Is the Debt Crisis History? Recent Private Capital Inflows to Developing Countries

Michael Dooley, Eduardo Fernández-Arias, and Kenneth Kletzer

The outlook for economic development for an important group of middle-income countries has once again been buoyed by substantial private capital inflows in the 1990s. As in the 1970s, this development has been met with cautious optimism. This empirical study finds that although debt reduction and policy reforms in debtor countries have been important determinants of renewed access to international capital markets, changes in international interest rates have been the dominant factor. We calculate the effects of changes in international interest rates for a "typical" debtor country. We conclude that increases in interest rates associated with a business cycle upturn in industrial countries could depress the secondary market prices of existing debt to levels inconsistent with continued capital inflows.

The turnaround in the external financial position of many debtor countries since 1989 has been phenomenal. Improvement is particularly impressive in countries that had completed Brady Plan restructuring of their external debt at the time this article was prepared (Argentina, Costa Rica, Mexico, Nigeria, the Philippines, Uruguay, and Venezuela). In the first quarter of 1989 the external debt of these countries sold for an average price of only forty cents on the dollar and private capital inflows were largely restricted to concerted lending or interest arrears. Various plans for dealing with the debt overhang, including the Brady Plan announced on March 10, 1989, were widely characterized as inadequate to restore access to international capital markets. Some observers, in fact, predicted that debtor countries might not return to private international capital markets for a generation (see U.S. Senate 1990).

Today the recovery in real economic activity and capital formation in debtor countries is just beginning, but a financial recovery is well under way. These countries have experienced very large private capital inflows, real exchange rate appreciation, stock market booms, and dramatic increases in the prices of their external debt (Calvo, Leiderman, and Reinhart 1993). In some cases capital inflows have been associated with a return to resource transfers to these coun-

Michael Dooley and Kenneth Kletzer are with the Department of Economics at the University of California, Santa Cruz; Eduardo Fernández-Arias is with the Office of the Chief Economist at the Inter-American Development Bank, on leave from the World Bank. The authors acknowledge Nlandu Mamingi for his econometric work, and thank Stijn Claessens and Paul Armington for helpful comments.

tries similar to those recorded in the 1970s, as measured by the emergence of sizable balance of trade deficits.

Do we understand enough about the 1982 crisis to predict that renewed accumulation of external debt can avoid a repeat of 1982 and the considerable costs that followed for debtor countries? Unless the memories of investors and residents of debtor countries are very short, they must believe that there is a difference in the expected outcome of this new round of international investment. Is the debt crisis dead, as suggested by several observers recently, or is it only sleeping?

To understand this turnaround in market access, it is necessary to identify the main factors that can account for the remarkable improvements in debtor countries' creditworthiness. We first argue that secondary market prices for syndicated credits are a useful measure of market access. We then show that changes in international interest rates and induced changes in real exchange rates and real domestic interest rates in debtor countries can account for all of the improvement in secondary market prices after the first round of Brady Plan restructuring agreements in early 1990. The empirical relationship between secondary market prices and international interest rates is robust to changes in model specification and to the period considered. In particular, the dominance of international interest rates holds both before 1989, when yields on sovereign credits rose over time—and prices declined—and after 1989, when yields generally declined—and prices rose. This is further confirmed by recent developments outside the period of our estimations. For example, during February and March 1994—after this article was prepared—U.S. interest rates increased substantially while secondary market prices dramatically declined.[1]

The decline in real long-term interest rates on dollar-denominated debt is certainly reversible and, in fact, it might very well be reversed in the next year or so. If domestic real interest rates in debtor countries were also to rise, and real exchange rates were to decline—as would be normal—many developing countries would probably again experience debt servicing difficulties.

Section I develops the relationship between capital inflows and secondary market prices. Section II discusses factors that might explain secondary market prices for developing-country debt. Section III estimates a simple model of secondary market prices. Section IV applies these estimates to a composite Brady Plan country in order to evaluate the source of recent capital inflows. Section V summarizes the results.

I. Capital Inflows and Secondary Market Prices

The secondary market price of commercial bank debt is a useful barometer for country creditworthiness. The secondary market price indicates the climate

1. The ten-year U.S. Treasury bond rate increased by 15 percent, from 5.7 to 6.6 percent per year, while the market price index fell by a similar proportion.

for private capital inflows to a debtor country, because it reflects both private investors' expectations concerning the ability of debtor governments to service existing debts and yields on alternative international investments. The secondary market price is a sensitive indicator because it is established in an active market for a relatively homogeneous financial instrument. Furthermore, it is also more up to date and accurate than private capital flow data, useful properties for an indicator.

Rising secondary market prices (falling yields) suggest that residents of the debtor country can issue new debt or equity on better terms than those on past debt. The rising prices reflect improvements in country creditworthiness that, to some extent, apply to all forms of external financing. We argue that the improvement in creditworthiness also results from the worsening in alternative returns in industrial countries. These improvements may fail to be powerful enough to eliminate substantial secondary market discounts and allow countries to regain access to similar commercial bank loans, but may be strong enough to allow access to and better terms for alternative forms of external finance that the market perceives as a safer instrument (for a formal model, see Fernández-Arias 1995). The important implication for understanding recent capital inflows is that a larger volume of new borrowing, or sales of equity, can credibly be serviced at lower yields. Thus, an improvement in secondary market prices was a precondition for recently observed private capital inflows to debtor countries. Moreover, a return of secondary markets to levels reached in 1989 would certainly stop and probably reverse recent capital inflows.

There are two fundamental reasons for changes in the terms on which investors hold new and existing claims on residents of developing countries. The first is changes in yields available on alternative investments as measured here by an appropriate risk-free dollar interest rate. The second is a change in investors' evaluation of the credit risk peculiar to the developing country. While easily observed secondary market prices undoubtedly reflect other factors such as the relative status of government and private debt, our working hypothesis is that the value of sovereign debt is closely related to the investors' overall assessment of the outlook for expected returns on existing and new investments in the debtor country relative to expected returns on alternative investments (Dooley and others 1990).

Capital inflows adjust to equalize alternative returns by financing marginal projects with lower domestic returns (flow adjustment) and by increasing overall exposure (stock adjustment) (Fernández-Arias 1995). Although several recent papers have attempted to directly explain private capital inflows, this has proven to be a difficult task. The fact that private inflows have been offset by official outflows, generally in the form of increases in international reserve assets, makes the existence of a stable relationship between expected yields and private capital flows unlikely. Different policy reactions over time clearly contaminate reduced-form relationships between expected yields and private capital flows. For this reason we focus on the expected yield of existing commercial

bank debt as the best proxy for the terms on which residents of emerging markets can issue new debt and equity. Analysis of this expected yield allows us to trace the underlying determinants of new capital inflows.

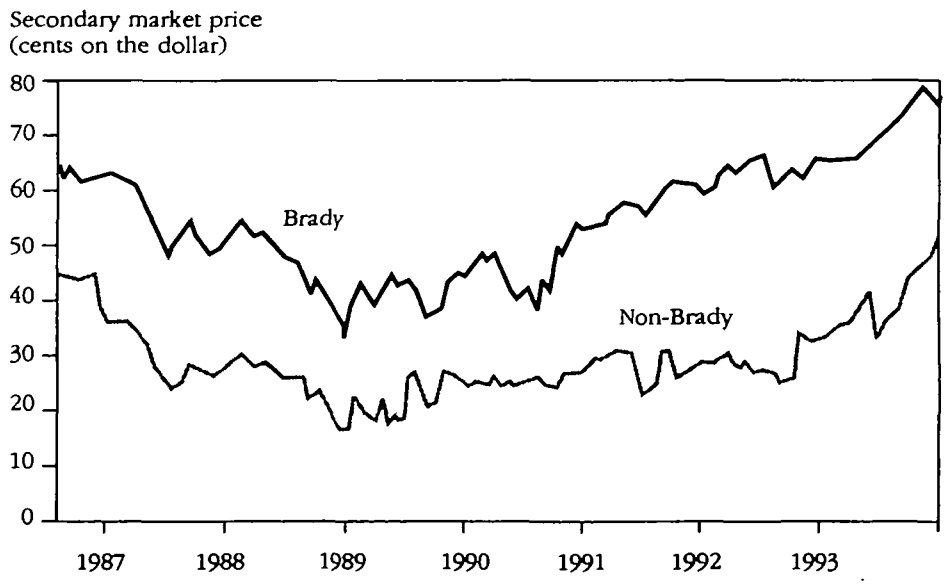
II. Quantitative Evaluation of Factors Affecting Secondary Market Prices

Although there have been a number of recent commentaries on the end of the debt crisis, relatively few quantitative analyses of what went right have been undertaken. While it is natural for disasters to get more attention than for fair weather, a careful evaluation of recent developments can help in analyzing the durability of the improvement. In this section we discuss measures of five factors that might explain secondary market prices for developing-country debt: debt reduction, economic policy reform, international interest rates, domestic interest rates, and exchange rates.

Debt Reduction

A simple model for secondary market prices sets the market price equal to the ratio of expected present value of debt service payments to the contractual value

Figure 1. *Debt Prices in Selected Countries, 1986–93*



Note: Calculated as a weighted average based on commercial bank debt. Argentina, Costa Rica, Mexico, Nigeria, the Philippines, Uruguay, and Venezuela are Brady countries; Albania, Algeria, Angola, Bolivia, Brazil, Bulgaria, Cameroon, Chile, Congo, Côte d'Ivoire, Ecuador, Honduras, Hungary, Jamaica, Jordan, Morocco, Nicaragua, Panama, Peru, Poland, Senegal, and the Syrian Arab Republic are non-Brady countries.

Source: Salomon Brothers (various issues); *International Financial Review* (various issues); American Banker, Inc. (various issues); World Bank data.

of outstanding debt. It follows that secondary market prices rise when the numerator—that is, expected payments—rises relative to the denominator, the contractual value. Consequently, these prices are linked to country creditworthiness.[2] Debt or debt service reduction is expected to increase the price if the present value of expected payments does not fall proportionately with the reduction in the contractual value of the debt (see Dooley 1988 for a general discussion of buybacks and market prices). As documented by Bacha (1991) and World Bank (1992), increases in debt prices since the announcement of the Brady Plan in 1989 have been larger for Brady Plan countries than for other debtor countries (figure 1).

There is much less agreement concerning the quantitative importance of debt reduction. The initial skepticism about the Brady Plan on the part of many academic economists was based on a simple argument. The Plan was voluntary in the sense that banks would not be forced to exchange their existing claims for new claims with a lower expected market value. The implication was that debt reduction would be expensive in the sense that private debt retired by the Brady Plan would be purchased at a price higher than the market price that would prevail if the Plan were not implemented. As pointed out in Dooley (1988), the higher price would reflect the market value of debt remaining after the agreement was implemented if banks could free-ride as in open-market buybacks (see also Bulow and Rogoff 1988). If the banks were in a less strong bargaining position, the price would be lower, and more debt reduction would be possible for the same amount of resources. But the amount of debt reduction would always be limited by the banks' voluntary participation constraint. Given this constraint it is possible to calculate the range of debt reduction that would result, given the resources available to support the deal. As shown by Claessens, Diwan, and Fernández-Arias (1992), Brady operations led prices and debt reduction to fall within the theoretical ranges.

Table 1 provides a summary of the debt reduction obtained by various countries to date.[3] The first column shows debt retired as measured by the reduction in the present value of debt service obligations. Debt reduction reflects reductions of contractual debt and interest service as well as collateralization and new money promises. An example is agreements where below-market interest rates

2. The relationship between prices and country risk is distorted in some of the instruments used in Brady operations by two factors. First, in the numerator, collateral enhancements increase the value of those instruments. Second, in the denominator, below-market interest rates such as those in Brady par bonds amount to a lower effective contractual value. These two biases counteract each other and may conceivably offset each other in the case of par bonds, which would justify the usual practice of using par bond prices. In general, however, *the two biases* do not offset each other and need to be adjusted to obtain the so-called stripped prices, whose level would better reflect country creditworthiness (see table 1 for details). The changes in these stripped prices caused by changes in international interest rates can be approximated by the changes in the prices of Brady bonds because most collateral enhancements are also interest-sensitive, and therefore stripping is not necessary for the econometric exercise.

3. After this article was prepared, Brazil, Bulgaria, the Dominican Republic, Ecuador, Jordan, and Poland completed Brady operations in 1994 and 1995.

Table 1. *Debt and Debt Service Reduction in Brady Plan Countries, 1990–93*

Country	Commercial bank debt-reduction equivalent		Total net payment to banks (millions of U.S. dollars)	Additional official loans (millions of U.S. dollars)	Overall net debt-reduction equivalent		Debt prices	
	Debt retired (millions of dollars)	Percentage of commercial bank debt			Millions of U.S. dollars[a]	Percentage of total debt	Pre-Brady[c] (cents to a dollar)	Postoperation stripped (cents to a dollar)
Argentina	10,723	37	3,732	2,117	8,606	14	18	63
Costa Rica	1,166	73	225	177	989	21	12	39
Mexico	19,033	40	6,812	3,732	15,301	16	36	51
Nigeria	4,221	79	1,681	0	4,221	14	21	45
Philippines[b]	3,553	54	1,451	154	3,399	12	40	76
Uruguay	807	50	413	140	667	15	56	73
Venezuela	5,153	27	1,949	687	4,466	14	37	59
Total	44,656	40	16,263	7,007	37,649	15	31	57

a. The amount is obtained by subtracting the additional official loans from the debt retired.
b. The debt reduction was completed in two phases.
c. Price in the month before the Brady Plan was announced (March 10, 1989).
Source: Claessens, Diwan, and Fernández-Arias (1992) and authors' calculations.

on collateralized par Brady bonds were exchanged for old floating-rate debt. We calculate the difference in the present value of the debt service obligations of the two bonds on the exchange day, assuming that each would be serviced in full as contracted. The methodology used is almost identical to the one used in Claessens, Diwan, and Fernández-Arias (1992). The only difference is the treatment of additional new money, whose negative effect on debt reduction is estimated as a fraction of its nominal value (the fraction being the ex ante price). Because banks' promises of new money were often conditional on countries' serving interest over a period of time (not a sure thing in the absence of the deal, as reflected in low prices), this estimation is probably better.

The third column in table 1 shows the net payment received by commercial banks. This cash was used to purchase collateral for new bonds or more directly for buybacks. In general, however, the reduction in the contractual present value of debt was largely independent of the financial engineering involved. These calculations indicate that the amount of resources devoted to the agreements are more than a third of the reduction in the contracted present value of private debt. Substantial additional official lending partially offset the reduction in commercial bank debt. The fourth column shows the dollar amount of additional loans made to the debtor government by international organizations and creditor governments to support the Brady Plan. Thus the *net* debt reduction represents only 15 percent of total debt (fifth and sixth columns). It is not difficult to see why many analysts doubted that this level of debt reduction would be decisive in reestablishing access to capital markets.

One way to evaluate the direct effects of debt and debt service reduction on secondary market prices is to analyze the market price of debt remaining after the restructuring. Prices of instruments are distorted by various features and attachments, such as collateral, new money promises, and below-market interest rates. Therefore, the last column in table 1 shows stripped prices, that is, the prices right after the operation, adjusted for these distortions. These prices are a good indication of the market view on country creditworthiness once the benefits of the operation are fully factored in. (Like the calculation of debt reduction equivalent, the methodology for estimating stripped prices is taken from Claessens, Diwan, and Fernandez-Arias 1992, except for estimating the impact of additional new money.)

If future repayments to commercial banks are positively linked to the country's future performance, then the efficiency gains of these debt and debt service reduction operations can be gauged by analyzing the impact of the operation on prices. In fact, in the absence of efficiency gains, in proportional terms (stripped) prices would not be expected to increase beyond the decrease in commercial bank debt (second column in table 1). As pointed out by Dooley and others (1990), a full evaluation of the impact of debt reduction on the value of remaining private debt should consider the relative seniority of the various types of debt and the probability that the debtor would have received the loans for another purpose. A hypothesis consistent with

the findings in Demirgüç-Kunt and Fernández-Arias (1992) and in Bulow, Rogoff, and Bevilaqua (1992) is that all creditors have the same implicit seniority and share the net present value of repayments in proportion to exposure. If this is true, then, in the absence of efficiency gains, (stripped) prices would not increase beyond the decrease in total debt (sixth column in table 1). Any excess price increase over the no-efficiency-gain benchmark could then be safely attributed to efficiency gains.

Unfortunately, the task of estimating the increase in prices caused by the debt-reduction operation is extremely difficult because the appropriate counterfactual price—the price prevailing in the absence of the operation—is not observable. Long before the operation was consummated, prices reflected the market expectations on the outcome of the future operation, and thereby contaminated the observed prices to an unknown extent. For example, if the last price quoted before the operation incorporates a perfect forecast of the operation, its comparison with the stripped price does not provide any meaningful information on the effects of a given operation.

Prices before the Brady announcement in March 1989 may not be subject to this contamination, but they do not reflect the changes in economic fundamentals over the period leading to the operation date. For this reason, results based on these prices (shown in the seventh column of table 1) need to be taken with caution. Nevertheless, as analyzed in the next section, the evidence shows significant variation only in international interest rates after most of the first-round Brady operations had taken place. Therefore, except for the recent operations and especially in Argentina, estimations and inferences made on the basis of prices prevailing before the Brady announcement appear reasonable.

Economic Policy Reform

It is plausible that the conditionality associated with the Brady Plan agreements explains the increased market value of existing debt and the turnaround in access to external markets. It is difficult to quantify the effects of economic reform on market valuations of external debt, but it certainly appears that policies changed for the better in Brady Plan countries. The widespread adoption of market-oriented reform programs along with aggressive fiscal reform may have been an additional important channel through which the Brady Plan workouts improved the financial position of debtor countries. It is perhaps not surprising that creditor governments emphasized this aspect of the plan. What may have been surprising, however, was how consistently and aggressively some of the debtor countries implemented fiscal reform changes. This suggests that the impact of fiscal reforms was not fully credible at the time of the debt exchanges (actual execution of the Brady operation). The effect of improved fiscal policies on secondary market prices may have been gradually incorporated into market prices in countries where the reform in fact occurred.

One measure of a number of important policy changes is the increase in government revenue net of expenditures other than debt service—what is usually

Table 2. *The Primary Fiscal Surplus (PFS) and the Operational Fiscal Surplus (OFS) in Selected Countries, 1985–92*
(percentage of GDP)

Country	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*
Argentina								
Primary fiscal surplus	0.8	1.8	–0.9	–1.0	–6.3	1.6	3.5	3.8
Operational fiscal surplus	–6.0	–4.7	–5.6	–6.3	–21.9	–2.9	–0.2	1.5
Brazil								
Primary fiscal surplus	2.1	0.6	–2.8	–0.5	–0.5	2.2	1.0	2.5
Operational fiscal surplus	–4.3	–3.6	–5.7	–4.8	–6.9	1.3	–2.2	–2.2
Chile								
Primary fiscal surplus	0.6	0.5	2.5	6.6	7.5	5.0	2.2	—
Operational fiscal surplus	–2.9	–6.0	–1.0	–1.2	3.1	1.0	–1.2	—
Mexico								
Primary fiscal surplus	3.9	2.2	5.8	8.1	8.4	7.6	8.8	8.7
Operational fiscal surplus	–3.3	–7.0	1.8	–3.6	–1.7	2.3	6.7	6.0
Morocco								
Primary fiscal surplus	0.7	1.2	1.2	2.2	1.8	5.6	5.0	—
Operational fiscal surplus	–5.5	–6.8	–2.6	–1.1	–1.4	2.1	1.5	—
Nigeria								
Primary fiscal surplus	4.7	2.6	2.4	–0.1	5.5	6.5	5.8	—
Operational fiscal surplus	–1.8	–5.4	–4.3	–5.9	0.5	0.4	0.2	—
Philippines								
Primary fiscal surplus	2.4	–1.3	2.7	3.2	1.4	1.1	1.0	—
Operational fiscal surplus	–2.1	–6.1	–0.7	–0.1	–1.6	–2.7	–3.0	—
Venezuela								
Primary fiscal surplus	4.7	0.9	–1.1	–6.1	3.8	6.1	7.1	–0.5
Operational fiscal surplus	–0.2	–9.9	–3.6	–9.9	–1.0	2.1	3.5	–4.5

— Not available.
Source: Goldman Sachs (1991, 1992).

called the primary fiscal surplus.[4] As shown in table 2, some Brady Plan debtors have made very impressive budgetary progress and can finance a considerable percentage of debt service payments through taxation rather than through additional borrowing. Another useful measure of fiscal performance is the operational fiscal surplus (OFS). This is the primary surplus less real interest payments on both domestic and external debt. Improvements in this surplus relative to the primary surplus are caused by a fall in domestic or international real interest rates or a fall in the stock of debt. The impressive improvement of the operational balances in table 2 reflects the combined impact of all of these factors. In

4. Proceeds from privatization are included as revenue.

Table 3. *The Public Debt Ratio in Selected Countries, 1985–92*
(percentage of GDP)

Country	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*
Argentina	72.2	78.6	89.9	95.9	112.3	94.3	68.5	62.0
Brazil	50.6	48.0	48.7	45.6	42.2	40.1	47.1	46.5
Chile	76.9	85.6	83.7	67.7	52.2	39.8	—	—
Hungary	42.5	46.7	56.9	52.6	55.5	54.0	—	—
Mexico	51.9	59.2	54.5	61.7	56.1	48.5	35.0	25.0
Morocco	137.1	127.5	136.3	125.3	117.3	105.2	—	—
Nigeria	50.1	88.2	133.6	118.7	113.3	114.3	—	—
Philippines	57.6	69.5	76.6	73.5	67.3	71.7	—	—
Poland	43.2	48.5	67.2	65.0	73.0	88.9	—	—
Venezuela	41.2	59.9	54.6	53.8	70.4	54.1	46.3	52.0

— Not available.

Note: The public debt ratio includes domestic and external indebtedness of the public sector minus official reserves.

Source: Goldman Sachs (1991, 1992).

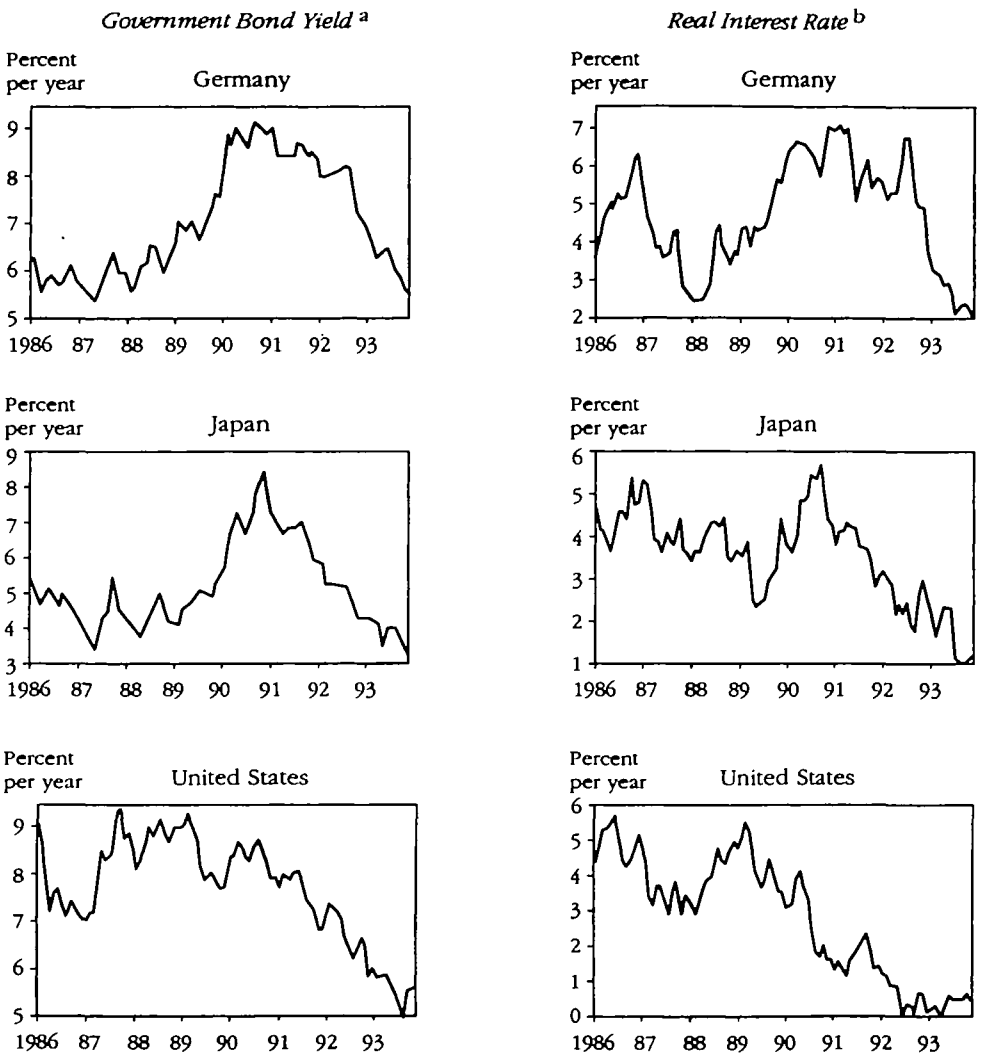
the empirical work that follows we assume that changes in these fiscal balances are correlated with a variety of policy reforms that are difficult to quantify. Although these measures are quite incomplete, it seems unlikely that strong changes for the better in policy regimes would not be closely related to improvements in these fiscal balances.

Improvement in the operational balance has been much more pronounced compared with improvement in the primary balance. An important challenge for evaluating the future is to identify what part of the reduction in real interest payments is a permanent part of the debtor countries' positions. One aspect that is clearly permanent is real debt amortization. A surplus for this operational budget balance for past years means that the real value of outstanding debt is being reduced. As shown in table 3, some debtor countries have made substantial gains in reducing the real value of their net government debt through a normal amortization of domestic and foreign debt. For some countries this has been more important than the debt reduction discussed above. It is also possible that the fiscal reform will generate a permanent reduction in the default premia incorporated in interest rates.

International Interest Rates

Another potential source of improvement in debtor countries' positions has been the change in the external environment. The dominant change after 1989 was a fall in nominal and real interest rates in the United States and, to a certain extent, in other major industrial countries (figure 2). As shown in Dooley and Stone (1993), the rise in international interest rates is the only variable in a regression analysis that has much power in explaining the widespread decline in secondary market prices through 1989. This result is consistent with the hypothesis that the expected present value of payments by debtor countries fell as

Figure 2. *The Government Bond Yield and the Real Interest Rate in Germany, Japan, and the United States, 1986–93*



a. Line 61 in IMF (various years).
b. Six-month London interbank offered rate (LIBOR) (line 60eb) minus inflation (calculated as the change in the consumer price index, line 64).
Source: IMF (various years).

international interest rates rose. Thus, the rise in debt prices after the Brady speech would be consistent with the observed fall in market interest rates.

The potential importance of the fall in international interest rates arises from two sources. First, there are good theoretical reasons to believe that the value of both fixed- and floating-rate Brady bonds should rise more than proportionally to percentage declines in international interest rates. Second, domestic interest

rates paid by debtor governments should fall with international rates, and there are good theoretical reasons to predict that the reduction will be more than proportional.

To evaluate the effects of changes in international interest rates, it is necessary to identify a relevant "discount rate" at which investors translate expected payments from the debtor government into a present value. Since most of the external debt is denominated in U.S. dollars, the appropriate discount rate is a risk-free real interest rate available on a dollar-denominated investment that is similar in terms of maturity and in the terms on which the contractual interest rate is adjusted over time. This is not a straightforward problem. In particular, it would at first seem natural to compare floating-rate sovereign debt to floating-rate risk-free debt. The problem with this approach is that, for risk-free floating-rate instruments, changes in market interest rates alter the nominal value of expected payments in future time periods. But this is exactly offset by the change in the discount rate so that the present value of these payments is unchanged.

With floating-rate sovereign credits that trade at a considerable discount, the effect of a change in the real risk-free rate is quite different. Assuming that the change in the real risk-free rate does not change the government's ability or willingness to pay, the value of expected payments in future time periods does not change. It follows that the present value of these payments does change. Thus, both floating-rate sovereign credits and stripped prices respond to a fall in international interest rates in a manner usually associated with fixed-rate long-term bonds. To the extent that repayments are shared by foreign creditors in proportion to contractual debt service, the response of fixed-rate sovereign credits would be even more pronounced because it would increase the share of fixed-rate debt service obligations in total debt service.

If future payments are expected to grow over time, as can be expected in a growing economy, then the increase in their present value would be proportionally larger than the decrease in the risk-free rate. Furthermore, if the foreign debt is lower in priority of payment to other types of debtor government expenditure, secondary market prices will tend to rise by more than the percentage increase in the present value of total expected payments. This is a potentially important aspect in understanding the relationship between international interest rates and secondary market prices. Unlike substantially risk-free instruments, a fall in the discount rate increases the present value of both floating- and fixed-rate debt of overindebted countries.

Domestic Interest Rates

Recent empirical research has documented a strong link between international interest rates and domestic rates in developing countries (Frankel 1994; Glick and Moreno 1994). Most internal debt is rolled over several times a year in debtor countries, and so real debt service payments are very sensitive to changes in domestic real interest rates. This is an interesting part of these governments' expenditures because, relative to real interest payments to foreign creditors, real

interest rates paid on their domestic debt show a much higher variance and much higher average levels before 1990. Although internal debt is typically smaller than external debt for these countries, changes in ex post real domestic interest payments have been an important component of total debt service costs.

A rise in domestic debt service payments should, for a given overall capacity to pay, reduce expected payments on external debt and in turn lower secondary market prices for external debt. If changes in international interest rates generate qualitatively similar changes in domestic rates, as would be expected if capital markets are at all integrated, this would clearly reinforce the effect of international interest rates on secondary market prices.

Exchange Rates

Government revenue in domestic currency can cover greater debt service payments if the foreign currency value of revenues rises, as happens when the local currency appreciates. Other things being equal, the real appreciation of currencies in debtor countries, shown in figure 3, increased the dollar value of government revenues devoted to external debt service. As with the other variables discussed above, the relevant measure of the real exchange rate is that expected to prevail over the life of the contract. For lack of a better prediction, we can take the current value as an unbiased, but certainly poor, prediction of its future values. Of course, the real exchange rate is not an exogenous variable, so other things are probably not equal. Our assumption that the real exchange rate follows a random walk is a weak but reasonable one, because structural models of exchange rate determination have not performed better than the random walk. It is also possible that changes in the real exchange rate do affect the domestic currency value of the fiscal deficit. For example, the dollar value of oil revenues does not change following a real exchange rate shock. In the empirical work we simply expect a positive relation between the terms of trade and debt prices.

As with domestic interest rates, it is also important to consider the relationship between exchange rates and international interest rates. If capital inflows associated with low international interest rates induce exchange rate appreciation, it follows that we underestimate the effects of exogenous changes in international interest rates on debt prices. Thus, the assumption that real exchange rates are unrelated to other variables in the model probably works against our main hypothesis.

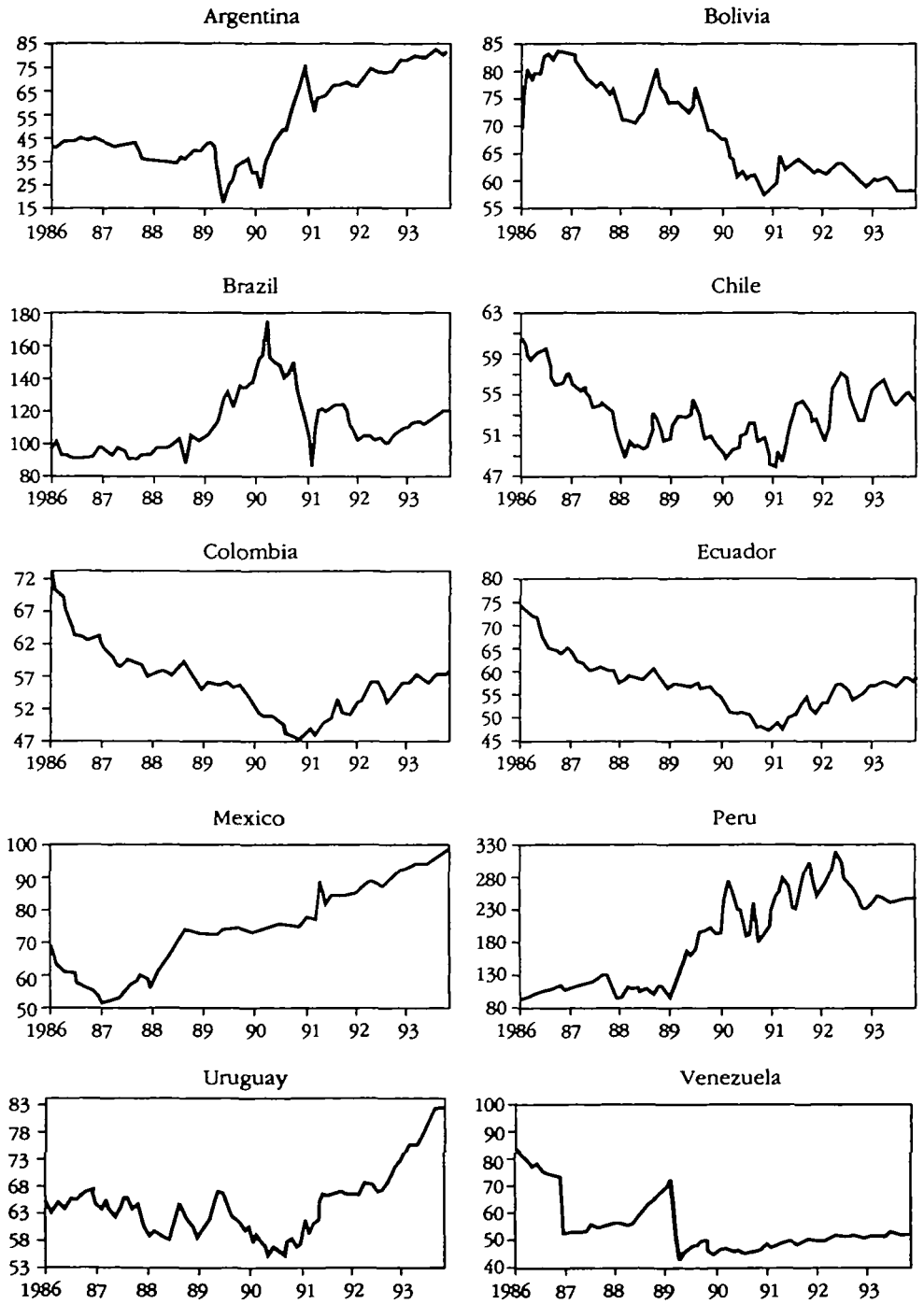
III. A Simple Model of Price Changes

The arguments developed in section II suggest the following regression hypothesis:

$$p_{it} = c + \alpha_i + \beta LTX_{it} + \gamma LTG_{it} + \delta RCT_{it} + \varepsilon r_t + u_{it} \tag{1}$$

where $t = 1, 2, \ldots, T$ is the time index; $i = 1, 2, \ldots, N$ is the country index; p is the logarithm of secondary market prices; LTX is the logarithm of the ratio of

Figure 3. *Index of Real Effective Exchange Rates in Selected Debtor Countries, 1986–93*



Note: An increase in the index denotes a real exchange rate appreciation.
Source: IMF Information Notice System data base.

total long-term debt to exports; *LTG* is the logarithm of the ratio of total long-term debt to GNP; *RCT* is the logarithm of the ratio of commercial debt to total long-term debt; *r* is the logarithm of the long-run (ten-year) U.S. interest rate; c is the common constant term; α_i are the country specific intercept terms; and *u* is the usual error term.

Since our purpose is to show that the substantial increase in the debt prices of Brady countries after 1989 can be easily explained by changes in international interest rates (and the purely arithmetic effect of debt reduction), and therefore does not point to fundamental improvements in the countries' economic prospects, we chose to use a parsimonious empirical model. The above specification simply adds the international interest rate to the usual basic determinants of commercial bank debt prices in the literature: the most common indicators of country creditworthiness (the debt-to-exports and debt-to-GNP ratios) and the share of commercial bank debt in total debt.

In line with the empirical literature, the explanatory variables were assumed to be statistically exogenous. This assumption is clearly justified in the case of the international interest rate, the key variable introduced in this analysis. The use of the change in the debt share caused by exchange rate effects as an instrument for the commercial bank debt share indicates that that explanatory variable, which is largely predetermined, can be also assumed to be exogenous (see Bulow, Rogoff, and Bevilaqua 1992). The resource variables, exports and GNP, are flows during the year prior to the point in time at which prices and debt stocks are measured, and are therefore predetermined. Bulow, Rogoff, and Bevilaqua (1992) also experiment with instruments for these and other variables and conclude that instrumental variable estimation is not needed. The underlying notion behind these models is that, under credit rationing, the value of commercial bank claims as a whole amounts to a piece of the country's resources, which are in turn largely exogenous (there is an analogy here with the value of claims against an insolvent firm). The above specification in terms of price rather than market value (price times stock) is best seen as the rescaling of an underlying value equation corrected for stock-related heteroskedasticity. As a result, the equation was estimated based on a least-squares method, taking into consideration the panel nature of the observations (see the appendix for more details).[5]

As shown in Dooley and Stone (1993), conventional regressors for secondary market prices, such as the debt-export and debt-GDP ratios, measures of the composition of debt, and fiscal variables, explain cross-section differences in prices from 1986 through 1990. But the international interest rate is the domi-

5. Additional variables have been used in the empirical literature to explain secondary debt prices, such as the reserve-import ratio or the proportion of debt in arrears (see, for example, Stone 1991). The endogeneity of these variables is clearly a significant potential problem. External variables other than international interest rates may be also relevant for explaining the comovement of prices across countries. To the extent that external variables are not correlated with interest rates, their exclusion should not induce serious estimation biases.

Table 4. *The Impact of Debt and Interest Rate Variables on Secondary Market Prices in Twenty Developing Countries, 1986–92*

Variable	*Coefficient*
Ratio of total long-term debt to exports, *LTX*	–0.50
	(–3.10)
Ratio of total long-term debt to GNP, *LTG*	–0.36
	(–2.30)
Ratio of commercial debt to total long-term debt, *RCT*	0.09
	(0.86)
Long-run (ten-year) U.S. interest rate, *r*	–0.87
	(–3.17)
Constant term, c	5.67
	(8.70)
R^2	0.36
Adjusted R^2	0.22

Note: Generalized least squares (GLS) was used to estimate the panel regression equation. The dependent variable is secondary market prices. All variables are in logarithms. *t*-ratios are in parentheses. The twenty countries in the sample are Argentina, Bolivia, Brazil, Chile, Colombia, Côte d'Ivoire, Costa Rica, Ecuador, Guatemala, Jamaica, Mexico, Morocco, Nicaragua, Nigeria, Panama, Peru, the Philippines, Senegal, Uruguay, and Venezuela.

Source: Authors' calculations.

Table 5. *The Impact of Debt, Interest Rate, and Fiscal Surplus Variables on Secondary Market Prices in Seven Developing Countries, 1986–92*

	Coefficients for model			
Variable	*Excluding PFS and OFS*	*Including PFS and OFS*	*Including OFS*	*Including PFS*
Ratio of total long-term debt to exports, *LTX*	–0.30	–0.23	–0.24	–0.24
	(0.16)	(0.19)	(0.19)	(0.18)
Ratio of total long-term debt to GNP, *LTG*	0.22	0.20	0.22	0.20
	(0.14)	(0.16)	(0.15)	(0.15)
Ratio of commercial debt to total long-term debt, *RCT*	–0.05	–0.06	–0.07	–0.05
	(0.13)	(0.14)	(0.14)	(0.13)
Long-run (ten-year) U.S. interest rate, *r*	–2.66	–2.57	–2.61	–2.58
	(0.47)	(0.48)	(0.47)	(0.48)
Transformed primary fiscal surplus, *LPFS*[a]		–0.03		0.32
		(1.19)		(0.50)
Transformed operational fiscal surplus, *LOFS*[a]		0.33	0.37	
		(0.74)	(0.80)	

Note: Generalized least squares (GLS) was used to estimate the panel regression. The dependent variable is secondary market prices. All variables are in logarithms. Standard deviations are in parentheses. The seven countries in the sample are Argentina, Brazil, Chile, Mexico, Morocco, the Philippines, and Venezuela.

a. *LPFS* and *LOFS* are positive transformations of *PFS* and *OFS* as a fraction of debt outstanding.

Source: Authors' calculations.

nant determinant of the time-series behavior of prices. A similar finding is reported in Cohen and Portes (1990). An important reason to doubt this result is a clear common trend for prices and interest rates over the 1986–89 time period. In this article we extend the sample period to 1992, a period in which there was a clear reversal in the trend for both interest rates and prices. Results re-

Table 6. *The Impact of Debt and Interest Rate Variables on Secondary Market Prices in Seventeen Developing Countries, 1986–89 and 1989–92*
(full sample)

Variable	*1986–89*	*1989–92*
Ratio of total long-term debt to exports, *LTX*	–0.071	–0.48
	(–3.76)	(–2.47)
Ratio of total long-term debt to GNP, *LTG*	–0.053	–0.55
	(–3.13)	(–3.24)
Ratio of commercial debt to total long-term debt, *RCT*	–0.20	–0.07
	(–1.47)	(–0.55)
Long-run (ten-year) U.S. interest rate, *r*	–4.91	–0.75
	(–9.25)	(–3.24)
Constant term, c	13.96	4.96
	(12.01)	(8.01)
R^2	0.73	0.52
Adjusted R^2	0.61	0.33

Note: Generalized least squares (GLS) was used to estimate the panel regression equation. The dependent variable is secondary market prices. All variables are in logarithms. *t*-ratios are in parentheses. The seventeen countries in the sample are Argentina, Bolivia, Brazil, Chile, Côte d'Ivoire, Costa Rica, Ecuador, Jamaica, Mexico, Morocco, Nicaragua, Panama, Peru, the Philippines, Senegal, Uruguay, and Venezuela.
Source: Authors' calculations.

ported in table 4 summarize panel regressions for annual data for twenty developing countries over the 1986–92 time period. Results for seven countries for which we have data for fiscal balances are reported in table 5. (See the appendix for details on data and econometric methods.)

For the larger sample (table 4), the conventional measures of debt relative to the economic resources available to service the debt have the expected signs, and are statistically significant at conventional levels. These variables presumably capture the impact of debt reduction and improvements in the debt service capacity of the debtor country. For the smaller sample of countries (table 5) the basic model is less satisfactory; inclusion of the primary fiscal surplus does not improve the statistical properties of the basic model, and is not a significant variable. This is consistent with results reported in Dooley and Stone (1993). Our primary interest, however, is on the size and stability of the interest rate effect. As shown in table 4, for the larger sample the interest rate has the expected negative sign and is near the expected value of negative unit elasticity. That is, a 1 percent change in the long-term U.S. Treasury bond interest rate, for example from 5 to 5.05 percent, generates about a 1 percent fall in market price.

To test the robustness of this result, we also divided the larger sample into two periods roughly corresponding to the period of generally falling prices before 1989 and generally rising prices thereafter (table 6). Again, the interest elasticity has the expected sign and is statistically significant, although the absolute size of the elasticity in the earlier time period is implausibly large. While the interest elasticity is –4.91 in the 1986–89 period, it is –0.75 for the period 1989–92. This discrepancy can perhaps be explained in terms of an omitted

variable that would measure increasing investor pessimism. Thus, the elasticity is biased downwards when interest rates made a negative contribution (1986–89) and upwards when interest rates made a positive contribution (1989–92). Such an interpretation is further confirmed when a time dummy is included in the specification of table 4: the time dummy is significantly negative, and the overall estimated interest rate elasticity becomes –1.70. Interest rates exerted a substantial effect in the expected direction during both periods. This is reassuring because interest rates increased in the first period and declined in the second period.

Our interpretation of this evidence is that changes in international interest rates have had an important influence on market prices of existing debt of developing countries and, in turn, on the reentry of residents of these countries to international credit markets. The remarkably parallel evolution of prices in Brady and non-Brady countries shown in figure 1 further confirms the notion that the international interest rates are the key underlying factor.

IV. A Simulation Exercise

In this section we use the results reported in the previous section to assess the importance of interest rate changes and other factors to the evolution of secondary market prices for a composite Brady Plan country. The econometric results support the use of the following simplified model for country *i*:

$$(2) \qquad p_{it} = (c_t^* B_{it})/r_t \quad \text{where} \quad B_{it} = (x_{it})^{1/2} (g_{it})^{1/2}$$

where x denotes the exports-to-debt ratio and g denotes the GNP-to-debt ratio. This simple model has a unitary interest rate elasticity and is homogeneous in the country-specific variables exports, GNP, and debt. One implication of this model is that what matters for the price of commercial bank debt is total debt rather than commercial bank debt. This is similar to findings in other empirical studies, for example, Bulow, Rogoff, and Bevilaqua (1992). We stop short of concluding that all creditors have equal seniority status, however, because this condition is necessary but not sufficient unless restrictive burden-sharing models are assumed (for a discussion, see Demirgüç-Kunt and Fernandez-Arias 1992).

A more concrete assessment of the factors discussed in section II can be generated by this simple model. For the purpose of illustration, the Brady deals concluded in 1990–92 (Costa Rica, Mexico, Nigeria, the Philippines—Phases I and II, Uruguay, and Venezuela) are aggregated, adding up all values as if they were a single country.[6] Consider this composite Brady country in March 1989, when the broad outline of the plan was presented to the market in a speech delivered by Secretary Brady. The contractual value of the outstanding commercial bank debt was about $81 billion, and the average market price was about

6. The Argentina operation is not included because, as noted above, its analysis is complicated by the inapplicability of pre-Brady prices as benchmarks. Although these problems are also present to some extent in other Brady operations, the size of the Argentina operation may significantly distort the average.

$0.35. Total external debt was about $196 billion. The reduction in contractual value of the debt generated by the completed deals as measured by the debt-reduction equivalent was about $34 billion in commercial bank debt and a total net debt reduction of about $29 billion. The stripped price of the remaining commercial bank debt immediately after the restructuring was about $0.54 (computed at the time of each country's restructuring).

The expected present value of payments to commercial banks after the restructuring can be estimated as the stripped price times the debt equivalent outstanding, about $26 billion. The pre-Brady value of the commercial bank debt was about $29 billion. This simple calculation suggests that if the expected value of official debt was unchanged, the initial market reaction to the Brady Plan focused on the debt reduction but did not generate a measurable revision of expectations about the payments on the debt that could be clearly associated with efficiency gains. This interpretation is consistent with the view that official creditors are senior to the banks.

Alternatively, the hypothetical assumption can be made that all creditors are equally senior. (Notice that this assumption is consistent with the simplified model in which prices depend on total debt, rather than commercial bank debt.) In that case, pre-Brady and stripped prices would apply to total debt. Under this assumption, the total expected present value of payments increased from about $69 billion in the absence of the Brady operation to $92 billion after the operation. This would suggest that, in the market's view, Brady operations entail effects that go beyond the arithmetic effect of debt reduction.

For the purpose of this article, there are two important points. First, whatever the improvements brought about by the operations, they are relatively permanent and therefore unlikely to contribute to a down-side risk of falling secondary market prices. Second, after the operations, sovereign risk in these countries, as measured by stripped prices, remains substantial.

We now analyze the evolution of the stripped price in the composite Brady country after the operations to show that improvements thereafter can be fully accounted for by the decline in international interest rates. This implies that, contrary to widespread belief, these improvements in creditworthiness need not be associated with new positive developments in fundamentals in the domestic economy or with the market's learning that the benefits of the Brady operations were larger than anticipated as reflected in the initial market prices. At the completion of the deals, the ten-year U.S. Treasury bond rate was 8.59 percent. In March 1993 the rate stood at 5.85 percent. Other things being equal, our simplified model would predict that this decrease would generate a 46 percent rise in the secondary market price, from $0.43 to 0.63.[7] The actual market price on May 8, 1993, was about $0.66. This is a disturbing result. For the composite

7. We assume here that the expected long-run inflation rate for the United States did not change over this interval. If expected inflation fell, the predicted change in the price would be less because in this case the dollar value of expected payments should increase.

Brady country, virtually all the increase in secondary market prices since March 1989 can be accounted for by the purely arithmetic effect of one permanent factor, debt reduction, and one reversible factor, international interest rates.

Moreover, the remaining increase in market prices can easily be accounted for by real exchange rate appreciations that averaged about 15 percent from March 1990 to March 1993, especially if the market expected this to be a permanent improvement. The corresponding increase in GNP measured in dollars would lead the model to predict a rise in market prices of about $0.03, bringing the predicted price to the actual price of $0.66.

An interesting possibility is that even this calculation may underestimate the role of international interest rates and that the rise in market prices can be overexplained when the indirect beneficial effect on growth (and therefore the increase in the exports and GNP ratios x and g) is taken into account. It seems quite likely that the decline in the dollar risk-free interest rate also accounts for the fall in domestic real interest rates in debtor countries. As discussed above, a fall in international rates should put downward pressure on domestic rates through interest arbitrage. In addition, each of these governments pays a premium to domestic holders of public debt, which in many cases reflects expected inflation and exchange rate depreciation. A change in international interest rates that casts doubt on the ability of the government to finance debt service without resorting to the inflation tax could generate an immediate increase in nominal and real domestic interest rates. Thus, a rise in international rates could generate even larger changes in domestic real rates. If a rise in international interest rates is associated with a more than proportionate rise in domestic rates, the possibility of a large fall in secondary market prices is even more likely.

This suggests that policy reforms may not have been crucial for the composite country. The explanation is that the change in the primary fiscal surplus for the composite country has been strongly negative since 1989. As mentioned above, Mexico has managed a small increase in its operational surplus since 1989, but this is more than offset by Venezuela.

It is possible that the impressive levels of primary surpluses and expectations about improved policies have also played an important role in the observed capital inflows. The difficult question is whether or not these permanent factors could sustain market access if international interest rates and secondary market prices fell to levels seen only three years ago.

It could be argued that the volume of private capital inflows recorded in developing countries is evidence that the improved outlook for these countries is robust to plausible changes in the economic environment. After all, investors are surely aware that international interest rates could rise as the industrial countries recover. The answer to this may be that the volume of private capital inflows is a poor indicator of expectations. In particular, we can think of the debtor-country government as offering foreign investors short-term, dollar-denominated investments that carry an interest rate far in excess of what can be currently earned in the creditor countries.

This is not to say that the debtor governments have again made the mistake of guaranteeing dollar-denominated debts of their residents explicitly as they did with syndicated credits. In this case the exchange and credit guarantees are both implicit. The dominant form of private capital inflow this time is a domestic currency claim on the debtor government, domestic banks, and other domestic firms. The dollar value of these positions depends on the debtor governments' commitment to defending an exchange rate with the dollar. In many cases the government's commitment is strong because it has based its inflation target on a fixed exchange rate. In these circumstances, a devaluation is seen as a major departure from the objective of price stability.

The government's commitment is to some extent credible because it has accumulated a substantial war chest of reserves to be used to defend the exchange rate policy. In recent years, about one-half of the private inflow to Latin American debtor countries has been matched by an increase in official reserves. Thus the investor has some comfort in the fact that the high domestic currency interest rate will also be a high dollar interest rate. Moreover, by keeping investments in the banking system or in government securities, the investor has some assurance that these investments will be backed by the government even if domestic firms become insolvent. This is all quite reminiscent of the late 1970s in that, as long as the private capital flows in and the official capital flows out, there is no reason to limit the size of the capital inflow. In effect, the government is acting as a financial intermediary that lends cheap and borrows dear. The only limiting factor on the volume of such a business is the net worth of the intermediary.

Suppose that the debtor government let the exchange rate be determined in a clean float. Would private capital inflows continue to be very large? Our guess is that they would not, and in fact would not even match the very large current account deficits now being recorded.

V. Conclusions

Secondary market prices may be more informative as a barometer of the financial strength of a debtor country as compared to the volume of observed private capital inflows. A reversal in U.S. interest rates could generate real trouble for debtor countries, particularly if it spreads to domestic markets. The related fall in secondary markets would signal a halt of recent capital inflows, rapid declines in international reserves, and exchange rate depreciation. Fiscal reform has been impressive in a few countries, but in general has not built the kind of cushion into the finances of most debtor countries that could easily offset the debt service payments that would result from an increase in U.S. interest rates. Moreover, additional fiscal adjustment might draw much less popular support if it merely underpins increased service payments.

There have been important permanent improvements in many debtors' financial positions. Debt reduction, both through external debt restructuring and

amortization through operational budget balances, has reduced the vulnerability of a few debtor countries. Moreover, permanent reforms of fiscal systems have strengthened the debt service ability of some countries. Nevertheless, recent capital inflows have not been restricted to countries with strong economic adjustment programs. Falling dollar interest rates have dramatically reduced secondary market discounts, and in many cases brought them close to zero (the limiting situation that characterizes the unrestricted access to markets of solvent sovereign debtors). It seems likely that rising dollar interest rates could reverse this situation.

Appendix. Data and Econometric Methods

The investigation covers the period 1986–92 for seventeen countries and 1988–92 for three countries for which secondary market prices are available. The countries considered starting in 1986 are Argentina, Bolivia, Brazil, Chile, Côte d'Ivoire, Costa Rica, Ecuador, Jamaica, Mexico, Morocco, Nicaragua, Panama, Peru, the Philippines, Senegal, Uruguay, and Venezuela. Because of lack of availability of secondary market prices prior to 1988, the following three countries have a reduced time period (1988–92): Colombia, Guatemala, and Nigeria.

Annual data were used because some of the relevant data are not available at higher frequencies. Using annual data should alleviate serial autocorrelation caused by omitted variables. The bulk of the data for secondary market prices comes from Salomon Brothers (end-of-year price). The world interest rate is captured here by the long-run (ten-year) U.S. interest rate from IMF (various years). Nominal interest rates are used because of the difficulty of estimating long-term ex ante real interest rates.[8] The other variables, that is, GNP, total long-term debt, commercial debt, and exports, are extracted from World Bank (1992). Note that the 1992 figures for the latter variables are projected figures. The total long-term debt includes interest arrears. Commercial debt includes bond debt and interest arrears.

The statistical procedure used in this panel sample was generalized least squares (GLS), where country-specific intercepts were considered random. To the extent that random effects are uncorrelated with the explanatory variables, GLS estimators are consistent and efficient. This hypothesis was tested and accepted at usual confidence levels using the Haussman misspecification test.

The homogeneity implicit in the use of the (log) ratios of total long-term debt to exports, total long-term debt to GNP, and commercial debt to total long-term debt was tested and not rejected at the 95 percent confidence level in the context of a more general model involving the (log of) exports, GNP, commercial debt stocks, and total debt stocks.

8. To the extent that they are correlated, nominal rates are suitable proxies. See Fernández-Arias (1994) for a justification.

Serial autocorrelation does not appear to be a problem according to the Sargan-Frazini test. Correcting for autocorrelation using the Prais-Winsten transformation introduces only marginal changes to the estimations of interest.

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