodology.[32] For example, if the news in the market prior to default generated expectations of large losses, but the actual default announcement revealed information that the projected losses were exaggerated, the default announcement would have a positive coefficient estimate. However we would argue that the interpretation advanced is quite consistent with the history of reschedulings. Prior to 1981, relatively few countries, which were typically small and presumably had less bargaining power entered negotiations. The surge of reschedulings over the last five, years carried out in an atmosphers of acute awareness of the vulnerability of banks and international credit markets seem, in contrast, to reflect more than temporary liquidity problems. Our results of course do not replace the case studies that might be conducted to understand a particular country's situations; rather they provide a measure of tendencies in the market in general.

Footnotes

[1]At the same time the amount of rescheduled bank debt increased from an annual average of US $1.5 billion during 1978-81 to US $9.6 billion in 1982 and US $99 billion through July 1984 (in nominal terms). Details of bank debt rescheduling agreements are given in IMF ((1983, 1984a)).

[2]See Gersovitz (1985) and Eaton and Taylor (1985) for detailed discussion.

[3]Eaton and Gersovitz (1981) and Sachs and Cohen (1982) emphasize the threat of repudiation in international lending and show the existence of credit-rationing.

[4]Avramovic (1958) formalizes this approach. Other definitions of insolvency use the present discounted value of balance of trade (see Sachs and Cooper (1984)), instead of the intertemporal budget constraint. Khras (1981) and Sachs (1984) consider the constraints on the borrower government's ability to tax. The political constraints and administrative costs of raising revenues is said to have an impact on the solvency constraint.

[5]Most LDC borrowing (75%) is either direct borrowing of the government or borrowing that is guaranteed by the government.

[6]The IMF performs the following main functions: 1) Gathering and disseminating information on economic conditions and government policy in borrowing countries, thus providing a public good to lenders. 2) Providing adjustment programs for the debtors. 3) Penalizing defaulters by organizing embargoes. For example, the IMF programs typically restrict public sector borrowing from the international capital markets until the successful completion of the program. 4) Enabling cohesion among private lenders.

The transition from private bond-holders, who were the private lenders at the beginning of the century, to private banks as the main private creditors has increased the market concentration of lenders extensively. This concentration has made it feasible for lenders to act as a cohesive unit (see Bulow and Shoven (1978)). Yet, the existence of the IMF in its role as a monitoring agent has been an essential element for this cohesion. The 1976 Peru negotiation is a highly cited example for this case (see Sachs (1982), Cline (1981)).

[7]See Crawford (1984) for a discussion of the IMF's role and possible ways of modeling it.

[8]The only result that is sensitive is the optimal level of borrowing in the first period. Under the assumptions of the model, first period Nash equilibrium in loan contracts entails socially efficient levels of borrowing (see Ozler (1985)).

[9]This corresponds to the definition of perfect equilibrium, which is an equilibrium where both the strategies chosen at the beginning of the game and in every subgame form an equilibrium.

[10]Equal division is a result of the symmetry of the players assumption. However, the qualitative results of the model are robust to non-symmetry.

[11]Since World War II there have only been two cases of repudiation, North Korea and Ghana.

[12]In the early 1980s there was deep concern about the possible formation of a debtors cartel. In our model there is one borrower, but in terms of whether reschedulings are bad news for the banks or not, low realizations of repudiation costs can be thought of as analogous to formation of a debtor cartel in a model with many borrowers since it would be more difficult to punish the cartel of borrowers. An exogenous increase in the interest rates (base rate) also would give the same result as that of declining repudiation costs, since it is the relationship between the cost of repudiation and the

value of outstanding debt service that determines the threat point.

[13]Detailed information regarding these indicators are presented in IMF (1984b), World Bank (1985), Cline (1984).

[14]Average annual percentage change in terms of trade for developing countries has been 2 between 1973 and 1980 and 0.5, -1.1, -0.6, 1.0 for 1981 through 1984 respectively. For the same group average annual change has been 4.1 in 1973-80, 3.3, 3.2, 5.8 and 8.9 for 1981 through 1984 respectively. (World Bank 1985, pp. 152-153.)

[15]Cline (1984), pp. 12-13.

[16]Calculated from Tables 37 and 38 of IMF (1984b).

[17]Cline (1984), p. 12.

[18]World Bank (1985), p. 79.

[19]It has been (in percentage) 16, 17.6, 20.5, 19, 19.7 between 1980 and 1984 respectively.

[20]As suggested before, another way of distinguishing between these two hypotheses is to examine the behavior of interest rates. The average spreads charged on new loans for developing countries have increased from 0.83 to 1.31 between 1979 and 1983. This observation supports the repudiation hypothesis. The spreads charged during rescheduling agreements have been on the average one to two percent points more than the original terms. The spreads on rescheduled loans were around 1 3/4 until 1980; most agreements during 1981-1983 had spreads around 2 1/4 percentage points. Nearly all agreements signed since October 1983 show a narrowing of spreads. This observation, on the other hand, supports the illiquidity hypothesis. Systematic investigation of interest rate behavior is a difficult task due to the difficulty in identifying actual and benchmark interest rates.

[21]Fama (1976) defines capital markets as efficient if the market capitalizes the true expected value of capital assets.

[22]Given the assumption of $E(R_{jt}|\phi_t) = R_{jt} - \varepsilon_{jt}$, and the definition of equilibrium market value of the firm:

$$E(R_{jt}|\phi_t) = \frac{E(V_{jt}|\phi_t) - V_{jt-1+djt}}{V_{jt-1}},$$

where V_{jt} is the market value of firm j at time t and d_{jt} are dividends, other variables are as described in equation (3.1), the result follows.

[23]It is equivalent to the maximum likelihood estimator if the errors are assumed to be distributed normally.

[24]This does not correspond to the legal definition of default, which refers to a creditor's declaration that the borrower has failed to comply with some stipulation of the loan agreement.

[25]Of course, the situation is more complicated if a country has defaulted and/or reached an agreement in the recent past. In cases where countries default on loans of several different maturities information on each default and the corresponding agreement (if there was one) is used.

[26]If more than one country has defaulted on the same date then the total amount owed to bank j by all the countries that have defaulted on date t is taken.

[27]Top nine U.S. banks are the following: Bank of America, Citicorp, Chase Manhattan, Manufacturers Hanover Corp., Morgan (J.P.) & Co., Chemical N.Y., Continental Illinois, Bankers Trust New York Corp., First Chicago Corp.

Following are the twelve banks whose stocks are exchanged in the NYSE in the "next fifteen largest banks" category of the Federal Financial Institutions Examination Council: Wells Fargo & Co., Irving Bank Co., Crocker National Co., Marine Midland Banks Inc., Bank of Boston Corp., Norwest Corp., Interfirst Corp., Republic Bank Corp., NBD Bancorp Inc., First City Bancorp. Tex., Texas Comm. Bankshares Inc.

[28]Largest nine U.S. banks exposure to Eastern Europe, non-oil developing countries, noncapital-surplus OPEC countries reach nearly 300% of capital in 1982-83 and the same figure is about 200% for all U.S. banks, approximately two-thirds of this debt has been subject to debt service interruption (Cline (1984, p. 26).

[29]Adding firm specific intercept terms and/or constraining A and β to be constant over time did not alter the qualitative nature of the results presented. We presented specification (3.5) for the following reasons: 1) Almost all firm specific intercepts are insignificant. 2) Constraining firm's β_j and A to be constant over time is a restrictive assumption, and it is not supported by the data.

[30]We also estimated equation (3.5), using the nonlinear GLS procedure. None of the event parameters are significant in all periods; all the point estimates decreased and the default parameter changed sign in the second period, becoming positive in comparison to least squares estimates. These results are somewhat troubling for the following reason. Whether the null hypothesis of diagonality is valid or invalid, NLLS and NLGLS estimates are both consistent (although standard errors may not be calculated correctly). When two consistent estimators yield different estimates, the validity of the specification is called into question. One would rigorously test the specification by employing a Hausman test. It would also be interesting to use some variant of White's (1980) procedure for calculating NLLS standard errors which are consistent under a variety of assumptions about the variance covariance matrix. However, these are beyond the scope of this paper.

[31] For the twenty-one banks as a whole the parameter estimates and standard errors for d in 1978-80, 1981-83 periods respectively are as follows: 0.050 (0.019), -0.015(0.010). The same figures for γ are: 1.16 (0.428), -0.040 (0.038).

[32] See Ozler (1986) for a rational expectations application of bank loan revaluation.

Appendix A

Proofs of Propositions

Proposition 1

b) This can be directly seen from the indirect utility functions. For the borrower algebraically they are as follows:

$$U(P) = (y-DS) + \frac{\gamma(N^*) + \gamma(0)}{(1+r_c)} \qquad \text{if pay}$$

$$U(B)^A = (y-DS) + \frac{\gamma(N^*)}{2(1+r_c)} + \frac{\gamma(0)}{(1+r_c)} \qquad \text{if bargain when} \quad z > z^R$$

$$U(B)^R = y - \frac{z + \alpha(z)}{2(1+r_c)} + \frac{\gamma(N^*)}{2(1+r_c)} + \frac{\gamma(0)}{(1+r_c)} \qquad \text{if bargain when} \quad z < z^R$$

For the lender they are

$$U_L(P) = DS$$

$$U_L(B)^A = DS + \frac{\gamma(N^*)}{2(1+r_c)}$$

$$U_L(B)^R = \frac{z + \alpha(z)}{2(1+r_c)} + \frac{\gamma(N^*)}{2(1+r_c)}$$

Hence

$$U(B)^A < U(P)$$

$$U_L(B)^A > U_L(P)$$

Proposition 2: z^* is defined by

$$Q = U(P) - U(B)^R \Big|_{z^*} = 0 \qquad \frac{dQ}{dz} > 0.$$

$$X = U_L(B)^R - U_L(P) \Big|_{z^*} = 0 \qquad \frac{dX}{dz} > 0.$$

Hence the result follows.

Proposition 3:

1) We can rewrite the probability of bargaining given with equation (1) in the text. Using Bayes' theorem it becomes

$$p(B) = \int_{y<DS} fy(y)dy + \int_{z<z*} g_z(z) \int_{y>DS} f_{y|z} (y|z)dydz.$$

It can directly be seen from this that if $\int_{z<z*} fz(z)dz$ increases holding the conditional distribution of y constant, $P(B)$ increases.

2) This can be shown using exactly the same method in 1) above.

Proposition 4:

1) We can rewrite the $E\Pi$ defined in equation (2):

$$E\Pi = (r_1-r_c)N_1 + \int_{\substack{z>z \\ y<DS}} (U_L(B)^A-DS)\ f_{z,y}(z,y)dzdy$$

$$+ \int_{\substack{z^R>z>z* \\ y<DS}} (U_L(B(z))^R-DS)\ f_{zy}(z,y)dzdy$$

$$+ \int_{z<z*} U_L(B(z))^R-DS)\ g_z(z)dz = 0$$

where $\int_{z<z*} g(z)dz = p_1(z < z*)$. We know:

$$(U_L(B(z))-DS) < 0 \quad \text{when} \quad z < z*, \quad \text{and}$$

$$> 0 \quad \text{when} \quad z < z*,$$

and that all the probabilities in the expression sum to one. Hence the result follows.

Proposition 5:

Results from the fact that 2nd and 3rd terms in the $E\Pi$ equation above are positive and the 4th term is negative and that $E\Pi = 0$ must hold in equilibrium.

Appendix B

Table B.1

Defaults

Date		Country	Total Amounts Owed[a] to Nine U.S. Banks (US $ Mill.)
1978	February	Turkey	945.1
	April	Jamaica	194.1
	May	Peru	880.5
	July	Peru	880.5
	September	Sudan	121.8
	December	Sudan	121.8
1979	March	Yugoslavia	1,104.1
	April	Jamaica	192.3
	June	Mexico	6,311.0
	November	Iran	520.8
1980	April	Bolivia	285.1
	August	Turkey	890.2
1981	March	Poland	766.6
	April	Bolivia	272.2
		Jamaica	168.4
	May	Senegal	47.7
	August	Costa Rica	232.2
	October	Romania	207.3
	November	Poland	766.6

(continued)

Table B.1 (cont.)

Date		Country	Total Amounts Owed[a] to Nine U.S. Banks (US $ Mill.)
1982	January	Honduras	138.8
	April	Liberia	143.5
		Zaire	56.5
	May	Yugoslavia	1,419.9
	June	Argentina	5,595.1
	July	Sudan	141.0
	August	Mexico	13,094.3
	September	Bolivia	229.8
		Venezuela	7,606.3
		Malawi	86.0
	October	Ecuador	1,156.5
	November	Dominican Republic	295.9
	December	Brazil	14,165.5
1983	January	Chile	2,991.1
		Romania	160.0
		Zambia	91.1
	February	Nigeria	1,303.2
	March	Argentina	5,631.8
		Peru	1,423.7
	May	Brazil	13,771.4
	June	Poland	660.0
		Nicaragua	231.6
	September	Morocco	651.6
	October	Liberia	83.5
		Philippines	3,631.4
	November	Chile	3,247.8
	December	Ivory Coast	385.9

Source: [a]Federal Financial Institutions Examination Council, Statistical Release E.16(126).

Table B.2

Bank Debt Restructuring Agreements

Date		Country	Amount of Relief[a]	Total Bank Debt[b] (US $ Mill.)	Total Amounts Owed to Nine US Banks[c]
1978	June	Peru	186	--	880.5
	December	Peru	200	--	880.5
1979	April	Jamaica	149	--	194.1
	June	Turkey	836	--	945.1
	August	Turkey	2,269	--	945.1
1980	January	Peru	340	--	1,014.3
	April	Zaire	402	--	62.6
	August	Bolivia	200	--	285.1
	December	Nicaragua	582	--	279.1
1981	April	Bolivia	412	1,390	272.2
	June	Jamaica	218.5	1,500	168.4
	August	Turkey	100	7,730	868.2
	September	Nicaragua	180	900	268.5
	December	Sudan	568	1,330	156.4
1982	March	Nicaragua	55	979.3	253
		Turkey	3,105	8,260	875.1
	April	Poland	2,300	4,610	743.9
	November	Poland	2,300	4,610	743.9
	December	Liberia	30	8,115	180.7
		Romania	1,598	9,752	168.1
1983	January	Argentina	10,600	24,070	5,761.4
	February	Brazil	20,671	73,710	13,754.2
	March	Bolivia	205	1,350	199.3
		Malawi	57	170	70.9
	April	Sudan	646	1,240	92.0
	May	Bolivia	412	1,350	199.3
	June	Jamaica	158.2	1,270	163.4
		Romania	567	9,000	150.3
	July	Chile	6,400	11,910	3,247.8
		Nigeria	1,350	7,750	1,336.9
		Peru	1,030	4,220	1,276.2
		Uruguay	815	1,760	763.7
	August	Mexico	27,767	84,960	13,738.2
	September	Costa Rica	834	1,560	214.5
		Nigeria	480	9,000	1,336.9
	October	Equador	2,966	3,630	1,139.5
		Yugoslavia	2,350	14,510	1,421.2
	November	Poland	1,400	4,700	593.7
	December	Dominican Republic	500	1,000	291.6

Sources: [a,b]IMF, International Capital Markets, 1984, pp. 64-107.

[c]Same as Table B.1(a).

Construction of DEF and AGR

DEF:

Total amounts owed to US banks by a borrower country is provided by the Fed data. (See Table B1 in the Appendix). These data also provide a breakdown of banks, top nine, next fifteen and the rest. Hence we can have information on the total amounts owed to the top nine US banks, by country (TOTLO).

The next task is to find a way of constructing a variable that gives information on the amount owed to a particular bank by a country. However, due to the poor quality of reporting in the bank annual reports (10-k) information on the total LDC loans extended by each bank is not available in a consistent fashion prior to 1982. The Securities and Exchange Commission first required banks to reveal LDC loan exposure in the third quarter of 1982. However, banks were given the option of reporting either (1) exposure to those countries experiencing liquidity problems where total exposure exceeds 1% of the bank's aggregate outstandings or (2) exposure to all countries where outstandings exceed 1% of the bank's total. Hence, a breakdown for each country is not necessarily obtainable even after 1982.

Therefore average foreign branch loans of the banks is employed in this study. Assuming that each bank holds the same portfolio of foreign loans, define

$$BR_{jt} = \frac{A_{jt}}{\sum_{i=1}^{9} A_{jt}},$$

where A_{ij} is the average foreign branch loans of bank j at time t, which were obtained from Bank Compustat tapes.

Finally, $DEF_{jt} = (TOTLO_t)BR_{jt}$.

AGR

We used a similar procedure.

Each banks share in this agreement is assumed to be proportional to that banks' exposure. Hence

$$AGR_{jt} = Amount_t^x \frac{TOTLO_t^x}{(World\ B)_t^x} BR_{jt}$$

where

$Amount_t^x$ = Amount of relief provided to country X for the agreement at t.

$TOTLO_t^x$ = Total amount of debt owed to the top nine US banks by country X at t.

$(World\ B)_t^x$ = Total bank debt of country X at t.

See Table B2 in the Appendix for these series.

Table B-3

Estimated Equation: (3.5)

Parameter	1978-80	1981-83
d	0.086 (0.031)	-0.033 (0.016)
γ	1.680 (0.066)	-0.092 (0.067)
β_{01}	1.484 (0.215)	0.995 (0.257)
T_1	-0.060 (0.013)	0.004 (0.017)
β_{02}	1.155 (0.212)	0.614 (0.296)
T_2	-0.026 (0.012)	0.033 (0.020)
β_{03}	1.086 (0.213)	0.536 (0.325)
T_3	-0.193 (0.012)	0.377 (0.022)
β_{04}	1.280 (0.212)	0.555 (0.323)
T_4	-0.044 (0.012)	0.034 (0.021)
β_{05}	1.443 (0.214)	0.533 (0.341)
T_5	-0.055 (0.013)	0.024 (0.020)
β_{06}	1.021 (0.213)	0.425 (0.366)
T_6	-0.028 (0.012)	0.038 (0.023)
β_{07}	1.467 (0.215)	0.582 (0.311)

Table B.3 (cont.)

Parameter	1978-80	1981-83
T_7	-0.053 (0.013)	0.036 (0.021)
β_{08}	1.044 (0.213)	0.668 (0.294)
T_8	-0.023 (0.012)	0.026 (0.019)
β_{09}	1.329 (0.214)	0.515 (0.330)
T_9	-0.028 (0.012)	0.040 (0.022)
A_0	-0.115 (0.033)	-0.262 (0.271)
K	0.003 (0.0009)	0.0009 (0.003)
H	5.509 (3.147)	31.501 (26.482)

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