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Considerations in the Choice of the Appropriate Discount Rate for Evaluating Sovereign Debt Restructurings

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Considerations in the Choice of the Appropriate Discount Rate for Evaluating Sovereign Debt Restructurings

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Abstract

Assessments regarding the effectiveness of sovereign debt restructurings are often summarized by comparisons of the net present value of debt service before and after the restructuring. These calculations are inherently sensitive to the choice of discount rate. This paper explores issues that arise in selecting discount rates when evaluating sovereign debt restructurings. It suggests using a range of discount rates and centering the analysis around the internal rate of return to assess whether the debt restructuring has generated net present value savings or costs to the debtor.

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I. Introduction

As part of its effort to resolve financial crises in member countries, the IMF is routinely called upon to make judgments regarding the effectiveness of sovereign debt restructurings. For emerging market countries, this judgment is often based on an evaluation of whether a debt restructuring—an agreement between a country and its creditors to ease the repayment terms or, in the most severe cases, reduce the value of the country's debt, often because it cannot be repaid under any feasible set of policies—is sufficient to restore sustainability.[2] [3] Such evaluations are very difficult to make in practice as they involve many factors. These include the tradeoff between near-term cash flow savings and longer-term debt-service costs; assessments regarding the timing, pace, and cost of regaining market access; and the effective removal of a debt overhang, among others. Frequently, the assessment is summarized by comparisons of the net present value (NPV) of debt service before and after the restructuring. Regardless of the method used, however, the principal question from the point of view of the IMF and the member involved is whether a given debt restructuring contributes to (or is part of a policy package ensuring) the restoration of debt sustainability.

This paper focuses on a key aspect of such assessments, namely the choice of discount rate used to calculate the NPV for evaluating sovereign debt restructurings in emerging markets. The discount rate, through its effect on NPV calculations, influences conclusions regarding

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[2]This paper is limited to examining *debt restructurings* in the context of crisis resolution, where restoring debt sustainability is of paramount importance (e.g., Pakistan, 1999; Russia, 2000; Ukraine, 2000; Uruguay, 2003). Other debt operations, such as liability management swaps and debt buybacks, are less likely to be evaluated in circumstances of financial distress or a restoration of debt sustainability, making the assessment of these operations distinct from debt restructurings, particularly with regard to the relationship between perceptions of country risk and the discount rate.

[3]Judgments about debt sustainability involve assessing whether a country's debt can be serviced without an unrealistically large correction in the balance of income and expenditure.

the contribution of a debt restructuring to restoring debt sustainability, the size of the haircut, and the required fiscal position—all of which are key and interrelated elements in determining whether a debt restructuring could satisfy the objectives of a Fund-supported program.

NPV estimates—while appealing in that they capture, in compact form, the time value of a stream of debt-service payments—are not the only method for assessing the effect of a debt restructuring. Although discounting a stream of payments associated with a restructuring can add some value in assessing a debt restructuring, this value is limited, can be misleading, and does not contain enough information to allow the IMF (or a member country) to fully evaluate a debt restructuring operation. For instance, the sensitivity of NPV calculations to the choice of the discount rate can affect assessments in individual country cases and has led to some skepticism regarding their use. Moreover, NPV estimates are used in a variety of circumstances to satisfy diverse objectives, and there is no consensus among IMF staff on the choice of the appropriate discount rate. In practice, a seemingly arbitrary array of discount rates has been used in staff assessments, and documentation has been limited at times.[4] All this, in turn, may lead to inconsistent underlying assumptions (and, by extension, conclusions) in analyzing the impact of debt restructurings. Thus, the evaluation of debt restructurings would require the use of a variety of techniques, including NPV calculations and other methods suggested in Box 1.

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[4]This is in contrast to the long-established rules for determining the concessionality of a loan, which are routinely included in the IMF's country documents, as a standard feature of Fund-supported programs and under the HIPC Initiative

Box 1. Additional Ways of Evaluating Debt Restructurings

While NPV calculations are widely used in evaluating a debt restructuring, some have argued that, precisely because of the difficulties in reaching a consensus on the discount rate, other methods, accompanied by appropriate stress tests, may be more useful. Several of these are discussed below.

- **Profile of debt service and near-term cash savings**. While debt restructurings can take a variety of forms, it is often the case that the restructuring is undertaken in order to reduce short- and medium-term debt-service humps, particularly in the face of emerging financing pressures. In such cases, debt service is often reprofiled with lower debt service in the near-term compensated for by higher debt-service payments later on, and the freeing up of collateral in some cases (e.g., Brady exchanges). The evaluation of a debt restructuring would need to take into account any qualitative benefits of such reprofiling, particularly with regard to "breathing space" to allow the country to implement, and ultimately reap the benefits of, necessary reforms.

- **Required fiscal position**. Related to the debt-service profile is the fiscal position (i.e., the primary surplus) needed to meet future debt-service payments. Clearly, it is unreasonable to expect that future debt-service payments will be made through an unrealistic fiscal correction. That is, debt sustainability cannot be said to have been restored if the required fiscal effort is no longer feasible.

- **Impact on default premium and market access**. A difficult issue to evaluate when examining a debt restructuring is the likely effect on the default premium that the debtor faces, and its ability to regain market access. While movements in spreads can be readily observed, it is more difficult to assess whether a debt exchange will successfully reduce rollover risks through improved market access.

- **Removal of a debt overhang and growth effects**. The debt overhang theory[1] suggests that a high debt stock creates a perception of higher (and more distortionary) future taxes needed to service the debt, which reduces incentives to invest and lowers growth. If the theory is correct, removal of the overhang through a debt restructuring can improve the debtor's growth prospects. More generally, the debtor's ability to take advantage of the breathing room created by the debt exchange to implement needed policies is critical to ensuring that debt problems do not re-emerge in the future. Understanding the linkages between the required policy adjustment and the growth path is crucial for determining whether the debtor will indeed be able to "grow out" of the debt problem.

[1] See Cohen and Sachs (1986), Krugman (1988), Sachs (1989), Cline (1995), Agénor and Montiel (1996), and Servén (1997). For a brief summary of the literature see Pattillo and others (2002) or Loko and others (2003).

Against this background, this paper lays out some issues for guiding the choice of discount rate. It briefly examines the analytical concepts and methods relevant for key players (i.e., creditors, debtors, and the IMF) in selecting discount rates, and illustrates the impact of the choice of the discount rate with some country examples. Based on various considerations, the paper proposes use of the internal rate of return (IRR)—the discount rate that equalizes the NPV of two streams of debt-service payments—as a benchmark for assessing whether the debtor would face NPV savings or costs as a result of a debt restructuring. It also suggests that a range of discount rates be used when evaluating debt restructurings, with the lower bound of the range guided by a measure of the debtor's repayment capacity such as the GDP or export growth rate, and the upper bound by spreads likely to prevail after the debt restructuring, but outside the period of financial distress, in order to avoid distortions associated with abnormal risks of default. This could improve transparency within the IMF on the use of discount rates in NPV calculations.

The paper is organized as follows. Section II discusses conceptual considerations; Section III presents the market's perspective on discount rates; Section IV examines the choice of discount rate from the debtor's perspective and reviews the pros and cons of some of the most commonly used rates. Section V outlines a framework for selecting discount rates, and Section VI offers some concluding remarks.

II. Some Conceptual Considerations

The calculation of the NPV involves discounting a payment stream by an "appropriate" interest rate which would generally be expected to reflect the opportunity cost of funds of the issuer. The NPV serves as a tool for evaluating different payment streams at a given point in time, and first principles suggest that the NPV should represent the "commercial equivalent" of the stream of payments discounted. That is, it should provide the amount that, if invested at the commercial interest rate which the country can earn, would be sufficient to cover obligations represented in the payment stream (Box 2).

To start with, the discount rate is meant to capture the value of making or receiving a payment in the future, as opposed to today (i.e., the time value of funds). In the case of debt, from the perspective of the sovereign, the opportunity cost embedded in the discount rate is the return that a country can obtain by investing funds, if it did not have to pay debt service

Box 2. Calculating the NPV

In practice, NPV calculations may be subject to a variety of interpretations:

- **Creditor/debtor perspective**. The NPV may be calculated from the point of view of the creditor or the debtor. The distinction arises because the creditor may insist on receiving a premium, or spread, which reflects the perceived probability of default. It is difficult to interpret this default premium from the point of view of the debtor, especially at times of financial distress when the probability of default is large and possibly increasing. There is no consensus on whether the NPV calculations should reflect the different perspectives of creditors and debtors, as they would depend, at least in part, on asymmetries of information. While it is possible that the probability of default perceived by the creditor is "justified" in that it represents the "true" probability of default, there may be different perceptions of default risk from the creditor and debtor sides.[1]

- **Repayment capacity**. Discount rates reflecting economic fundamentals, such as GDP or export growth rates, are sometimes used in NPV calculations when the NPV is associated with an evaluation of a country's capacity to tolerate its debt burden.

- **Debt stock**. NPV calculations have also been used to derive a debt stock concept capturing the time-value of debt-service payments. If debt is contracted on market rates (with coupons equivalent to the market rate) and the NPV is calculated using the same market discount rate, the NPV and the face value of debt (at issuance) are equal, provided that the debt is not issued at a discount. An NPV of debt that is lower than the face value (through an interest rate below the market rate, possibly combined with an extension of maturities) signals that the debt contains a grant element (equivalent to one minus the ratio of the NPV to the face value).

[1]Since prospective repayment involves both capacity and willingness to repay, it is possible that debtors and creditor perceptions differ. See Corden (1989) for a nice summary of asymmetric information in the context of an international debt facility.

today. For instance, assume that a country borrows in order to finance a project and that the project yields (early) returns in excess of the debt service. Under these circumstances, the debtor can invest the excess returns in other, typically risk-free, assets and earn the risk-free world rate of return. This could also be the case if the debtor decided to set aside resources or invest in a sinking fund from which to make payments at a later date. Conversely, if the project yields returns that are lower than the debt-service payments, the debtor will need to reduce its reserve holdings in order to meet its debt-service obligations, thus forgoing the earnings on its reserve holdings, which are, again, typically equivalent to the risk-free world rate.[5]

Alternatively, the corporate finance literature suggests that a firm's appropriate discount rate refers to its cost of capital.[6] The logic of this literature can be extended to sovereigns. The implication is that the appropriate discount rate would be risk-adjusted, reflecting the market assessment of individual country risks, including those related to non-payment (i.e., default) and other related conditions (i.e., the liquidity of the underlying securities, capital controls, etc.). Under this reasoning, the decision to fund an investment by issuing debt is based on the results of discounted cash flow calculations, with the cost of funds used as the discount rate. Along these lines, it has been argued that, by reducing debt-service payments through a debt restructuring, debtors are "saving" at a rate equal to the country-specific interest rate at which they borrow. Similarly, one could imagine a situation in which the debtor refinances (part of) its debt stock over time at the country-specific rate at which it can borrow from the market.

Use of a country-specific rate, rather than a risk-free world rate, would recognize the fact that emerging markets countries are generally not able to borrow at the risk-free rate, and that their spreads reflect individual country risk as well as overall market premia. In addition, use of a country-specific rate would underscore the possibility that countries coming out of a crisis may find themselves in an equilibrium different than that prevailing before the crisis. In particular, because of possible inertia in market confidence and credit rating assessments,

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[5]Although in any given time period, the debtor could borrow (rather than draw down reserves) to meet its debt-service obligations, this can not go on indefinitely. If projects continually yield returns that are lower than the associated debt service, the debtor would eventually need to reduce reserves in order to meet its debt-service obligations.

[6]See, for example, Bodie and Merton (2000).

sovereigns may face higher borrowing costs after the crisis than those prevailing under "normal" circumstances before the crisis. Similar results may arise in cases where markets perceive the exit from the crisis as lacking complete credibility (i.e., temporary in nature). This would suggest that discounting by the risk-free world rate, and in some cases by the borrowing rate prevailing before the crisis, could overstate the longer-term costs associated with a debt restructuring.

That said, care is required when interpreting the resulting NPV calculations. Using a discount rate which includes, among other things, a high risk of nonpayment would reduce the NPV of a given debt-service stream compared with one that includes a lower risk of nonpayment. This is consistent with the fact that the market values the debt of a country when it is in crisis at less than it values the same debt when the country is not in crisis. However, from the country's perspective, the nominal amount of debt service is unchanged whether it is in or out of crisis.[7] Thus, when debt sustainability is of paramount importance, debt restructuring assessments should ensure that a reduction in the NPV comes from adjustments in the debt-service profile (i.e., a reduction in interest rates paid on the debt or a lengthening of duration), as opposed to adjustments in the discount rate. This is a factor that may be especially relevant at times of crisis.

III. The Market's Perspective on Discount Rates

In most circumstances, debtors and creditors have different objectives when entering into and assessing a debt restructuring. One would expect that debtors, and for that matter the IMF,

[7]Debt-service costs of new borrowing would likely increase during a crisis, if such borrowing were possible. However, the existing debt stock, to the extent that it comprised long-term debt at fixed interest rates or obligations to international financial institutions (which do not include a risk premium on their lending), could be expected to have stable debt-service costs.

would be concerned with the goal of restoring debt sustainability. Creditors, on the other hand, are typically interested in maximizing their (risk-adjusted) expected returns, which depend, in part, on the probability of nonpayment by the debtor. Because of this divergence of objectives, the appropriate discount rate from the creditor's perspective may differ from that from the debtor.

Given that creditor participation and market acceptance are crucial to the success of a sovereign debt restructuring, it is important for the debtor, and for that matter the IMF, to keep the market perspective in mind. Market participants are generally concerned with whether and how much of the original claims they will be repaid (i.e., the size of the haircut). Thus, they will examine the streams of debt-service payments before and after a restructuring and determine which stream will yield a higher return, typically measured by its market value. The market will assess the probability of non-payment and select a discount rate which reflects this probability. This is typically represented by the yield curve, or the exit yield,[8] which characterizes the market's views of sovereign risk at a given point in time. At or around the time of a restructuring, these yields encompass both the expected yield on the new bonds to be issued and the probability that the restructuring will go ahead. This suggests that yields prevailing around the time of the restructuring will be higher than those which can be expected after a successful restructuring.

However, because the exit yield is embedded in the price of the new bonds and represents market views at the time of the restructuring, it is generally the discount rate used by market

[8]The exit yield is generally thought of as the yield that would prevail immediately after a restructuring (i.e., a post-restructuring yield), and at which the newly issued debt would be priced. A concrete example of the importance of exit yields comes from much of the investment bank literature where a key concern has been the assumption of the post-restructuring yield (the exit yield) used to assess Argentina's recent debt exchange.

participants.[9] The rationale behind this usage is relatively straightforward in that creditors that mark-to-market are concerned with the market price of debt holdings in their portfolios, which implies that they would utilize the prevailing market rate as a discount rate. Thus, discounting cash flows at current and hypothetical "exit" yields is the standard, if conceptually imperfect, method that market participants use to calculate the haircut they are being asked to accept. While other factors—namely the upside potential of the new bonds and the perceived benefits of a holdout strategy—are also relevant to market acceptance, exit yield projections will need to be continuously monitored to ascertain market attitudes toward debt restructuring proposals or exchange offers.

IV. Practical Issues in the Choice of the Discount Rate: The Debtor's Perspective

In practice, reaching a consensus, including within the IMF, on the appropriate discount rate for assessing a debt restructuring has proven to be very difficult. While creditors typically use exit yields as discount rates, this may not be appropriate from the perspective of the debtor, particularly if market rates reflect large default premia. Similarly, a key challenge for the IMF is to ensure that debtors themselves—often faced with an increasingly short-term view during a crisis—remain focused on the ultimate goal of restoring longer-term debt sustainability. In such cases, it is critical that the discount rate not lead to NPV calculations which understate the debt burden of the debtor.

Beyond this, however, selecting the "appropriate" market interest rate is not self-evident. This is because market rates: (i) vary over time and across currencies, and it is not clear that

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[9] Sturzenegger and Zettelmeyer (2005) propose that the appropriate discount rate to use when calculating investor losses resulting from a debt restructuring is the exit yield.

current market conditions adequately capture the costs of servicing future liabilities; and (ii) reflect both current country-specific factors and global conditions. This section looks at the pros and cons of various discount rate choices, with a focus on selecting a time-invariant discount rate that could be used by the IMF in assessing the contribution of a debt restructuring to restoring sustainability (Box 3 discusses variable discount rates).

A. Risk-Free World Interest Rate

In many instances, the risk-free world interest rate (e.g., U.S. Treasury rates) has been used as the discount rate. The risk-free world interest rate frequently represents the opportunity cost of funds, and it is appealing in that a common rate can be used across countries.[10] Use of this rate implies that NPVs would differ across countries depending only on the debt-service profile—the interest rate and the length of maturities—and would represent the cost (or benefit when dealing with concessional debt) compared with a truly risk-free asset. The NPV would be higher than the face value of debt, reflecting the default premium that emerging market countries must pay to make their debt attractive to risk-averse investors. Implicitly, use of the risk-free world interest rates would correspond to the case where the debtor is committed to fully servicing its debt obligations, or where the probability of default is negligible. Under these circumstances, asymmetric information could be at play if creditors perceived a probability of default while the debtor did not.

[10]The risk-free rate has been cited in academic publications as the opportunity cost from the perspective of creditors, see Agénor and Montiel (2002). However, in some cases where the risk free rate is used as the discount rate, explicit (theoretical) probabilities of nonpayment are typically applied to the payment stream (see Folkerts-Landau and Rodriguez , 1989).

Box 3. Use of Time-Varying Discount Rates

In most cases a uniform, constant, discount rate is used to examine debt restructurings or other debt operations. The use of a uniform rate adds simplicity and clarity to the calculations of the NPV. In cases where a sovereign is facing financial distress, it is often difficult to select an appropriate, time-invariant, discount rate. Under these circumstances, determining a set of variable (i.e., time-varying) discount rates, associated for example with a yield curve, could prove unwieldy. This could occur because, at time of extreme financial distress, the yield curve may be subject to significant volatility with frequent shifts in position and slope. It often becomes inverted, complicating the analysis of NPV calculations. In addition, in post-default cases, the yield curve essentially collapses to one point which implies that, since all claims become due and payable, use of variable rates along a term structure would be arbitrary. For these reasons, this paper does not discuss the use of variable rates.

Nonetheless, a case could be made that use of variable rates is appropriate in certain instances, and some market participants may use variable rates when evaluating a debt operation. In such cases, the market might use lower rates for payments falling due in the near term (e.g., the next 1-2 years) and higher rates for payments falling due further into the future. The rationale is that there is more certainty regarding payments falling due in the near-term, possibly reflecting reduced policy uncertainty associated with a Fund-supported program. This is analogous to using a yield curve, which includes spreads that vary depending on the maturity of the underlying instrument.

In contrast, it may be the case that debtors face tougher financing constraints in the near term (as the cost of borrowing is higher). Under such a scenario, it could be argued that a higher discount rate should be used in the near term and lower discount rates later on, reflecting the expectation that policy implementation will reduce risk in the medium-term. This would be consistent with the often observed inversion of the yield curve at times of crisis as well as declines in spreads over time for countries that have experienced financial distress and undertaken a debt restructuring, particularly outside of default. Similarly, if discount rates reflecting the debtor's repayment capacity were selected, the use of variable rates could be appropriate to reflect the post-crisis "rebound effect" on measures such as export or GDP growth, followed by a period of lower, "steady state", growth (see below for a detailed discussion of discount rates reflecting repayment capacity).

B. GDP or Export Growth Rates

At times, the NPV is used to measure a debtor's repayment capacity, with discount rates reflecting economic fundamentals—GDP or exports growth rates.[11] The use of these measures is analogous to using the familiar debt indicators of the debt-to-GDP ratio or the debt-to-exports ratio. The analytical concept underlying the use of growth rates is derived from the simple debt sustainability relationship whereby a country's capacity to service its

[11]Use of exports is only relevant when looking at foreign currency-denominated debt, as exports represent the ability of the sovereign to generate foreign exchange with which to service such debt. GDP growth would need to be adjusted for exchange rate movements when looking at foreign-currency denominated debt.

debt, and thus the sustainability of its debt, depends on the relationship between GDP (or export) growth and the interest rate paid on its debt.[12] Moreover, assessments of default probabilities implicitly capture expectations of future repayment capacity which is inextricably linked to GDP (or export) growth. Thus, by discounting the stream of debt-service payments by the GDP growth rate, one is nicely capturing repayment capacity in one single measure.

While the use of GDP or export growth rates is appealing for the above reasons, caution is required when interpreting the resulting NPV. Determining the potential growth rate of GDP or exports is not straightforward for some emerging market countries, and the NPV will be very sensitive to assumptions made in this regard. While it is possible to use (long-run average) historical growth rates as a proxy for future growth rates, these too can be misleading, particularly if the country is experiencing structural shifts related to economic activity. In addition, the use of U.S. dollar growth rates implicitly includes assumptions regarding the evolution of the real exchange rate and/or dollar inflation. Thus, the resulting NPV calculations will also depend on such assumptions. If actual realizations of either variable are significantly different than those assumed, future debt-to-GDP ratios could turn out quite different than those predicted by the NPV calculations. Notwithstanding these difficulties, consideration of the debtor's repayment capacity—as measured by GDP or export growth rates—is a critical aspect in assessing whether debt sustainability has been restored.

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[12] In a simplified framework, the required primary surplus for maintaining a constant debt-to-GDP ratio is equal to the debt-to-GDP ratio multiplied by the difference between the nominal interest rate (i) and the nominal growth rate of GDP (g) (i.e., $ps = d^*(i-g)/(1+g)$). This simplified framework abstracts from exchange rate considerations, seignorage, and contingent liabilities.

C. Country-Specific Interest Rate

The country-specific rate corresponds to a borrowing rate in "normal" circumstances, unaffected by a large default premium. Use of this rate would avoid incorporating risk factors that may be irrelevant over a long time horizon into NPV calculations. The practical problem with this rate is that many countries have never been able to borrow at rates which reflect a low default risk.[13] More generally, the use of a country-specific rate could complicate comparability of debt restructurings across countries since, for a given stream of debt-service payments, a country with a higher (lower) default premium would have a lower (higher) NPV. An additional complication would arise from the fact that some sovereigns may find that the consequences of a debt restructuring are such that its (new) "normal" equilibrium borrowing cost (i.e., spread) is higher than that prevailing before the crisis. This implies that use of a country-specific rate will require judgments regarding potential future spreads for a given country. In such cases, the difficulty would boil down to how to inform such judgments and what reliance can be given to historical information.

D. Benchmarking

A possible guide to constructing "normal" borrowing costs would be to use spreads from countries with similar economic circumstances. Both country-specific and benchmarking rates could be useful if the idea is to capture general risk, outside of the immediate crisis context. Benchmarking could also be accomplished by estimating the average spread that would be expected to prevail when the country returns to more "normal" conditions, and using this is estimate a (dollar) discount rate. A fair amount of academic research has

[13]The country-specific long-term average rate would represent the average cost at which the debtor was able to refinance itself in the past. Taking the average would smooth out fluctuations and should provide a better approximation to an equilibrium rate.

concentrated on identifying the factors which lead to changes in spreads in emerging market countries, and such literature could be drawn on to inform selection of an appropriate benchmarking spread.[14] A more simplified approach would be to make a "guestimate" of the average spread expected to prevail (e.g., 500 bps), and use it to derive the discount rate. This "guestimate" could be based on average spreads for non-distressed cases and related to prevailing EMBI+ or EMBIG spreads.[15] Notwithstanding the above arguments, benchmarking rates may prove to be challenging and could involve some upward bias in cases where contagion affects spreads for countries with similar characteristics, or downward bias in cases where international liquidity conditions are particularly favorable to emerging markets.

E. Market Yields at Times of Distress

The use of a discount rate based on a prevailing yield curve or an exit yield which includes a high probability of default distorts any NPV calculation from the perspective of the debtor. This is because both the yield curve and the exit yield will invariably include two elements: the risk-free rate (i.e., the "normal" borrowing cost) and a default premium, which may be residually influenced by the legacy of the crisis environment. Results derived from use of the debtor's yield curve may vary significantly, depending on whether the sovereign is in a period of tranquility or financial pressure. At times of crisis, the behavior of the yield curve is highly unstable and dominated by high spreads which correspond to the market's changing assessment of default risk. In fact, as noted above, at times of crisis, yield curves often

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[14]See, for example, Eichengreen and Mody (1998), Kamin and von Kleist (1999), and Sy (2002).

[15]EMBI+ and EMBIG are acronyms for J.P. Morgan Emerging Market Bond Indices that tracks the total returns for traded external debt instruments in the emerging markets.

become inverted or tend to collapse to a single point as all claims become due and payable, irrespective of original or remaining maturity, which further complicates their use. To the extent that yield curves reflect rapidly changing market expectations, they may be highly unstable in the aftermath of a debt restructuring.

Thus, the cost of funding from the debtor's perspective should aim to strip out high default premia prevailing at a time of crisis, when spreads are particularly wide. This is particularly the case since debt restructurings often entail tradeoffs between near-term cash flow savings and longer-term debt-service costs. Future debt-service payments could be excessively discounted and, as a result, the restructuring could appear to be NPV neutral. This may not represent a fair evaluation of the cost to the debtor. By placing less value on future debt-service obligations, a debt restructuring which simply pushes liabilities further into the future may appear as though it has generated NPV savings. These results could be misleading in cases where restoring solvency/sustainability is the paramount objective underpinning IMF assessments.

V. A Suggested Framework

As NPV calculations are highly sensitive to the choice of the discount rate, a first step in determining whether a debt restructuring has yielded NPV savings or costs would be to calculate the IRR.[16] The IRR of the difference between two payment streams is the discount

[16] If the IRR is calculated as the cash flow differential between two debt-service profiles, it is likely that the difference between the two profiles will have multiple sign (i.e., positive and negative) changes. In such cases, the IRR solution will not be unique, as a result of Descartes' sign rule which determines the number of roots of a polynomial (see http://mathworld.wolfram.com/DescartesSignRule.html for details). However, in practice, tests can be undertaken to ensure that, within a reasonable range of discount rates, the IRR solution is, in fact, unique.

rate at which its NPV is equal to zero.[17] In other words, the IRR represents a uniform discount rate that equalizes the NPV of two streams of debt-service payments. At a conceptual level, the IRR can be thought of as the borrowing cost implicit in the debt restructuring—that is, the cost incurred for shifting debt service into the future. More precisely, the debtor effectively borrows at a rate equal to the IRR in order to achieve a balance between the upfront debt-service savings and the debt-service costs down the road. Thus, the IRR provides a useful benchmark for assessing how NPV savings/costs in undertaking a debt restructuring operation are related the choice of discount rate, and this information could usefully be included in IMF assessments of debt restructurings. If the discount rate is greater than the IRR, NPV calculations will show that NPV savings will result, and, if the discount rate is less than the IRR, the associated NPV calculations will show the borrower will incur an NPV cost.

To complement the IRR calculation, a sensitivity analysis over a range of discount rates could be examined. The use of a range allows for greater transparency in the interpretation of NPVs, and enhances the awareness of potential costs associated with debt restructurings by highlighting the sensitivity of NPV calculations to the choice of discount rate. While the precise definition of the range may be difficult in some cases, it will be important that the range reflect the objective underlying the NPV calculations. For most IMF operational work, it would be expected that the objective is whether the debt restructuring contributes to restoring debt sustainability.

[17]In the context of debt, an IRR can be calculated based on the cash flow differential between two debt-service profiles (e.g., before and after a debt restructuring). To calculate the IRR, the stream of (net) positive and negative cash flows are evaluated. The IRR determines the rate(s) which equates the positive and negative flows.

The range of discount rates would need to take into account both conceptual and practical considerations. The risk-free world rate—typically representing the opportunity cost of funds, including in cases where resources were invested in a sinking fund for payment of future debt service—is a commonly cited discount rate because is can be applied across countries, and, if a long-term average are used, results in easy comparability over time. However, the risk-free world rate may overstate the costs of future debt-service payments, since it is lower than the cost of borrowing for most countries. Therefore, it would be preferable that a rate capturing the ability to service debt, in essence related to economic activity—such as the nominal GDP growth rate in the relevant currency—form the typical lower bound of the range. Notwithstanding the practical difficulties in determining expected GDP growth rates, the use of such a rate would add value in determining whether a debt restructuring has contributed to restoring debt sustainability—a notion supported by the economic relationship between the interest rate and the GDP growth rate in determining the conditions for debt sustainability (see footnote 12). The upper bound of the range should reflect country-specific factors which capture the debtor's ability to refinance its debt stock over time and under "normal" circumstances, outside a period of financial distress.[18] However, care must be taken to ensure that an appropriate rate is used for countries whose spreads are unlikely to return soon to their pre-crisis levels. In such cases, spreads of comparator countries could be of some use. Overall, attention must be paid in individual country cases to ensure that the range is sufficiently confined so as to be of practical

[18]This, in itself, presents difficulties in that countries often face repeated crises, making the definition of "normal" borrowing times rather complicated. To try to smooth out periods of financial distress, an average rate could be considered, for a rather long period of time. Of course, additional problems can arise in that countries may not have a long time series, structural breaks may exist, or prolonged periods of upheaval (e.g., wars or

(continued…)

operational use. This again implies the need for judgment when selecting the appropriate range.

The IRR can be used as a benchmark against which to compare the range of discount rates. An IRR that is greater than the sovereign's "normal" borrowing costs implies that the sovereign is paying a high cost to shift its debt service into the future. In such cases, a debt restructuring operation should be carefully examined, as it would yield an NPV cost to the debtor. Conversely, an IRR that is lower or equal to the sovereign's "normal" borrowing costs could imply that the sovereign has successfully capitalized on the lower perceived future default risk (e.g., by removing a debt overhang) through lower interest rates on its restructured debt. In these cases, the debt restructuring operation could yield NPV savings from the perspective of the debtor. While other factors would still need to be considered in assessing the debt operation, the debtor would not face an NPV cost.

To illustrate the proposed framework, two country cases (Uruguay and Ukraine) are examined (Boxes 4 and 5). Each case demonstrates the sensitivity of the NPV calculations from the countries' respective debt operations to various discount rates. The IRR is calculated and, in both cases, is equal to roughly 7 percent. For discount rates below 7 percent, the debt restructuring operation would yield an NPV cost to the country, while for discount rates greater than 7 percent, there would be NPV savings for the country. As part of the proposed framework, a range of discount rate is derived for each country based on information on medium-term GDP growth rates (lower bound) and judgments regarding

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civil conflicts) may have occurred. The relevant country-specific rate will therefore depend on judgments made about such factors.

potential "normal" borrowing costs (upper bound). The proposed ranges are then compared to the IRR.

In the case of *Uruguay*, since the IRR falls within the proposed range of discount rates (5.5–9.5 percent), the debt restructuring operation could be considered to be in the "grey zone" wherein careful consideration would need to be given to other factors before determining the extent to which the debt restructuring contributed to a restoration of debt sustainability.

In the case of *Ukraine*, the proposed range of discount rates spans from 8.5 to 10.5 percent. Since the IRR falls below the lower bound of the discount rate range, the debt restructuring would unequivocally yield NPV savings from the perspective of the debtor at any discount rate in the range. However, other factors would still need to be examined to determine the contribution of the debt restructuring to debt sustainability.

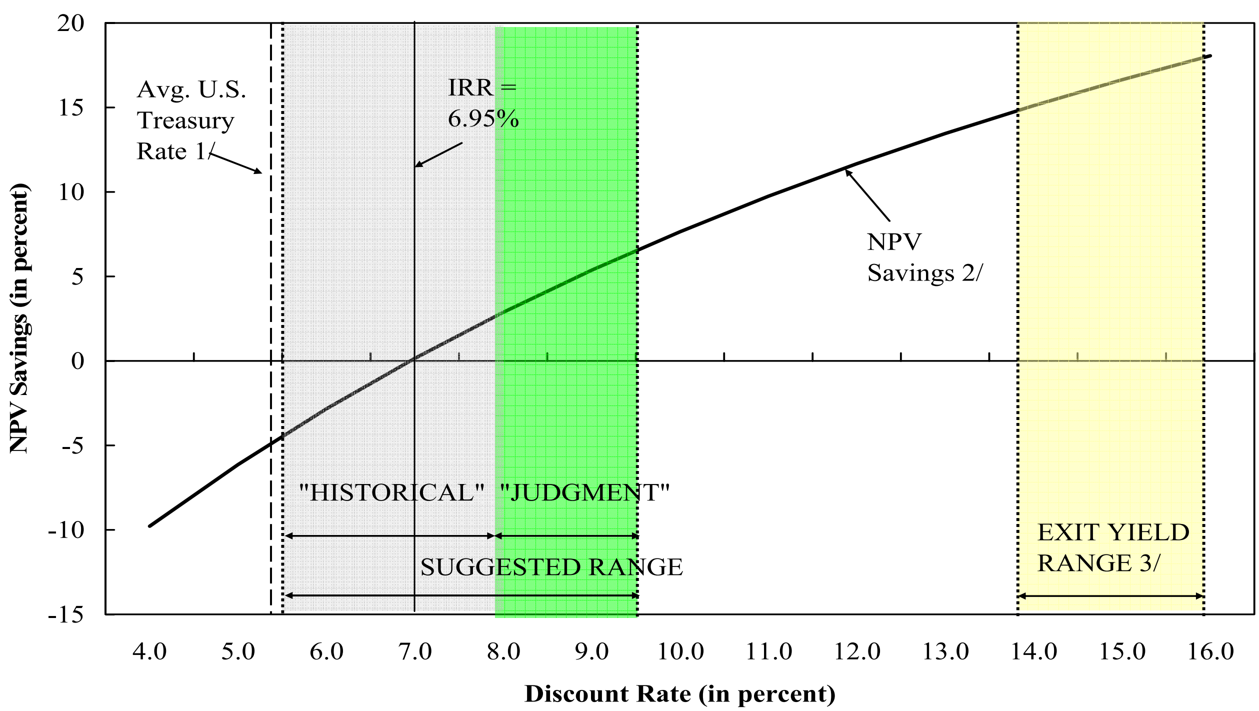
In both cases, it is clear that the NPV calculations are indeed highly sensitive to the choice of discount rate. Furthermore, the evolution of spreads after these countries' debt restructurings indicates that use of spreads prevailing at times of financial distress to inform the choice of discount rate would lead to an overstatement of the NPV gains and, thus, of the implied debt relief, to the debtor. This could be avoided by using more conservative discount rates in evaluating debt restructurings.

Box 4. Country Example: Uruguay

In May 2003, Uruguay undertook a debt operation which restructured nearly all of its external bonded debt. The restructuring involved a small reduction in principal (US$50 million), although it mainly resulted in a shifting out of debt service (at prevailing coupon rates) into the future. This led to significant cash flow relief in the years immediately following the restructuring, although total debt service increased by around US$2.5 billion over the period 2003–33, mostly in the later years.

Using the framework suggested in Section V of the paper, this debt operation is examined. The NPV of the debt-service differential (i.e., the difference between the debt-service flows before and after the swap) is calculated using a range of discount rates, based on the methodology proposed in this paper. Based on this, the NPV savings associated with Uruguay's debt restructuring are calculated at various discount rates. The figure shows that the NPV savings are very sensitive to the choice of the discount rate—a fact which must be kept in mind when using the NPV to calculate savings arising from debt restructurings. Uruguay's GDP growth rate (lower bound) is based on its medium term framework which indicates that nominal GDP growth in U.S. dollar terms is likely to be around 5–6 percent.[1]

Figure 1. Uruguay: NPV Savings at Various Discount Rates



Source: Fund staff estimates.
1/ 10 year average of interest rate on 5-year U.S. Treasury bonds.
2/ Defined 1 - (NPV(after restructuring)/NPV(before restructuring)). NPVs are evaluated at the same, constant, discount rate.
3/ The yield prevailing immediately before the exchange was 16 percent, and shortly thereafter it fell by 200 bps (see Uruguay staff report, EBS/03/93, Appendix II). The discount rate used by the Fund to evaluate Uruguay's debt exchange was 16 percent.

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[1]Since most of Uruguay's debt is dollar denominated, the dollar GDP growth rate is the appropriate measure of capacity.

Box 4. Country Example: Uruguay (*continued*)

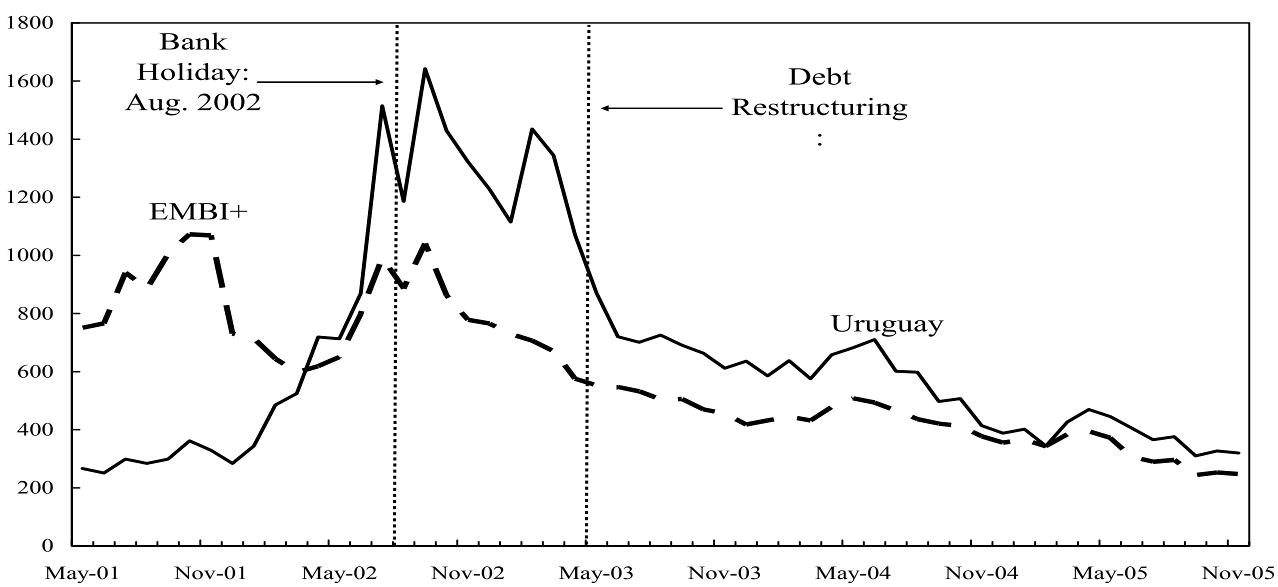
The upper bound is estimated as the average borrowing cost for Uruguay during "normal" times, with the understanding that Uruguay will likely face spreads in the 400 bps range over the medium term, rather than in the 200-300 bps range (as they were before the crisis when Uruguay had an investment grade rating).[2 3]

For illustrative purposes, the range is segmented into "historical" and "judgmental" sub-ranges. The "historical" section represents the range between potential GDP growth (while this is a projection rather than a historical figure, it is, to some extent, based on historical performance) and the historical yield on government debt (at spreads of 200–300 bps). The "judgmental" sub-range reflects a potential judgment by staff regarding future spreads. In the case of Uruguay, it is assumed that spreads will remain around 400 bps.

While various arguments can be made regarding the effectiveness of Uruguay's debt exchange, it is clear that the results of the exchange are extremely sensitive to the choice of the discount rate. If a rate closer to the current 9–10 percent implied yield on Uruguayan bonds was used, the savings would be closer to 7 percent than to 20 percent (the market haircut quoted at the time of the exchange). This is demonstrated in Figure 2, which shows the evolution of Uruguay's sovereign spreads. If the rate were closer to Uruguay's nominal GDP growth rate, the savings would be negative, indicating an NPV cost to the country.

Overall, the example illustrates the sensitivity of NPV calculations to the choice of discount rate, and suggests that the use of more conservative discount rates in evaluating debt restructurings will lead to conclusions of lower NPV savings from the perspective of the debtor.

Figure 2. Uruguay: Sovereign Spreads, May 2001–November 2005
(In basis points)



Source: Bloomberg.

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[2]The spread represents the premium over U.S. Treasury rates. In this case, the average U.S. Treasury rate is calculated as the 10 year average of the 5-year bond rate, or 5.5 percent

[3]Currently, Uruguay's spreads are around 300 bps, but this is likely due to a combination of factors, including the benign international liquidity environment.

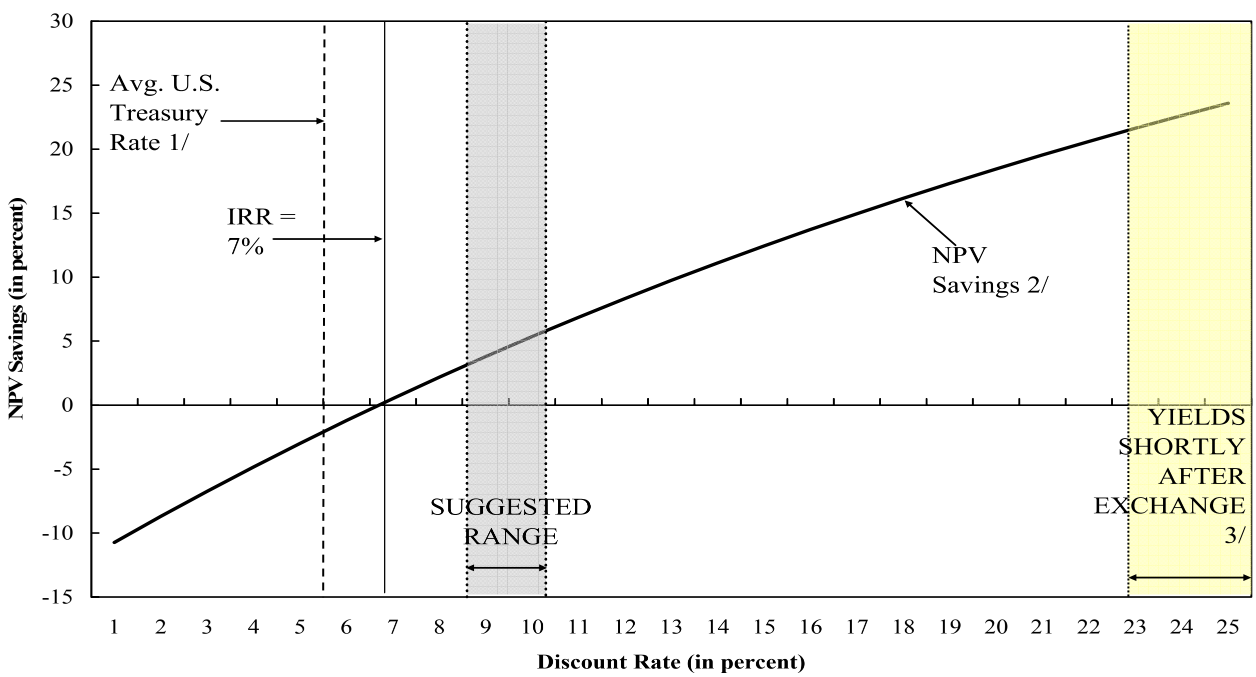
Box 5. Country Example: Ukraine

In February 2000, Ukraine launched a comprehensive debt exchange offer which restructured four different Eurobonds and Gazprom bonds maturing in 2000 and 2001. The deal exchanged roughly US$2.5 billion of the old bonds for news bonds with a seven-year maturity. The restructuring involved a no reduction in principal, although it did provide significant cash-flow relief in the first few years. Total debt service increased by around US$400 million over the period through 2007

The NPV of the debt-service differential (the difference between the debt-service flows before and after the debt restructuring) and the resulting savings/costs are calculated using a range of discount rates, based on the methodology proposed in this paper. As shown in the figure, the NPV calculations are very sensitive to the choice of the discount rate, varying from -5 percent to 15 percent over a range of discount rates.

Ukraine's GDP growth rate (lower bound) is based on staff estimates, which suggest that Ukraine could grow by 8.5 percent in dollar terms on an annual basis.[1] The upper bound is estimated as the average borrowing cost for Ukraine during "normal" times. Soon after the debt exchange was completed, Ukraine's spreads fell from around 2000 bps in early 2001 to 1000 bps by end-2001. After an up-tick in 2002, spreads hovered around 200–300 bps in 2004–05. Determining the upper bound in this case is therefore tricky. In particular, if one were to use spreads of 1750–2000 bps prevailing shortly after the exchange, the NPV savings could be overstated, especially since spreads have since fallen dramatically. Using current spreads of 200–300 bps would collapse the range, or invert the presumed upper and lower bounds, since the favorable global liquidity environment has compressed spreads in emerging market countries. Using the rough average of Ukraine's spread between mid-2001 and end-2005 would imply a spread of about 500 bps, and an upper bound of 10.5 percent (assuming a U.S. Treasury rate of 5.5 percent).

Figure 3. Ukraine: NPV Savings at Various Discount Rates

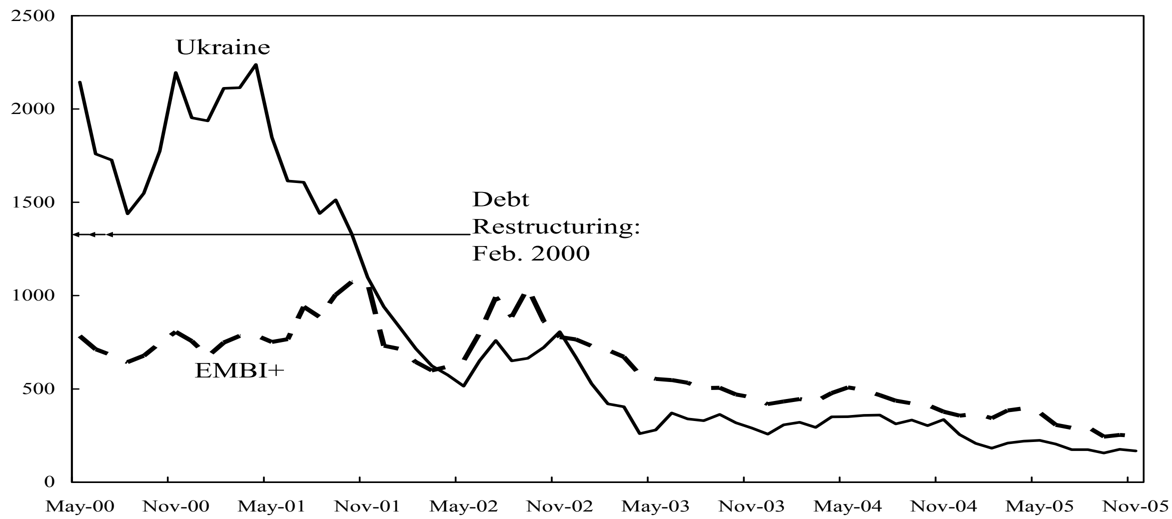


Source: Fund staff estimates.
1/ 10 year average of interest rate on 5-year U.S. Treasury bonds.
2/ Defined 1 - (NPV(after restructuring)/NPV(before restructuring)). NPVs are evaluated at the same, constant, discount rate.
3/ Estimates based on spreads of 1750-2000 bps around the time of the exchange.

[1] Estimates taken from *World Economic Outlook*.

Box 5. Country Example: Ukraine (*continued*)

Figure 4. Ukraine: Sovereign Spreads, May 2000–November 2005
(In basis points)



Source: Bloomberg.

VI. Conclusions

The assessment of whether a debt restructuring has contributed to a restoration of debt sustainability is frequently summarized by comparisons of the NPV of debt service before and after the restructuring. The NPV calculations—by discounting a stream of future debt-service payments—can provide a basis for assessing the merits of a debt restructuring operation, but are inherently sensitive to the choice of the discount rate. Moreover, the debtor, the IMF, and the market may have different perspectives on the choice of the appropriate discount rate, with the debtors and the IMF primarily concerned with assessing the contribution to restoring debt sustainability, and market participants focused on maximizing expected returns given their evaluation of sovereign risk. This underscores the need to exercise caution when evaluating a debt restructuring, particularly if restoring debt sustainability is an overriding concern. Thus, the NPV should be used in conjunction with other, non-NPV-related considerations, such as the debt-service profile and near-term cash savings, the required fiscal adjustment, and judgments about the various tradeoffs also need to be examined when evaluating a debt restructuring.

When applying the NPV methodology to the evaluation of sovereign debt restructuring, a sensible approach would be to compare the IRR—the borrowing cost implicit in the debt restructuring—to a range of discount rates to determine whether the debt restructuring would yield NPV savings or costs. Based on conceptual and practical considerations, the range could span from rates reflecting the ability to service debt to country-specific estimates of non-distressed borrowing costs. If the IRR is less than the lower bound of the range (i.e., typically the GDP or export growth rate), the debt restructuring operation will yield positive NPV savings for the debtor. While other factors would still need to be evaluated before an agreement on the operation is reached, the debtor would not face an NPV cost. Conversely, if the IRR is greater than the upper bound of the range (i.e., the country-specific borrowing rate during normal times), the operation would carry an NPV cost to the debtor. In cases where the IRR falls within the range, judgments would need to be made to determine whether a debt operation would contribute to the restoration of debt sustainability.

Presentation of the IRR and consideration of the suggested range would increase transparency in evaluations of debt restructurings. It would also help avoid selecting discount rates prevailing at times of financial distress, as these may distort NPV calculations by significantly overstating the estimated financial relief and understating the costs to the sovereign debtor. Ultimately, this distortion may cloud the assessment of whether a debt restructuring contributes to a resolute exit from the crisis and a clear restoration of the sovereign's debt sustainability.

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