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WP/92/21

INTERNATIONAL MONETARY FUND

Research Department

A Note on Burden Sharing Among Creditors

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March 1992

Abstract

This paper presents a framework for evaluating the relative contributions of different creditors in cases where only partial payments can be made by the debtor country. A methodology is developed to calculate partial payments--or alternatively put--determine residual financing.

By focusing on the relative seniority of creditors and expectations of the debtor's ability to repay, alternative sharing rules are quantified. The measure is based on the expected present value of payments. Creditors earning a below-market rate of return suffer a burden; creditors earning the same rate of return are said to share the burden equally.

JEL Classification No.:

F34

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<sup>1</sup>/ The authors would like to thank C. Maxwell Watson and other colleagues at the Fund for valuable discussions on this topic. All views and opinions expressed are those of the authors and should not be interpreted as reflecting the official views of the International Monetary Fund.

Table of Contents

Summary	iii
I. Introduction and Summary of Conclusions	1
II. Accounting Framework	2
1. Introduction	2
2. Expected and market values	3
3. Burden sharing if official claims are senior	3
4. Debt reduction financed by a senior creditor	6
5. Burden sharing between equal creditors	6
6. Debt reduction	8
III. Conclusions	10
Appendix I. Mathematical Appendix	12
Appendix II. Notes to Tables	15
<u>List of Charts</u>	
Chart 1. Yield for Official Investor (Without Buybacks)	14a
Chart 2. Yield for Official Investor (With Buybacks)	14b
References	19

Summary

This paper examines the issue of burden sharing among creditors. The introduction of market-based debt-reduction programs has made the financial relationships between debtor countries and their various creditors both complex and important in analyses of debt issues. Because official, multilateral, and private creditors typically hold very different types of financial claims on debtor countries, it is difficult to evaluate their contributions to a given financing package. This paper provides a simple framework that can be used to address this important issue.

The need for such a framework is most apparent in cases where the debtor requires additional financing. In this case, the values of the different types of credits are interdependent, and each creditor must consider the behavior of other creditors before committing to any financing plan. It is necessary to have some criterion by which debtors can make partial payments--or, equivalently, receive partial financing--when their feasible payments fall short of their contractual obligations. The "sharing" among private creditors is typically spelled out in their contracts but is generally not made explicit between official and private creditors.

The framework developed in the paper provides a mechanism for the quantification of the consequences of different sharing rules among different types of creditors. The approach necessarily abstracts from some important aspects of the problem, among them the assumptions required about the relative seniority of creditors and about the relationship between financing arrangements and expectations of the debtors' ability to pay.

Nevertheless, the methodology presented sheds some light on how an appraisal of "burden sharing" might be derived. The measure suggested is based on the idea that each creditor's relationship with a debtor country during a financing program is summarized by the rate of return earned on the market value of the creditor's initial claims on the debtor. Where there is no observable market value--principally official debt--the analogous measure is the expected present value of payments to the creditor relative to the contractual value. The rate of return includes capital gains or losses as well as all payments and receipts generated by financial transactions among creditors and the debtor. These transactions include not only debt-service payments, but "new money" lending and debt- and debt-service-reduction operations.

A creditor is said to suffer a burden if the calculated rate of return is less than the market rate. Creditors earning the same rate of return are said to share any burden equally.



## I. Introduction and Summary of Conclusions

At this stage in the evolution of the debt strategy, it might be helpful to take a closer and more technical look at the issue of burden sharing among creditors. The introduction of market-based debt reduction programs has made financial relationships between debtor countries and their official and private creditors much more complex. Because official, multilateral, and private creditors typically hold very different financial claims on debtor countries, it is difficult to evaluate their contributions to a financing package. The main objective of this paper is to provide a simple accounting framework that might serve as a useful first step in addressing these important issues.

The need for such a framework is most apparent in cases where the debtor is expected to require additional financing for a period of time. In this environment, the values of credits are interdependent and it is natural for a creditor to consider the behavior of other creditors before committing to a financing plan. Suppose, for example, that feasible payments by the debtor are uncertain but that without new credits, payments will likely fall below contractual obligations in some time periods. It is clearly necessary in such cases to distribute the partial payment--or, what is the same thing, to distribute the residual financing--according to some criterion. Among private creditors, the "sharing" of partial payments is typically spelled out in each loan contract. However, "sharing" between official and private creditors is usually not explicitly set out in existing contracts or, if such provisions exist, they may be conflicting.

The lack of a widely accepted analytical framework has led official observers to view the reluctance of commercial banks to provide "new money" as a failure to share the "burden" of financing the debtor country. At the same time, others have argued that banks have taken the "burden" of market-based debt reduction programs and, therefore, cannot also provide new money financing. This paper explores the analytical issues raised by such statements.

The framework developed below provides a quantitative measure of the economic consequences of alternative sharing rules for creditors. This measure necessarily fails to consider some important aspects of the problem. The main limitations of the exercise are that strong assumptions are needed about the relative seniority of creditors, and about the relationship between financing arrangements and expectations concerning the debtor's ability to pay. Nevertheless, the methodology presented sheds some light on how an appraisal of "burden sharing" might be derived. The next step in this research is clearly to provide behavioral models for seniority.

The measure is based on the idea that each creditor's relationship with a debtor country during a financing program is summarized by the rate of

return earned on the market or resale value of a creditor's initial claims on the debtor. In cases where there is no observable market value, the analogous measure would be the expected present value of the payments to the creditor. This is necessarily a subjective measure, and as discussed below, plays an important role in the analysis. The return on the market or expected value of a creditor's claims includes capital gains and losses as well as all payments and receipts generated by financial transactions undertaken with the debtor. Transactions include debt-service payments and "new money" lending as well as swaps, buy-backs or other exchanges associated with debt or debt-service reduction programs. A creditor is said to suffer a burden if this rate of return is less than the rate of return available on an alternative safe investment. Creditors earning the same return share the burden, if any, equally.

## II. Accounting Framework

### 1. Introduction

In negotiating a program with a member country, multilateral institutions rely on quantitative performance criteria that are set and monitored to ensure that their resources are protected. The basic idea behind the concept of burden sharing is that the behavior of other creditors is also important to the success of an adjustment program. The objective of this section is to develop a measure of "burden sharing."

A creditor or group of creditors faces two types of uncertainty. The more obvious is uncertainty about the debtor's willingness and ability to pay. In this paper we reduce this problem to the absolute minimum by abstracting from this, not because it is unimportant, but because this is the central issue for a large literature on debt problems. It is assumed here that the member country's payments to all its creditors are predictable in the sense that a medium-term scenario provides a most likely outcome. Of course, the actual outcome for a given year will never be exactly as expected, and our analysis of burden sharing will take this into account.

In this paper, it is assumed that the distribution of payments among creditors is uncertain. In particular we will look at the hypothetical situation in which the creditors begin each year with a view as to the rule or convention that will determine the distribution of all future payments. Two polar cases are first considered. The first is where one of the creditors is believed to be strictly senior. The second case is where all creditors are believed to have equal status. The analytical framework suggests that the value of various creditors' claims depends on expectations, both for total payments and for the distribution of these payments. In any one time period, a creditor's share of a given payment may be larger or smaller than expected. This additional uncertainty might reflect unexpected behavior by other creditors. For example, a creditor might voluntarily accept a new money security rather than his expected share of the debtor's payment. Or the debtor might direct payments in a manner

inconsistent with what was believed to be the seniority status of various creditors. Finally, a debt or debt-service reduction program might alter the expected distribution of payments. For simplicity, it is assumed in the main body of the paper that the expected pattern of payments is not altered by the ex post distribution in the one time period we will consider. Under this assumption, it is possible to develop a simple accounting framework for measuring burden sharing that might be useful in evaluating medium-term financing plans.

2. Expected and market values

A difficulty in evaluating the burden associated with official lending is that there is no objective measure of the expected value of payments to official creditors. Secondary market prices can be utilized to evaluate expected payments for private debt, but there is no comparable market test for the expected value of official credits. It is clearly possible that official credits are fully valued in cases where private claims on the same debtor country are discounted in secondary markets. This is possible if it is assumed that official claims are senior to private claims. The consistent application of this assumption will lead to the result that official creditors share none of the burden of financing debtor countries regardless of private lending policies. However, in cases where official credits are large relative to private credits, as is typically the case for African and Eastern European countries, the assumption that official claims are de facto senior may not be appropriate. An alternative assumption would be that private and official creditors enjoy equal status. In this case, the values of private and official credits are interdependent and an evaluation of burden sharing requires a comprehensive measure of each creditor's relationship with the debtor.

3. Burden sharing if official claims are senior

Consider the following case. A senior official creditor has \$100 in claims on the debtor country. Private creditors also have \$100 in claims on this country. Private debt sells for \$0.50 in secondary markets. Official debt would sell at par if there was a market because it is assumed that the official creditor is senior (can always be paid first) and that the debtor will always be able to make at least \$100 in present value terms of payments to the official creditor.

For convenience, it is assumed that the expected value of total payments the debtor is willing and able to make to its creditors is fixed at \$150. Moreover, this fixed expected payment remains constant over time regardless of the actual payments made. This fixed present value is allocated according to the seniority of claims so that expected payment to official creditors is \$100 and expected payment to private creditors is \$50.

Suppose in this year the private and official creditors were each due \$10 in interest, \$20 in total, but the debtor country is able to allocate

only \$10 to debt service. 1/ What is the "fair" thing to do? If \$5 cash is paid to each creditor and \$5 in "new money" is obtained from each, it might appear that the private creditor has done better than expected. After all, the junior, private creditor has received payment in a time period in which the senior, official creditor has not received full payment. But this is not the case. Because the official creditor's "new money" claim is assumed to be senior, it is worth \$5. Moreover, the value of the \$100 of existing official claims is not changed since we assume its price remains at par, and its value remains at \$100. In contrast, the private creditors receive \$5 contractual value of new debt, but the market value will depend on the new market price. Two things have happened to depress the market price of private debt. First, the new \$5 of official debt reduces the present value of expected payments to private creditors by \$5 to \$45. Second, the reduced payments will be spread over \$105 of private debt. In a simple model, the price of private debt will fall to about \$0.43. 2/ Thus, the official creditor's net worth increases by \$10, while the net worth of the private creditor is unchanged. Thus, it is rational for the senior creditor to voluntarily provide new credit as long as repayment is assured. For the junior creditor, the fact that the debtor can only make \$10 in payments in this time period means that, at least in this time period, he has absorbed a loss.

The burden of this outcome can be calculated as follows. The official creditors started the year with an investment valued at \$100. They received \$5 cash and \$5 in new claims, with an expected value of \$5, for a rate of return of 10 percent. The private creditors started the year with claims valued at \$50. During the year they also received \$5 in cash but suffered a capital loss of \$5. Thus, the rate of return for the year was zero.

If we assume that the alternative rate of return was 10 percent for both groups of creditors, the official creditors suffered no burden by holding claims on the debtor country, while the opportunity cost or burden for the bilateral creditors was the full 10 percent. This result reflects the fact that the debtor's payment of \$10 in this time period is less than the expected value. Since this shortfall is not expected to be recovered in the future, the junior creditor takes the loss.

This case is summarized in Table 1. Lines 1 to 4 describe the initial conditions, 4-6 describe the financing package, line 7 the implied market prices after the financing package is announced, and lines 8 and 9 the new net worth and the burden for each group of creditors.

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1/ We assume that the ability to pay is determined by exogenous variables such as the terms of trade. The "draw" in this time period is, of course, not known at the beginning of the period.

2/ See notes for Table 1 in Appendix II for an explanation of these calculations.

Table 1

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$1.00	\$0.50
(3) Net worth	\$100	\$50
(4) Interest due	\$10	\$10
(5) Cash interest payments	\$5	\$5
(6) New money bonds	\$5	\$5
(7) New price	\$1.00	\$0.429
(8) New net worth	\$110	\$50
(9) Burden	0%	+10%

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1/ See Appendix II for calculations presented in this and in following tables.

Under the assumptions summarized in Table 1, even if the private creditors were to receive all the cash payment, so that the official creditors receive all the new money bonds, the resulting changes in net worth and burden would be the same. This financing package is summarized in Table 2. The official creditors receive \$10 of new money bonds worth \$10 while the private creditors receive \$10 cash, no "new money" debt and a capital loss of \$10 on old and new debt. This result, of course, reflects the assumption that the official creditors are senior and therefore are not expected to lose as long as the minimum value for the present value of total payments is greater than the contractual value of official debt.

Table 2

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$1.00	\$0.50
(3) Net worth	\$100	\$50
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$0	\$10
(6) New money bonds	\$10	\$0
(7) New price	\$1.00	\$0.40
(8) New net worth	\$110	\$50
(9) Burden	0%	+10%

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4. Debt reduction financed by a senior creditor

The case in which a senior creditor accepts new money bonds, and the resources freed are utilized in a buy-back, is summarized in Table 3. As in the cases discussed above, official creditors do not take on a greater or lesser burden as long as they remain senior. In this case, the private creditors receive \$10 in cash from the buy-back (line 5'), but give up \$22 in debt in the buy-back (line 6') with a market value of \$10.

It is important to note that official debt is growing relative to private debt in each of these scenarios, and this might eventually make the assumptions of seniority and of certain repayment inappropriate. If the official creditors become large relative to private creditors, it might be more appropriate to assume that their de facto seniority is called into question. In Appendix I, it is shown that if seniority decays as a creditor becomes relatively large, there is a significant shift in the burden toward the creditor that is initially senior. The same general conclusions can be drawn from a very simple framework by analyzing the case in which there is no senior creditor. We turn to this case in the next section.

Table 3

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$1.00	\$0.50
(3) Net worth	\$100	\$50
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$0	\$0
(5') Cash buy-back payment	\$0	\$10
(6) New money bond	\$10	\$10
(6') Bond sold in buy-back	\$0	-\$22
(7) New price	\$1.00	\$0.455
(8) New net worth	\$110	\$50
(9) Burden	0%	10%

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5. Burden sharing between equal creditors

In this section, burden sharing between creditors of equal status is considered. Under this assumption, private and official creditors are expected to be treated equally in the sense that each is expected to receive cash payments and accept new money bonds proportional to their exposures.

To illustrate this, assume again that the present value of expected payments to private and official creditors is \$150 so that the market price for private debt is \$0.75 and the expected value of official debt is

consistent with a price of \$0.75. In the current year, each receives proportional cash payments of \$5.

Table 4

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$0.75	\$0.75
(3) Net worth	\$75	\$75
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$5	\$5
(6) New money bonds	\$5	\$5
(7) New price	\$0.714	\$0.714
(8) New net worth	\$80	\$80
(9) Burden	3.33%	3.33%

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As shown in Table 4, the initial price (line 2) is now the same for both official and private creditors. The increase in new money bonds (line 6) causes the price of old and new debt to fall, generating a capital loss for both private and official creditors. In this case, a financing package with equal economic burden requires that creditors share cash interest payments proportionately. Not surprisingly, this is the normal sharing rule utilized to distribute partial payments among individual private creditors.

Another financing profile is summarized in Table 5. In this example, private creditors receive all of their interest in cash while the official sector accepts new money bonds 1/ for interest due on official credits. In this case, the private sector's burden is reduced at the expense of an increase in the official sector's burden. This financing package underlines official creditors' concerns about burden sharing in cases where official exposure increases relative to that of private creditors.

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1/ While the term new money is usually associated with private creditors, it is also clearly relevant to official creditors.

Table 5

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$0.75	\$0.75
(3) Net worth	\$75	\$75
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$0	\$10
(6) New money bonds	\$10	\$0
(7) New price	\$0.714	\$0.714
(8) New net worth	\$78.57	\$81.43
(9) Burden	5.24%	1.43%

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6. Debt reduction

In order to evaluate the effects of debt reduction on burden sharing, it is necessary when dealing with equal creditors to identify the source of resources used for the debt or debt-service reduction. For example, if interest payments owed to official creditors are diverted to buy-backs of private debt, the buy-back reduces the burden taken on by the official sector as compared to the case presented in Table 5 where interest payments owed to official creditors were diverted to interest payments to private creditors. To illustrate this point, it is again assumed in Table 6 that the official sector accepts \$10 in new money securities (as in Tables 3 and 5). But in this case, rather than \$10 in cash interest payments, private creditors receive \$5 cash for interest, \$5 in new money, and \$5 in a buy-back at market prices. As summarized in Table 6, the official sector still bears the greater burden, but some of the burden has been shifted to private creditors.

It is important to note that if the official sector participated in the buy-back the results would not change. The cash received in the buy-back, (line 5' in Table 3) is always exactly equal to the market value of debt sold in the buy-back (line 6' multiplied by line 7). It follows that we could "move" the buy-back transaction from the private creditor's accounts to the official creditor's accounts without altering our measure of burden sharing. In this example, the burden has been partially shifted toward the private creditors because the resources necessary to carry out the debt reduction operation were partly obtained at the expense of interest payments to private creditors. 1/

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1/ This analysis might help explain the banks' reluctance to grant waivers for debt-reduction operations that exceed amounts that can be financed from official sources.

Table 6

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$0.75	\$0.75
(3) Net worth	\$75	\$75
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$0	\$5
(5') Cash buy-back payment	\$0	\$5
(6) New money	\$10	\$5
(6') Debt sold in buy-back	\$0	\$6.93
(7) New price	\$0.721	\$0.721
(8) New net worth	\$79.30	\$80.70
(9) Burden	4.27%	2.40%

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The argument can be further clarified by considering a case in which the equal sharing of interest payments is maintained by setting interest payments to both creditors at zero and using all the debtors' resources for debt reduction. The case in which all the cash goes to banks in the form of buy-backs, and none as an interest payment, is summarized in Table 7.

Table 7

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$0.75	\$0.75
(3) Net worth	\$75	\$75
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$0	\$0
(5') Cash buy-back payment	\$0	\$10
(6) New money securities	\$10	\$10
(6') Debt retired in buy-back	\$0	\$13.75
(7) New price	\$0.727	\$0.727
(8) New net worth	\$80	\$80
(9) Burden	3.33%	3.33%

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This is an interesting result. If the debtor uses all of its cash for a buy-back of private debt (or official debt) and official and private lenders accept new money bonds for interest due to them, the burden is equally shared. It might be noted here that the official sector is better off with the larger buy-back because it shares in the capital gain generated by the increase in price for the debt (relative to Tables 5 and 6).

Finally, if the official sector made new loans in excess of interest due, what might be called "new new money," a greater burden is taken on by the official sector. This case is summarized in Table 8. By arguments similar to those presented above, if the official sector accepted \$10 in new money bonds to cover interest and \$5 in "new new money bonds" to finance buy-backs, the accounting would be as follows:

Table 8

	<u>Official</u>	<u>Private</u>
(1) Initial debt	\$100	\$100
(2) Initial price	\$0.75	\$0.75
(3) Net worth	\$75	\$75
(4) Interest due	\$10	\$10
(5) Cash interest payment	\$0	\$0
(5') Cash buy-back payment	-\$5	+\$15
(6) New money securities	\$10	\$10
(6') New new money securities	\$5	\$0
(6'') Debt retired in buy-back	\$0	-\$20.45
(7) New price	\$0.733	\$0.733
(8) New net worth	\$79.33	\$80.67
(9) Burden	4.22%	2.44%

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### III. Conclusions

The analysis developed above, and in more detail in the attached appendices, provides a framework for evaluating the contributions of various groups of creditors to a debtor country's financing plan. It does not, of course, provide guidance as to how a financing burden "should" be allocated among creditors. No purely analytical framework can provide answers for this question. Moreover, creditors may disagree on the debtor country's ability to pay--an issue not addressed in this paper.

Nevertheless, an exercise along these lines might at least serve to clarify the sources of potential conflicts among creditors and debtors. The framework itself suggests some general conclusions:

A small, senior creditor does not share an economic burden in granting new loans to a problem debtor as long as it remains small and senior and does not forgive debt. This conclusion follows from the fact that if this creditor's claims remain sufficiently small and senior, the debtor will always be able to fully service them, if necessary at the expense of other creditors. Thus, new senior lending at risk free interest rates, as well as existing senior credits, are always fully valued. In contrast, if a senior

creditor forgives debt, its net worth falls by the contractual value of debt forgiven.

In evaluating the burden of new lending, a creditor with existing senior claims would have to determine if, at some point, it would become too large to be de facto senior to other creditors. If the creditor remains small and senior, there is no burden from new lending. But if the creditor becomes large enough not to be senior, the analysis for equal creditors discussed below would likely be more appropriate.

The burden sharing among creditors that are expected to share in repayments proportional to their credits is quite different. 1/ If each creditor provides new money lending and receives cash interest payments in proportion to their initial stock of claims, the burden is equally shared. Sharing payments proportionately and sharing "new money" financing proportionately are, of course, two sides of the same coin. Equal creditors that provide a larger than proportionate share of new financing bear a greater burden.

Equal creditors will be concerned about the sources of funds for debt reduction, but once sources are identified, burden sharing is not influenced by participation in debt reduction transactions. It follows that the burden taken on by a group of creditors cannot be evaluated by asking whether or not they participated in voluntary debt reduction programs as sellers of debt; the relevant question is whether or not a creditor helped finance the debt reduction.

These two conclusions imply that a creditor that receives a less than proportionate interest payment (makes greater than proportionate new loans) can, under conditions set out in Appendix I, offset the implied burden if some part of the lost interest payment is used in a buy-back or equivalent debt-reduction program.

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1/ A simulation model which endogenizes the sharing rule has been developed by the authors and is available on request. In this model the share of payments going to an individual creditor is related to that creditor's initial expense.

Mathematical Appendix

The application of the above framework to individual debtor countries is facilitated by setting out general expressions for rates of return. This allows us to see what parameters are important and to calculate a quantitative application for a particular debtor country. The general expression for the yield for an individual creditor is

$$y_i = \frac{c\alpha r}{P_1 s} + \frac{P_2 D_2^i}{P_1 D_1^i} - 1 \quad (1)$$

- $y_i$  = yield on i's claims on the debtor
- $D^i$  = individual's holdings
- $c$  = share of interest payments made to i
- $\alpha$  = share of contractual interest payments made by debtor
- $P_1$  = initial market price
- $P_2$  = expected price at end of period
- $s$  = share of debt
- $r$  = interest rate

To solve equation (1) we need to express the end of period price  $P_2$  in terms of the other parameters. To do this, it is assumed that the expected value of debt service has a single unchanged value in each time period. In this special case

$$P_1 D_1 = P_2 D_2 \quad (2)$$

It follows that

$$y_i = \frac{c \alpha r}{P_1 s} + \left[ \frac{1}{1 + fr} \cdot \frac{s(1+r) - c\alpha r}{s} - 1 \right] \quad (3)$$

$$\beta \equiv (1 - \alpha)$$

The first term on the right-hand side of equation (1)  $\frac{c\alpha r}{P_1 s}$  is the yield for creditor i from the cash payments he receives. This yield is shown in Chart 1 as A B. 1/ As  $c$ , the share of the debtor's total cash payment, increases, creditor i's cash payment rises and his rate of return increases.

As the creditor's share of the total cash payment rises, his share of the new money bonds issued by the debtor falls. The increase in the contractual value of the creditor's claims is captured by the term,

1/ The chart roughly represents a country for which:  $r = 0.10$ ,  $s = 0.38$ ,  $c = 0.3$ ,  $P_1 = 0.17$ .

$\frac{s(1+r) - car}{s}$ , in equation (3). Finally, the change in the market price of the creditor's claims depends upon the total new money bond issue and this is captured by the term,  $\frac{1}{1 + \beta r}$  in equation (3). These two effects are shown in line C D in Chart 1.

It is possible that  $car > s(1+r)$ . In this case, we assume that the creditor receives an amortization payment so that his stock of claims is reduced at a price of unity.

In analyzing this case, it is natural to start from a situation in which the creditor's share of the initial stock of debt is equal to his share in partial payments. This is of course where "equal sharing clauses" among private contracts would place the individual creditors. In the example shown, the official creditor has about 30 percent of the initial stock of debt. We assume that the debtor is able to pay 30 percent of its total contractual interest obligation. If  $c = s$ , then the official sector gets its share of this payment. The first component of the yield is simply  $\frac{ar}{P_1} = 18$  percent.

The second component is also interesting. Because  $c = s$  the official creditor's share of the new money financing is also equal to its share in the initial stock of debt. We know that the issue of new money securities will, assuming unchanged expected payments, leave the value of total debt unchanged. Thus, the increase in the total stock of debt must be exactly offset by a fall in the market price. Since the change in the market price is the same for all creditors and since when  $c = s$  the official creditor receives a proportionate share of the new money securities, it follows that the second component of the rate of return is equal to zero. In Chart 1, C D intersects the horizontal axis at  $c = s = 0.3$ .

To the right of  $c = s$ , the official creditor receives a percentage increase in new money securities that is smaller than the change in the market price of all debt so that this component of his yield is negative. To the left of  $c = s$ , the increase in the stock of debt dominates the fall in prices so that this component is positive.

It is clear, however, that in this simple case the individual creditor will always prefer a larger share of the cash payment. This will be true for any set of parameters as long as the initial price is less than unity.

As argued above, however, it may be possible to give up a share of the cash payment if the other creditors help finance a debt reduction program.

This possibility can be explored by modifying the above analysis to allow for some diversion of interest payments to other creditors to a buy-back or an equivalent debt-reduction program.

The only component of equation (2) that is modified by a buy-back financed by other creditors is the capital gain or loss due to the change in market prices. Suppose, for example, that half of all interest payments to other creditors is diverted to a buy-back. In this case, the total stock of debt at the end of the period will be reduced by an amount equal to  $1/2 (1-c) \alpha r D_1/P_2$ . The new solution for the total yield is

$$y^i = \frac{c\alpha r}{sP_1} + \frac{P_1 + 1/2 (1-c)\alpha r}{P_1(1+(1-\alpha)r)} \frac{s(1+r) - c\alpha r}{S} - 1 \quad (4)$$

If  $c = 1$ , there is no payment to the other creditors, no buy-back, and equation (4) is the same as equation (3). Thus, the capital gain component of the yield shown as E F in Chart 1 intersects C D at  $c = 1$ . To the left of  $c = 1$ ,  $P_2$  and therefore the capital gain for the official creditor is greater. As shown in the chart, E F is (slightly) nonlinear in  $c$ . The lower the initial price of debt the more E F rotates up from C D. Thus it is not possible to generalize about the trade-off between cash payment and financing debt reduction. Nevertheless, a simple simulation model can quantify alternative financing plans.

The total yield for the official creditor without buy-backs is the sum of A B and C D, shown as G H in Chart 1. The total yield if one-half of interest payments to other creditors is diverted to buy-backs is the sum of A B and E F, shown as I J in Chart 1. Chart 2 reproduces the total yield curves from Chart 1. Suppose, for example, that other creditors agreed to one-half of their interest payments being diverted to finance buy-backs. Starting from a cash payment at 30 percent of the total, official creditors could reduce their cash receipts to about 16 percent and maintain the same yield and therefore the same burden.

Alternatively, the official sector could forgive debt which would shift both curves down. Again, starting from a share of 30 percent official creditors could forgive about one-half of their share of debt if other creditors agreed that all of their interest payments be diverted to buy-backs.

Finally, a similar chart drawn for private creditors could help explain why private creditors are anxious to have officials finance buy-backs. In this case, the yield on private credits would rise if official receipts were diverted to debt reduction.

Chart 1. Yield for Official Investor (Without Buybacks)

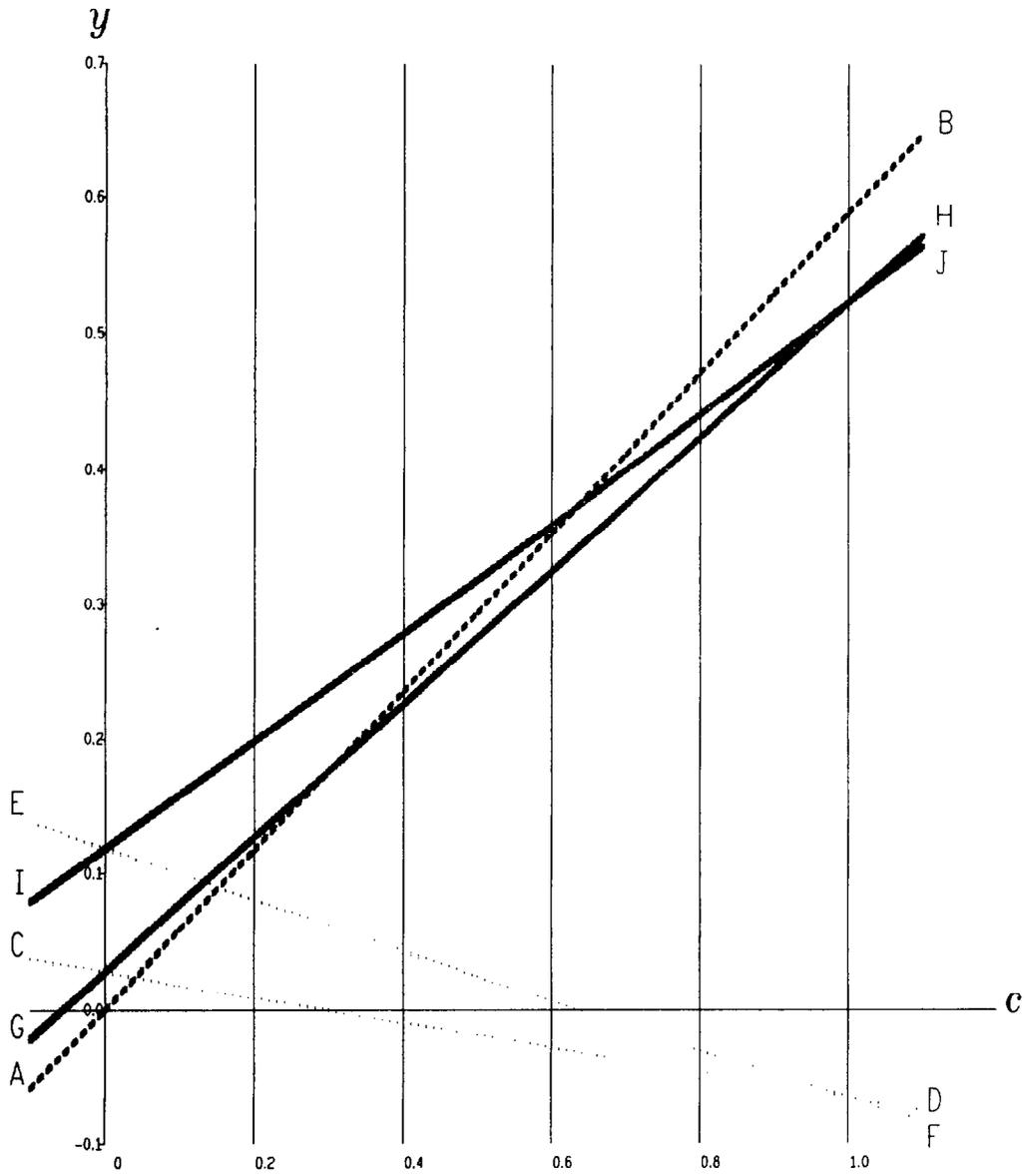
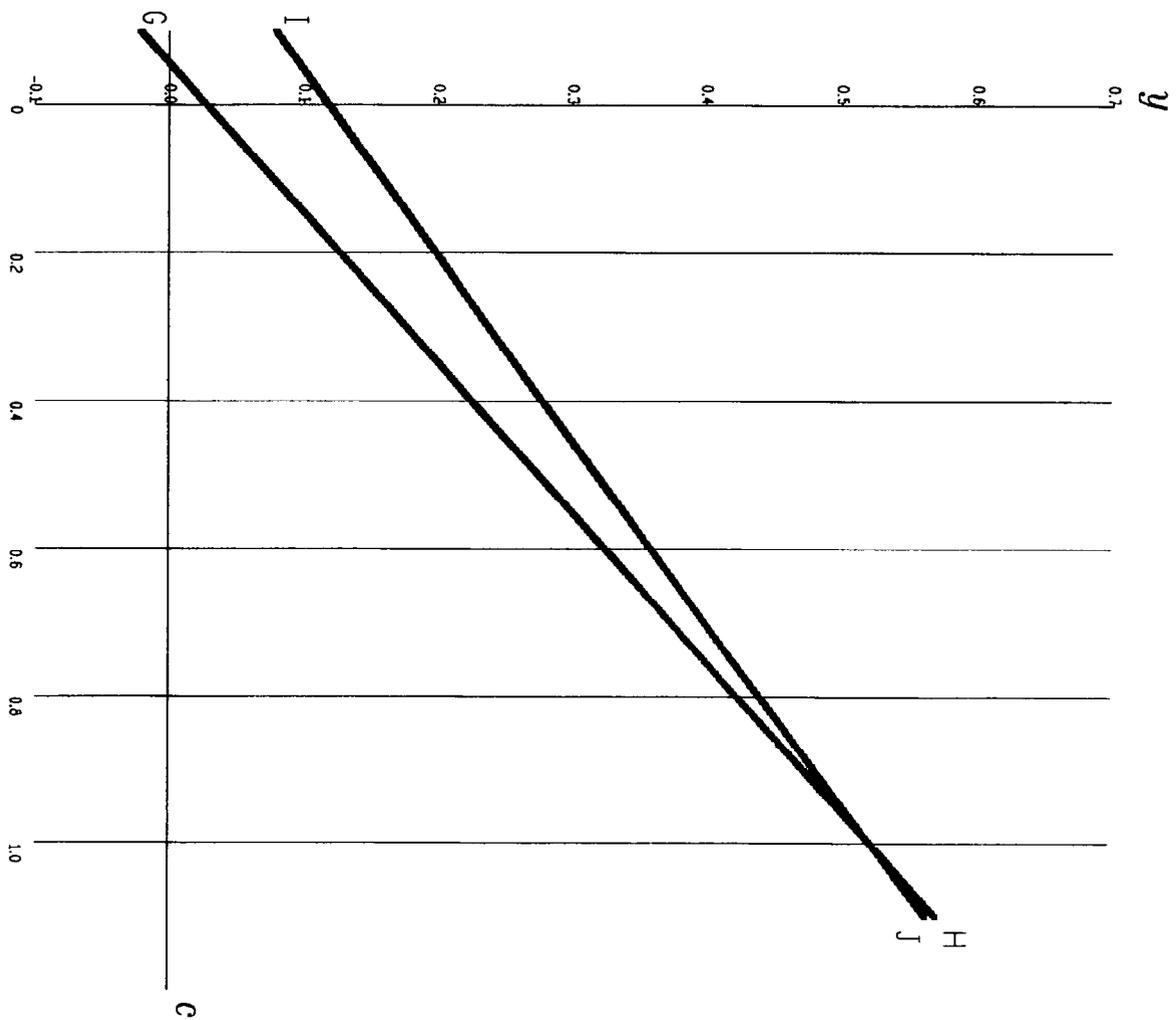




Chart 2. Yield for Official Investor (With Buybacks)





Notes to Tables

Tables 1, 2

Line 2. Initial price

In the examples presented in the tables, it is assumed that the expected present value of total payments by the creditor has a single value and that this value is not altered by the realization of the actual payment in this time period.

Define:  $v^T$  = Expected present value of total payments to creditors  
 $v^P$  = Expected present value of payments to private creditors  
 $v^O$  = Expected present value of payments to official creditors

The initial debt price is the ratio of the present value of expected payments to that class of debt divided by the stock of debt inherited from the previous time period (line 1).

Define:  $P^P$  = Market price of private debt  
 $P^O$  = Imputed price of official debt

Because  $v^T$  is assumed to equal \$150 and initial official debt,  $D_o^O$ , has a contractual value of \$100 and is senior, it follows that the expected present value of payments to official creditors is \$100. The implied price of official debt is therefore:

$$P_o^O = \frac{V_o^O}{D_o^O} = \frac{\$50}{\$50} = \$1.00 \quad (1)$$

The residual payments to private creditors imply the initial market price:

$$P_o^P = \frac{V_o^P}{D_o^P} = \frac{V_o^T - V_o^O}{D_o^P} = \frac{\$50}{\$100} = \$0.50 \quad (2)$$

Line 3. Net worth

The initial net worth is simply the expected present value of interest payments.

Line 4. Interest due

By assumption all debt carries an interest rate of 10 percent.

Line 5. Cash interest payment

By assumption.

Line 6. New money

The difference between contractual interest payments and cash payments, C, must be new money lending, NM. Note that this is not a "new" exposure nor does money change hands.

$$NM^P = 0.1 * D_o^P - C^P$$

$$NM^O = 0.1 * D_o^O - C^O$$

Line 7. New price

The new price for official debt is

$$P_1^O = \frac{V^O}{D_o^O + NM^O} = \frac{\$105}{\$105} = \$1.00 \quad (3)$$

The new price for private debt is

$$P_1^P = \frac{V^T - V^O}{D_o^P + NM^P} = \frac{\$45}{\$105} = \$0.4286 \quad (4)$$

Line 8. New net worth

The end of period net worth summarizes the consequences of holding the initial stock of debt. It is simply the market value of initial debt plus any new money debt acquired during the period plus the value of payments received during the period.

$$NW_1^O = (D_o^O + NM^O)P_1^O + C^O \quad (5)$$

$$NW_1^P = (D_o^P + NM^P)P_1^P + C^P \quad (6)$$

Line 9. Burden

The burden of holding claims on the debtor during this period, is summarized by the ratio of  $NW_1$ , and the end of period net worth that would have occurred if the initial debt had been sold at beginning period prices and invested at the risk-free interest rate (10 percent),  $1.1 * NW_o$ .

$$B^0 = 1.1 - \frac{NW_1^0}{NW_0^0} = 0 \tag{7}$$

$$B^P = 1.1 - \frac{NW_1^P}{NW_0^P} = 0.10 \tag{8}$$

Tables 4 and 5

Calculations are identical to those discussed above except for a new sharing rule for payments. Since official and private creditors are assumed equal, each expects to receive proportionate payments. This alters equations (1)-(4) as follows:

$$P_0^O = \frac{V_0^O}{D_0^O} = \frac{V_0^T * D_0^O / D_0^T}{D_0^O} \tag{1a}$$

$$P_0^P = \frac{V_0^P}{D_0^O} = \frac{V_0^T * D_0^P / D_0^T}{D_0^P} \tag{2a}$$

$$P_1^O = \frac{V_1^O}{D_1^O} = \frac{V_1^T * (D_0^O + NM^O) / (D_0^T + NM^T)}{D_0^O + NM^O} \tag{3a}$$

$$P_1^P = \frac{V_1^P}{D_1^P} = \frac{V_1^T * (D_0^P + NM^P) / (D_0^T + NM^T)}{D_0^P + NM^P} \tag{3b}$$

where  $V^T$  = expected present value of total interest payments  
 $D^T$  = total debt  
 $NM^T$  = total new money borrowing

Tables 3 and 5-7

Tables 3 and 5-7 incorporate buy-backs. Since a buy-back involves an exchange of cash for securities, line (5') is added to account for cash received in buy-backs and line (6') is added to account for debt retired in the buy-back. The calculations are identical to those reported above, except for the changes generated by a buy-back. To account for this in (3), (3a), and (3b)

$$D_1^P = D_0^P + NM^P - BB/P_1^P$$

where BB is the cash received in the buy-back and (6) is replaced by

$$NW_1^P = D_1^P * P_1^P + C^P + BB^P$$

Table 7

If the official sector lends more than is necessary to finance interest payments

$$D_1^O = D_0^O + NM^O + NNM^O$$

otherwise calculations are the same as above.

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