

An Auction-Based Sovereign Debt Restructuring Mechanism

Prepared by Tim Willems¹

This Version: March 2021

1. **Sovereign debt vulnerabilities are high and rising.** Debt-to-GDP ratios in many countries stand at record highs—with the COVID-19 pandemic being latest factor sharply contributing to debt accumulation across the globe. While central bank actions in Advanced Economies have managed to keep financing costs low for countries borrowing at safe interest rates, this holds less true for Emerging/Developing Economies issuing riskier debt.

2. **Given recent trends, analysts are fearing an increased incidence of sovereign debt restructurings.** Such fears already existed prior to the COVID-pandemic,² but have risen since. Alas, sovereign debt restructurings tend to be complex and time-consuming for various reasons:

- In a restructuring, creditors typically need to take losses to which they are naturally averse, making the process difficult—particularly in the presence of incentives for each individual creditor to free-ride on others' contributions towards restoring debt sustainability (the collective action problem);
- Debt sustainability is a fuzzy concept (Debrun et al., 2020), frequently involving debate as to how much relief the debtor really needs. In this context, creditors are typically wary of "overshooting" (Buchheit and Gulati, 2020), i.e. providing more relief than necessary, which would equip the sovereign with fiscal space that it might subsequently use for future excessive borrowing;
- Restructurings tend to occur when uncertainties are high, including those about future policies that the sovereign will pursue. As a result, the various stakeholders are likely to enter the process with differing beliefs about the country's economic future (including its debt servicing capacity). This may complicate the process of finding common understanding and, ultimately, agreement;
- In many restructuring cases, particularly those where bonded debt is important, the number of creditors is large—making negotiations challenging for operational reasons. The process is often complicated further by the likelihood that every single creditor has a different preference as to how to provide relief (extend maturities, lower face values, convert into local currency, etc.).

3. **As a result, there are calls to improve the debt restructuring process** (Breuer and Cohen, 2020; Orszag, 2020). But even with improvements, the inherent complexity of the problem means that

¹ This note has benefited from contributions by Chanda DeLong and discussions with Craig Beaumont, Wolfgang Bergthaler, Lee Buchheit, Stuart Culverhouse, Patrick Curran, Tim DeSieno, Mark Flanagan, Starla Griffin, Claire Husson-Citanna, Paul Klemperer, Eric Lalo, Edwin Lock, Yannis Manuelides, Eriko Togo, Felix Vardy, Sweder van Wijnbergen, Sam Wills, and Jeromin Zettelmeyer. The views expressed are mine and should not be attributed to the IMF, its Executive Board, or its management.

² During the Spring Meetings of 2019 (a year prior to the onset of the pandemic), the IMF and World Bank hosted a seminar entitled "[Tackling the Next Wave of Sovereign Debt Crises](#)".

the current negotiation-based process is unlikely to achieve the most efficient outcomes. Human actors likely struggle to spot (and subsequently realize) all gains from trade—implying that negotiation-based outcomes won't be located at the efficient frontier. Both debtor and creditors could thus be made better off, which would ease the restructuring process. Within creditors, some are also likely to be better served by any negotiated deal than others—harming inter-creditor equity. Potentially because of these challenges, restructurings tend to be time-consuming, at great cost to all parties involved.

4. **Following the proposal in Willems (2020), this paper develops an auction-based approach to restructuring sovereign debt.** Although the deployment of auctions is not able to change the unpleasant nature of the challenge, it does have potential to ease the process. While negotiations become more difficult as the number and diversity of players grows, auctions converge to the optimal outcome—spotting and realizing gains from trade. This pushes the outcome towards the “efficient frontier”, making a mutually acceptable deal easier to find. Auctions replicate liquid markets, even where there is none in practice, offering an effective platform for any large number of participants to engage and express their preferences.

5. **In a restructuring context, the “seller” is a debt-distressed sovereign (looking to restructure its debt), while “buyers” are the sovereign’s creditors.** The latter group is likely to be diverse, with an important distinction being that between official and private creditors. This paper focuses on the application to private claims, but a similar process could be applied to official-bilateral creditors. Even if their preferences display less heterogeneity, the mechanism may still be of value as it coordinates among all creditors, ensuring that the sum of all restructured claims will add up *exactly* to a pre-specified repayment profile that is deemed sustainable.

6. **Sovereign debt restructurings are often seen as zero-sum games between debtors and creditors, but to a significant extent they are not:** creditors may differ in their outlook, liquidity preference, and risk tolerance—translating into heterogeneous preferences for various ways of offering debt relief.³ These preferences are typically unknown to the debtor. Consequently, debt restructurings tend to leave money on the table—money which could have been used for additional relief, to increase creditor participation, or both. This paper’s auction mechanism can help discover creditors’ preferences and maximize efficiency of the restructuring.

7. **It is paramount that debt restructurings cater to preference heterogeneity on the side of creditors.** This should take place along two dimensions: the sovereign should first issue the “right” type of new instruments, after which those should be *allocated optimally* among creditors. It may also be

³ If a certain degree of NPV-relief needs to be provided to a sovereign, those with a more optimistic (pessimistic) view on the country will prefer to grant this relief via a maturity extension (face value haircut). More optimistic or risk-tolerant creditors may also be more eager to exchange into a GDP-linked instrument (paying off in case of a strong recovery) or local-currency debt (preferring a higher coupon over the relative security of a claim in hard currency). Balance sheet-, regulatory-, or tax considerations can affect preferences as well.

important to cater to creditors who believe that a restructuring proposal “overshoots” by providing too much debt relief. From the perspective of such creditors, instruments like GDP warrants or local-currency debt might look attractive (as their value can be expected to rally following superfluous relief). Enabling them to obtain such claims in the restructuring enhances prospects of closing a deal.

8. **With the arrival of the “Product-Mix Auction”, we now have an important tool that was previously preventing effective application of auctions to sovereign debt workouts.** The Product-Mix Auction, developed by Klemperer (2008, 2010), enables a seller to auction different varieties of the same good in a single round—exploiting gains from trade in the process. The process allows the sovereign to first collect creditor-bids on a wide variety of *potential* restructured claims: bonds differing in maturity, denominated in different currencies, with state-contingent features, and so forth. Upon observing bids, the sovereign can be given some flexibility as to which instruments to issue, and in what amounts. Here, it will be optimal (cheaper) for the sovereign to issue more of the type of instruments for which creditors have expressed high demand—tailoring the restructuring to creditor preferences. The auction subsequently allocates all claims optimally, letting each creditor provide relief in a way that is least painful to them. This enables the sovereign to find a given amount of debt relief while inflicting the lowest-possible damages on creditors, which can be expected to ease the whole process.

9. **The mechanism can also be used to facilitate voluntary debt exchanges on market terms.**

This could enable countries to find liquidity relief from private-sector creditors without such an operation being considered a default by credit rating agencies. The latter is an oft-cited reason why debtors are currently hesitant to seek liquidity relief from private creditors. Similarly, the auction can be used for debt management purposes—enabling governments to swap an existing bond into a new one with different characteristics, e.g. longer maturity and/or different currency. Both options empower sovereigns and should help them to prevent deeper debt difficulties from arising in the first place.

10. **The remainder of this paper is structured as follows.** After describing current restructuring practices, Section II discusses the Product-Mix Auction and its potential for sovereign debt workouts. Section III describes how existing legal tools to bind holdouts could be used in conjunction with an auction mechanism. Finally, Section IV will illustrate how debt workouts could be organized via the proposed mechanism. This paper is accompanied by an HTML-tool (147), which can be used to simulate the auction-based debt restructuring process. Section V concludes.

I. Description of current practices

11. **The current approach to sovereign debt restructurings can be characterized as “negotiation-based”** (Buchheit et al., 2020). When a sovereign announces the intention to restructure its debt, it will initiate engagements with its creditors. In a restructuring-context, it is helpful to distinguish between three types of creditors: multilateral-official, bilateral-official, and private. Since multilateral-official creditors are *de facto* considered “senior”, their claims are usually excluded from a restructuring—putting the onus on claims held by private- and bilateral-official creditors.

12. Where applicable, negotiations with bilateral-official creditors are frequently conducted via the Paris Club.

Since the 1950s, this informal group of 22 creditor countries has been convening regularly to cooperate in resolving debt difficulties in countries with significant obligations to official creditors. Recently, this platform has been broadened to include all creditor countries that are part of the G20 via the so-called “Common Framework for Debt Treatments Beyond the DSSI”.⁴ An important principle entertained by the Paris Club (as well as the Common Framework) is “comparability of treatment”, meaning that a country which has received debt relief through an official-bilateral agreement should not accept a debt treatment from other creditors (be they private, or non-Paris Club bilateral) on terms less favorable to the debtor than those embedded in the official-bilateral deal.

13. Holdings of private claims are typically dispersed across many creditors, spread over multiple jurisdictions.

As this may create operational challenges for uncoordinated negotiations, discussions with private creditors often occur through a committee of representatives. This is believed to improve creditor-coordination, also facilitating efficient acquisition and sharing of information (DeSieno, 2016). The formation of creditor committees may also impact the collective bargaining power of creditors vis-à-vis the debtor, although the exact direction is unclear (Buchheit et al., 2020).

14. After all relevant players have been organized, debtor and creditors will have to agree on the amount of relief needed to restore debt sustainability.

Views on what type of debt stock (and debt service profile) is sustainable are typically informed by a Debt Sustainability Analysis conducted by the IMF (in case of low-income countries jointly with the World Bank). When private creditors engage with the sovereign on the back of an official-bilateral agreement, private creditors essentially need to match the relief embedded in the latter (through “comparability of treatment”, ¶12; when assessing comparability, the process looks at the nominal financing relief provided, the extent of NPV relief, as well as the degree of maturity extension).

15. Once there is agreement on the overall amount of debt relief, as well as on the precise terms of all restructured instruments, the exchange offer can be presented.

Creditors then get to decide whether they accept the proposal. In recent restructurings, collective action clauses (CACs) have played a key role in achieving high participation by allowing the majority of creditors to bind the minority to the terms of a restructuring.⁵ Restructuring proposals may also impose a minimum participation threshold (typically 70-90 percent, including participation from the activation of CACs), below which the restructuring will not advance. This, to alleviate concerns among participating creditors

⁴ See the [G20 Statement](#). Concretely, this implies that the process has been extended to include various non-Paris Club creditors (Argentina, China, India, Indonesia, Mexico, Saudi Arabia, South Africa, South Korea, and Turkey).

⁵ Originally, voting occurred per bond series, but recent “enhanced CACs” allow for aggregation across all series within the perimeter of the restructuring (see IMF (2020b) for a detailed discussion). End -March 2020, it was estimated that 51 percent of outstanding foreign-law sovereign bonds featured enhanced CACs, 45 percent series-by-series CACs, leaving only 4 percent not containing any CACs (Chung and Papaioannou, 2020).

that they will be alone in accepting the offer, to end up with illiquid new instruments. Provided that the threshold is met, the restructuring will be finalized. Any remaining holdouts can either be paid in line with original terms (this happened following Greece's 2012 restructuring), or the sovereign can choose not to do so—often triggering a litigation process (see the aftermath of Argentina's 2001 default).

II. An auction-based sovereign debt restructuring mechanism

16. **Auctions can be highly useful in sovereign debt workouts, enabling a sovereign to tailor the post-restructuring debt stock to creditor preferences** (Willems, 2020). Well-suited to the modern, dispersed creditor landscape, auctions offer an effective platform for any large number of players to communicate their preferences. This subsequently enables the debtor to tailor the post-restructuring debt stock to creditor preferences, ensuring a close "fit". Any debt relief that is deemed necessary to restore sustainability should take a form that is least painful to the country's creditors. Such design makes it easier for the country to find the needed amount of debt relief, as it minimizes the damages inflicted upon creditors (thus preserving creditor support).
17. **An attractive feature of auctions is that they can replicate the allocation and prices that would arise in a well-functioning liquid market.** This is particularly valuable in cases where the latter is not in place (e.g. because the type of claim does not yet exist). Using auctions to allocate and price sovereign debt is a well-appreciated practice when debt is first issued, but the case for using auctions is arguably even stronger in restructuring scenarios—where there is a need to price and allocate new instruments that are not yet being traded.
18. **Auctions are more common in corporate debt restructurings.** Going back to proposals like Bebchuk (1988), Aghion et al. (1992), and Hausch and Ramachandran (2000), this practice is standard and institutionalized in Sweden (with favorable outcomes; cf. Eckbo and Thorburn, 2009); there have been US examples too (Noked, 2013). The corporate sector has also used auctions for Initial Public Offerings (IPOs),⁶ exploiting auctions' ability to replicate liquid markets (which don't exist yet in cases of firms that are yet to go public). This brings a more efficient pricing and allocation of stocks at issuance. Just like it is important to "get the price right" when a company first issues shares in an IPO (as that creates comfort among stakeholders to move ahead with the listing), it is equally important to "get the prices right" in restructurings. The more informationally-efficient prices are, the less reservations investors should have to move ahead at those prices.
19. **In a sovereign debt context, auctions can be used to implement full-blown restructurings, as well as voluntary debt exchanges.** In both cases, the advantage of using auctions will be greatest if it is able to present creditors with multiple options—allowing creditors to self-select into that mode of providing relief that is least painful to them. This turns the problem for the distressed sovereign into one

⁶ This practice is widespread in e.g. France and Israel, but the most prominent example is Google's auction-based IPO back in 2004 (Choo, 2005).

of selling a mix of products which are considered imperfect substitutes (e.g. a local-currency bond maturing in 2023 versus a USD-bond maturing in 2025 or a GDP-linked payment in 2028). Hereto, Klemperer's Product-Mix Auction (PMA) is an essential innovation that enhances the potential of auctions in sovereign debt workouts. The remainder of this section will cover the PMA in greater detail, followed by an explanation of how the PMA can be applied to sovereign debt.

Product-Mix Auctions

20. **Sellers occasionally wish to auction off a mix of products which can be seen as different varieties of the same good.** Telecom spectrum auctions are one example (governments selling rights to transmit signals over set bandwidths), but this is also the case when central banks auction off liquidity against different types of collateral (e.g. safe government bonds or riskier mortgage-backed securities)—the latter being the application for which the PMA was originally designed (¶23).

21. **The simplest way of auctioning different varieties of the same good, is a sequential approach:** after auctioning off variety #1, one moves on to variety #2, and so forth. In this scheme, however, buyers need to bid for varieties which are being offered early in the process, without knowing conditions for varieties which are only auctioned later. As a result, a bidder might enter the auction for variety #7 after having bought 100 units of #3, subsequently learning that demand for #7 (and hence the resulting price) is so low that they now regret their 100-unit purchase of variety #3 (which it views as a close substitute to #7).⁷ Had the auction reversed the order in which varieties #3 and #7 were put on offer, a different outcome would have materialized. This points to the drawbacks of this approach, with such randomness illustrating that the process does not lead to an efficient outcome.

22. **To address these and other issues in the context of spectrum auctions, the "Simultaneous Multiple Round Auction" (SMRA) was developed.**⁸ In this multi-stage auction, buyers take turns in bidding on multiple assets until prices are such that the process comes to rest, with no one wanting to bid again on any asset. While this alleviates the informational imperfection discussed in ¶21, completing this process can be perceived as complex while taking a long time (weeks if not months).

23. **During the Global Financial Crisis, the Bank of England wished to expand the range of collateral against which it was ready to provide collateral.** Given the nature of financial markets, in which one does not have the luxury of being to wait weeks for the auction to close, running an SMRA was not an option. As a result, the Bank of England asked Paul Klemperer to design a *single-round* auction able to sell different varieties of the same good (in this case liquidity provided against "strong" collateral, like government bonds, versus liquidity provided against "weak" collateral, like mortgage-backed securities). This led to the PMA, described in Klemperer (2010, 2018).

⁷ A similar form of ex-post regret can arise with the seller. If they learn, in the seventh auction, that demand for variety #7 is unexpectedly low, they may wish that they had sold more of variety #3 in the third auction.

⁸ Also known as the "Simultaneous Ascending Auction", see e.g. Milgrom (2000).

24. **The PMA asks buyers to express their relative preferences between varieties via simultaneous sealed bids.** The PMA allows for mutually exclusive “OR”-bids through which bidders can express indifference, e.g.: “I wish to purchase 6 apples at \$0.50 each OR 5 bananas at \$0.60 each”. This enables bidders to approximate their demand curves—essentially giving bidders the option to decide how much to buy of each variety *after* seeing prices which end up prevailing. Equivalently, the seller is able to observe demand curves *before* choosing prices and/or how much to offer in each variety; this enables the seller to “poll demand” for different hypothesized varieties prior to determining how to fill total demand. The seller has this flexibility (subject to constraints, ¶26) since the rules of the auction are such that they will always leave bidders “on” their demand curves, allocating them exactly what they would have chosen voluntarily given the prices that end up prevailing.⁹

25. **Thanks to these features, the PMA has important advantages:**

- It is simple to understand and communicate, particularly as it allows for intuitive graphical representations in terms of standard supply and demand curves;
- Relative to running a sequence of separate auctions, the PMA will achieve a more efficient allocation (alleviating the informational imperfection discussed in ¶21);
- Since it is a static, single-round auction, the PMA is quick—approximating the SMRA-outcome in a matter of seconds after receiving all bids (while the SMRA process can take months in practice). A single-round process is easier to understand and less sensitive to market power and manipulation;
- The PMA not only solves for prices, but can also allow quantities to respond to demand. This gives sellers the ability to “poll demand” for various hypothetical claims, before having to decide how to fill demand (¶24). In a debt context, this enables a country to specify various new claims (e.g. in both USD and local currency) on which creditors can bid. Only *after* seeing bids, the sovereign can decide how much to issue in USD and how much in local currency (subject to constraints, ¶26). In practice, this likely implies that a country will issue more debt in local currency if demand for that variety is strong (lowering yields on local-currency debt). When doing so, the debtor does have to “walk along” the aggregate demand curve implied by creditors’ bids: the entire notion of price-based resolution is to leave creditors on their demand curve, ensuring that the final allocation is consistent with choices creditors would have made voluntarily, had they seen the terms in advance.

26. **To allow quantities to respond endogenously to expressed demand, it is important that bidders have enough information when bidding.** In particular, a bidder’s relative preference between two varieties should not depend on their relative supply. This “independence condition” is likely satisfied when the choice is to denominate a 2030-bond partly in EUR, and partly in USD: subject to both bonds being sufficiently large and liquid, the value of a USD-claim maturing in 2030 is not greatly affected by

⁹ Take the example of a bid expressing indifference between receiving 6 apples at \$0.50 each or 5 bananas at \$0.60 each. After seeing this bid, the seller is free to determine whether to provide 6 apples for \$3 or 5 bananas for that amount. If the seller is short on apples, it will likely prefer to allocate this bidder 5 bananas at \$0.60 each.

the share of 2030s issued in EUR. But the independence condition is likely violated when auctioning bonds with different maturities: a bidder's relative preference for a 2030-bond normally decreases in the amount of debt falling due prior to 2030 (which "dilutes" the value of a 2030 claim). Consequently, any quantity choices that are deemed to have a first-order impact on relative preferences are best fixed in advance. If not, buyers may demand an uncertainty premium—at the seller's expense.

Leveraging the PMA for voluntary debt exchanges

27. A natural application of the PMA to sovereign debt markets is to voluntary exchanges,

e.g. for debt management purposes. Countries sometimes wish to use favorable market conditions to lengthen maturities, or increase the local-currency share of debt. In such cases, a sovereign can announce its desire to swap a bond due in (say) 2022, into a new bond with longer maturity. Crucially, the PMA enables the country to poll demand *without* requiring it to pre-specify the maturity (or other characteristics) of the destination bond (¶25). Instead, it can put *multiple* maturities on offer (e.g., 2025, 2030, 2035), collect bids, and decide to issue that bond which it deems most favorable given quoted prices.¹⁰ Similarly, creditors could be allowed to express their relative preferences for different currencies—say, USD, EUR, or local currency (LC)—enabling the sovereign to then fill demand in a way that is most in line with market (and its own) desires. Here, the pre-existing 2022 bond serves as the numéraire and investors can submit bids (through which they express indifference and inform the auctioneer about their rate of time/currency preference vis-à-vis the country) like:

"I am indifferent between {keeping the 2022 USD-bond OR receive 110% of that amount in a 2025 USD-bond OR receive 115% of that amount in a 2025 LC-bond OR receive 135% of that amount in a 2030 USD-bond etc.}"

Next, the sovereign is presented with the aggregated bids, after which it can decide what maturity is most attractive to exchange into (if any), and in what currency. Of note, a similar process can be used to issue new debt in the primary market (potentially as part of a debt management/restructuring operation). In either case, the PMA provides the creditor community with an aggregate voice via which they can nudge a country to issue the particular instrument that they are most interested in. In addition, empowering sovereigns' debt management options should help to prevent debt problems from arising.

28. Similarly, the PMA can be used to facilitate the provision of liquidity relief (which may help a solvent country make it through a period of illiquidity). As the PMA essentially recreates a liquid market (yielding market-clearing prices), and as it can offer creditors the option of holding on to their "status quo", this means that the PMA can arrange for the provision of *voluntary* liquidity relief by private creditors on *market terms*. As a result, such an exchange would likely *not* be considered a default by rating agencies—the latter being an oft-cited reason why debtors are hesitant to seek liquidity relief from private creditors. Similarly, the process can be launched without a need to deploy CACs. This enables a sovereign to maintain market access and keep sovereignty over its debt management process.

¹⁰ For simplicity, bonds are of the zero-coupon type, but the process can easily be generalized to coupon-bearing bonds.

29. **In particular, one could envision presenting holders of a USD-denominated bond with the following options:**

- Hold on to the status quo (not touching the principal and coupon);
- Leave the principal untouched, but exchange the coupon payments into a longer-dated USD-claim (say a USD-bond maturing in 2024);
- Leave the principal untouched, but exchange the coupon payments into local-currency debt (say a LC-bond maturing in 2024);
- Leave the principal untouched, but exchange the coupon payments into a state-contingent claim (say a GDP-linked payment in 2025).

As before, the status quo option serves as the numéraire. Creditors would bid like:

"I am indifferent between receiving {the coupon payments under status quo OR 110% of that amount in the 2024 LC bond OR 105% of that amount in the GDP-linked payment}"

Upon observing aggregated demand curves for the various options, the debtor can decide whether to launch any exchanges (and if so, which ones). If appetite for the offered alternatives is low, the sovereign can choose *not* to engage in any exchanges. In that case, the status quo will remain fully intact (possibly creating a need for a restructuring in the future). But if bids imply that sustainability-enhancing swaps are deemed possible, the sovereign can launch them. Ultimately, this enables the debtor to find liquidity relief in the optimal way.

Leveraging the PMA for sovereign debt restructurings

30. **The PMA can also be used in a restructuring context.** When a sovereign has accumulated debts which exceed its ability to repay, a restructuring of the country's debt stock is typically needed to restore sustainability. Such a restructuring can take a variety of forms: face value haircuts, coupon reductions; maturity extensions; redenomination from foreign currency into local currency; or conversion of conventional debt into state-contingent claims. In practice, restructurings often end up displaying combinations of these options—sometimes also working in different directions (e.g. a maturity extension accompanied by higher coupon rates, as seen in Ukraine's 2015 restructuring).

31. **Creditors are typically heterogeneous regarding their preferred mode of providing relief to the debtor** (see e.g. Diwan and Spiegel (1994) for evidence). A creditor who is relatively optimistic about a country's future (or more risk-tolerant) will prefer to provide relief via a maturity extension, as opposed to taking a face value haircut. A creditor who is more pessimistic/risk averse will prefer to receive their money back sooner rather than later—willing to incur a haircut in exchange for rapid repayment. Das, Papaioannou, and Trebesch (2012) furthermore report that, in general, retail investors show a preference for maturity extensions, while institutional investors prefer to provide relief through face value haircuts (receiving quicker repayment). Regulatory-, tax-, or balance sheet-considerations might affect this trade-off as well. Along similar lines, different creditors likely differ in their appetite for

restructured claims denominated in local currency, or debt with state-contingent features. As a result, debt restructurings are not pure zero-sum games.

32. An optimal restructuring should create the “right” type of instruments and allow each creditor to self-select into those claims that best fit their preferences: that will maximize the relief a debtor can find subject to maintaining creditor support. This is the key reason why restructurings at times offer a menu to creditors (Van Wijnbergen, 1991; Diwan and Kletzer, 1992; Claessens and Van Wijnbergen, 1993) and it is this insight which an auction-based restructuring exploits to the maximum. This process involves two questions—catering to both aggregate and relative creditor preferences:

- What type of instruments should be issued as part of the restructuring: what maturities, in which currencies, featuring what state-contingent features (if any), etc.?
- How should the restructured claims be allocated among creditors (i.e.: who should receive what)?

In a PMA-based restructuring, the first issue—optimizing the structure of the new debt stock—can be dealt with via the PMA’s “polling ability” (¶25). Once the “right” type of restructured instruments have come into existence (i.e.: those in line with aggregate preferences), the PMA will allocate them efficiently—handing each new claim to that creditor who puts most relative value on it. The latter will typically happen over time in the secondary market, but it will be easier to find the needed amount of relief if creditors can self-select into their preferred mode of providing relief from the start.¹¹

33. Concretely, an auction-based sovereign debt restructuring could work via the following sequence of steps (initially the focus is on the simplest-possible restructuring that only caters to heterogeneity in discount rates, but ¶36 will discuss extensions):

- i. As under current practices, creditors enter the restructuring with budgets that are proportional to the value of their existing claims (in practice, budgets are often based on face value).
- ii. Next, stakeholders determine a sustainable debt service-profile. (Finding such agreement is difficult but, as will be argued in ¶40, an auction-based process is likely to ease this task.) Fixing the restructured repayment profile in advance may be important since a creditor bidding for bonds due in year T ideally needs to know how much debt falls due prior to T (recall the “independence condition” discussed in ¶26).

Suppose that stakeholders agree to restructure the debtor’s repayment profile as follows:

Debt-service profile	2022	2023	2024	2025	2026
Pre-restructuring	\$4 bln	\$3 bln	\$2 bln	\$2 bln	\$2 bln
Post-restructuring	\$0 bln	\$1 bln	\$2 bln	\$2 bln	\$3 bln

¹¹ As noted by Diwan and Kletzer (1992), the mere existence of a secondary market does not imply that preference heterogeneity will be arbitrated away; this will only happen if the asset market is fully efficient and “complete”, meaning that all country-specific risk can be perfectly insured against. This does not seem to be the case for most emerging/developing economies and even if it were, there is still the question of what instruments to issue as part of the restructuring (after all, a secondary market is of no value to claims that aren’t brought into existence).

As before, the debt service profile is assumed to consist only of zero-coupon bonds. Given a discount rate, this step brings a certain amount of *aggregate* NPV-relief to the country.¹² The question which the PMA will subsequently answer is: how can one distribute this aggregate amount of NPV-relief in such a way among creditors that their *individually perceived* NPV-cut (as judged through their individual discount rates vis-à-vis the debtor) is minimized?

iii. Creditors submit their preferences for the various restructured claims announced under Step ii. Since we are now restructuring the old debt stock, which is about to be "replaced", one of the new bonds (say 2023s) will serve as the numéraire. In this case, bids look as follows:

"I am indifferent between being compensated with {USD100 of bonds due in 2023 OR USD105 of bonds due in 2024 OR USD112 of bonds due in 2025 OR etc.}"

Such bids inform the auctioneer about a creditor's yield curve (rate of time preference) vis-à-vis the country. More pessimistic creditors will file a steeper curve (since one would have to compensate a pessimist, characterized by strong preference for early repayment, with more 2024-bonds in exchange for one 2023-bond). By bidding this way, pessimists increase their odds of obtaining short-dated new bonds (albeit at a haircut). Creditors with a more optimistic outlook (or other reasons to prefer a maturity extension) will bid a flatter yield curve, as they place greater value on longer-dated claims (while being more averse to haircuts).

Ultimately, haircuts are determined endogenously, to ensure market clearing. This implies that haircuts will be such that creditor demand ends up being exactly consistent with the repayment profile as pre-specified under Step ii., thus ensuring that all restructured claims "fit" with a repayment profile that is deemed to restore debt sustainability (see Appendix I).

34. Holding the repayment profile fixed, the introduction of the auction-step will initially benefit creditors: they now end up with new claims more in line with their beliefs and preferences. However, there are ways in which this gain to creditors may spill back to benefiting the debtor country:

- If the debtor has some bargaining power vis-à-vis creditors during the restructuring, creditors may settle for a more lenient repayment profile if they know that the ensuing auction step will distribute the losses in a creditor-friendly way (as opposed to imposing a crude "one size fits all" treatment);
- The entire process may become quicker to resolve, likely benefiting both creditors and debtor (who will regain market access more rapidly);
- The anticipation of a more orderly and efficient restructuring may lower ex-ante borrowing costs (this has been observed for CACs, see Carletti et al. (2020) and Chung and Papaioannou (2020)).

35. An auction-based approach may bring further benefits to the debtor if it can be given some flexibility to determine the shape of the new debt stock.¹³ The example in ¶33 only catered to

¹² In cases where the restructuring of privately-held debt follows a Paris Club-agreement, the NPV-relief "to be found" is effectively pre-determined by the latter through "comparability of treatment" (recall ¶14).

¹³ Along the lines of ¶34, some of these benefits may ultimately spill back to creditors.

creditors' discount-rate heterogeneity, but richer variants are possible (in fact preferable, as they allow for closer tailoring to creditor preferences).¹⁴ As discussed in ¶132, a restructuring ideally also optimizes over the shape of the new debt stock—both with respect to the repayment profile as well as by allowing for different types of debt, e.g. in local currency or with state-contingent features.¹⁵

36. The extent to which the debtor can be given ex-post flexibility to shape the debt stock

will vary from case to case. One should avoid situations where creditors need to place bids in an environment where they feel they have insufficient information to determine their relative preferences between the different options (violations of the "independence condition", recall ¶126). Granting countries (some) flexibility may be possible under certain circumstances and conditions:

- *Flexibility regarding the repayment profile.* Ideally, a debtor would like to poll demand for bonds of different maturities and issue more in maturities for which demand is strongest. The repayment profile is then only set *after* creditors have filed their bids, which may violate the "independence condition": a creditor who bids aggressively for longer maturities might feel expropriated if the debtor subsequently ends up issuing more short-term debt than anticipated (diluting the value of longer-dated claims). Pre-specifying the repayment profile solves this problem. In principle, the process could move ahead *without* pre-specifying the repayment profile, but creditors eyeing on longer-dated claims then likely want compensation for the dilution risk they are facing (e.g. demanding higher nominal repayments). Whether the benefits of greater flexibility outweigh the costs will vary from case to case, depending on the credibility of the sovereign. If dilution is deemed a relatively minor concern, giving the country some flexibility on the repayment profile could be an option—e.g. supported through a guarantee by the debtor to keep its annual repayments within a pre-specified range (so that creditors know an upper- and lower-bound for potential debt service each year).¹⁶

¹⁴ There is a trade-off as offering a richer menu can lead to many small bonds, harming their secondary-market liquidity. The potential for using auctions is therefore greater when the debt stock that is to be restructured is larger: that will allow for a richer menu, ultimately reflecting individual creditor preferences more closely.

¹⁵ Although conversions into state-contingent or local-currency debt can be sustainability-enhancing (IMF and World Bank, 2021), the way of assessing "comparability of treatment" (¶14) has difficulty appreciating them (as they do not automatically bring NPV-reductions, maturity extensions, or nominal financing relief). Consequently, these forms of relief may currently be underutilized. When offering such options alongside conventional FX debt in an auction, one can claim that every participating creditor has contributed "comparably", as the mechanism simply lets each creditor provide relief in its preferred way (subject to some pre-specified amount of relief being generated in aggregate).

¹⁶ Debt-dilution risk also exists in normal times: after having issued a long-term bond, a sovereign can always dilute that claim by next issuing new debt at shorter maturities. Hatchondo et al. (2016) find that creditors demand compensation for this risk through higher yields on long-term debt. One could argue that, given the presence of the dilution problem in the primary market (outside of the restructuring context), allowing some of this risk into the restructuring makes no real difference. After all: keeping dilution-risk outside of the restructuring merely shifts it to the next primary auction. In that case, the dilution risk-premium on long-term bonds is likely to feature in the restructuring auction anyway.

- *Flexibility regarding currency choice.* One could pre-announce that only x percent of the new repayment profile will be USD-denominated—the remaining (100- x) percent in some other currency:

Debt-service profile	2022	2023	2024	2025	2026
Pre-restructuring	\$4 bln	\$3 bln	\$2 bln	\$2 bln	\$2 bln
Post-restructuring	\$0 bln	\$1 bln	\$2 bln	\$2 bln	\$3 bln
Currency		$x_1\%$ in USD	$x_2\%$ in USD	$x_3\%$ in USD	$x_4\%$ in USD

Here, one only pre-specifies *total* repayments in USD—not its breakdown between various currencies. In this case, the “independence assumption” is likely satisfied if the alternative is some other reserve currency (the value of a 2023-bond in USD should not be greatly affected by the share of 2023s in EUR, provided both bonds are sufficiently large and liquid). In case the alternative is local currency, the composition may matter (e.g.: when a country’s FX reserves are worryingly low, a higher share in LC improves the quality of USD-claims). But if the country has access to significant FX reserves (e.g. on the back of IMF support), the LC-share may cease to be a first-order concern and the country can be offered flexibility to let the currency composition vary with demand (potentially pre-specifying a range for x in each year, to provide creditors with some anchor). Creditors would then bid like:

“I am indifferent between being compensated with {USD100 of USD-bonds due in 2023 OR USD105 of USD-bonds due in 2024 OR LCU108 of LC-bonds due in 2023 OR etc.}”

If demand for LC debt turns out to be strong, the sovereign can decide to issue more LC claims than originally envisioned. This is also beneficial to creditors, as the restructured debt stock ends up more in line with their preferences (supplying more LC debt if demand asks for this). If some creditors are in principle willing to accept debt in local currency but worry about future inflation, the sovereign may wish to augment the menu with *inflation-linked* local-currency bonds.

- *Incorporating state-contingent claims.* Similarly, one could allow for the inclusion of state-contingent instruments, e.g. a GDP-linked payment due in year T .¹⁷ After pre-specifying the exact payment terms for the latter, creditors can submit bids like:

“I am indifferent between being compensated with {USD100 of bonds due in 2023 OR USD105 of bonds due in 2024 OR USD95 of the GDP-linked instrument}”

Creditors who are optimistic regarding future growth will bid more aggressively on the GDP-linked instrument (i.e.: settle for a lower notional amount, e.g. USD90 rather than USD95).

Upon analyzing demand for the various restructured products, a country can again decide how much of the GDP-linked instrument to issue (trading this off against the bonds maturing in 2024). If bids are not attractive, the debtor can decide not to issue any GDP-linked claims.

37. The PMA ends up soliciting and aggregating market-views on what creditors like the restructured debt stock to look like—endowing the creditor community with an efficient

¹⁷ Here, the “independence condition” is likely satisfied if the GDP-linked payment is due *after* the last bond included in the restructuring matures. Then, only the size of the last payment is uncertain, but those bidding for that instrument know exactly how much debt falls due in prior years and are thus able to judge their position in the hierarchy.

aggregate voice. All else equal, it seems reasonable to assume that creditors prefer to end up with a restructured claim on a solvent country, as that best preserves the secondary-market value of their new claims. If they (collectively) believe that the country's debt sustainability is better served by having more debt in local currency, they can be expected to bid more aggressively on those claims (if present on the auction menu)—inducing the sovereign to fill demand in that direction (as it is cheapest). Hereby, the PMA gives the sovereign access to a “wisdom of the creditor-crowd”.

38. **Allowing the restructured debt stock to feature local currency-, floating rate-, or GDP-linked debt may furthermore help mobilizing creditor support** (Cohen et al., 2020). This holds true for enriching the restructuring menu in general, but even more so in the face of creditors who believe that the new repayment proposal (Step ii. of 133) “overshoots” (embeds too much relief). Through their eyes, local-currency debt or GDP-linked claims may look attractive, as they can be expected to rally following superfluous relief. Another option is to put debt with a floating interest rate on offer; such claims might appeal to creditors who fear that their new claim will be “diluted” through excessive future borrowing by the debtor.¹⁸ By giving such creditors an option to position themselves so that they are compensated in case their fears materialize, even they may be attracted to some options on the menu (which they can self-select into), without liking every element of the proposed deal. This enhances prospects of surpassing participation thresholds.

39. **The proposed approach and resulting outcome have various desirable properties:**

- *Logical consistency:* Creditors who are pessimistic on the country's future will want to be repaid soon, the odds of which can be increased by bidding a steeper yield curve—bringing larger haircuts to shorter-dated claims (see Appendix I). This is consistent with their bearish outlook, as the logical implication of that view is that debt relief is needed. More optimistic creditors will, *ceteris paribus*, bid a flatter yield curve—accepting that they will likely end up with longer-dated claims. But given the lower haircut (which is again consistent with their optimistic view), they too are happy with this outcome. Casting the process in a logical framework may facilitate the process of reaching agreement, as it does not allow for inconsistent arguments (on which restructurings can lose valuable time, ultimately to the detriment of all creditors and debtor).
- *Efficient sorting:* The auction allows creditors to self-select into that mode of providing relief that is least painful in their perception. Creditors preferring a haircut (maturity extension), can get their haircut (maturity extension). The PMA's “polling ability” (136) can furthermore be used to test market demand and optimize over the structure of the post-restructuring debt stock—informing the choice as to what instruments the sovereign should issue in the restructuring (only FX-bonds or also GDP-

¹⁸ Hatchondo et al. (2016) argue that floating rate debt can substitute for the addition of covenants (which often feature in corporate debt contracts, mitigating debt dilution-risks for existing creditors). When bonds carry a floating interest rate, which is expected to rise following heavy borrowing by the sovereign, the holder of such claim will see compensation (through a higher interest rate) if the feared dilution-scenario materializes.

linked or LC-bonds?), and in what amounts. This allows a debtor to maximize the relief it can obtain, as the auction shapes and distributes the losses in a way that is least painful to creditors.

- *Inter-creditor equity:* Among those participating in the auction, no creditor will prefer the allocation resulting for any other creditor over its own—making all creditors believe they struck the best deal in the restructuring.¹⁹ In that sense, all creditors participating in the auction can be said to contribute “comparably”: they all contribute to bringing a certain amount of aggregate debt relief to the sovereign, but each creditor does so in the way to which they are *comparatively* least averse. This makes the mechanism reflect inter-creditor equity, which should help generate creditor support and willingness to move ahead. It furthermore facilitates the provision of relief in ways that are more difficult to appreciate with the standard metrics through which “comparability of treatment” is assessed (recall footnote 15), like conversion into local currency debt or state-contingent claims.

40. **Thanks to these features, an auction-based procedure has potential to ease the restructuring process:**

- By enabling the sovereign to tailor the structure of the new debt stock to creditor preferences, and by subsequently generating an allocation which places the restructuring on the efficient frontier, it enlarges the set of restructuring proposals that are mutually acceptable to the various stakeholders.
- Auctions enable a large number of players to communicate efficiently, making more creditors feel included. The auction enables *all* creditors to express their preferences—not just those present (or represented) at the negotiating table. The fact that an auction-based framework forces all participants to reason along logically-consistent lines may lead to a more direct path towards agreement (¶39).
- Since the PMA will approximate market prices, creditors don’t have to worry about opting into an inferior restructured instrument (prices will adjust where needed). Although the PMA (or any mechanism) is unlikely to achieve *fully* efficient prices (e.g. due to the logic of Grossman and Stiglitz (1980)), it is likely to do better than a negotiation-based approach. Knowing that transactions will ultimately take place at fair market prices should create comfort among creditors to move ahead with the restructuring, even if not all details are to their liking.
- While the auction only comes into play once stakeholders have agreed upon a restructured repayment profile (which will continue to be challenging as creditors are understandably averse to taking losses), knowing that the ultimate resolution mechanism will be price-based is likely to make

¹⁹ Imagine a country with a 5 percent discount rate. However, for whatever reason (e.g. an optimistic outlook), investor X is applying a 0 percent discount rate to this country—thus bidding a flat yield curve. As a result, the restructuring will boil down to a pure maturity extension for X (no nominal haircut). Given its 0 percent discount rate, X doesn’t feel an NPV reduction following a maturity extension. But the country (discounting at 5 percent) does! Moreover, no other investor (all with discount rates > 0) will look at X’s deal and think of it as attractive relative to their own; still X is happy, considering themselves as the only creditor to have avoided an NPV reduction (while all others saw nominal haircuts).

any repayment profile more acceptable.²⁰ Creditor-support can be enhanced further by enriching the restructuring menu with options that should look attractive to creditors who believe that the proposed restructuring “overshoots” by providing excessive relief (like GDP-linked bonds, recall ¶38).

- Debt restructurings can be complicated by holdout creditors who do not wish to contribute to the provision of debt relief. This problem is likely less severe in an auction-based restructuring:
 - Fang et al. (2020) find that holdouts are more likely when the restructuring imposes a bigger NPV-loss. Fang et al. calculate NPV-losses using exit-yields, but their finding would likely be even stronger if one were to use creditor-specific discount rates. An auction distributes the aggregate NPV-loss embedded in the operation in the least painful way (exploiting preference heterogeneity on the creditors’ side, letting each creditor provide relief in its preferred way; see footnote 19), minimizing the sum of NPV-cuts “felt” by each individual creditor. This should limit unhappiness among creditors, reducing the likelihood that the holdout problem will become binding.
 - The holdout problem may also be weakened by a converse to the “winner’s curse”. Since restructuring proposals tend to feature minimum participation thresholds (¶15), creditors know that a restructuring will only go ahead if a sufficient majority of bondholders agrees. But if other creditors accept a proposal, they must have information that doing so is indeed beneficial. This makes creditors realize that any relief they offer, will only come into effect if enough other creditors agree that accepting the proposal is sensible. The presence of such a “cross-check” makes creditors more willing to contribute to the public good of debt reduction and decreases the likelihood of creditor coordination issues getting in the way of a deal (Detragiache and Garella, 1996).²¹
 - As will be explained in the next section, the holdout problem may be diminished further by the fact that an auction-based process can make use of powerful “single-limb” voting procedures.

III. Use of Majority Restructuring Provisions in an Auction-Based Process

41. **Majority restructuring provisions in sovereign debt contracts have played an important role in debt workouts to increase creditor participation** (IMF, 2020b). CACs for example allow a qualified majority of bondholders (either within or across bond series) to bind a non-consenting

²⁰ Consider the following analogy. A firm intends to dismiss 10 percent of its work force. A happy employee might resist this proposal. But if this employee is next told that the resolution mechanism will be price-based (asking all workers for their “willingness to accept dismissal” and compensating accordingly) their resistance might weaken. After all, they now know that if they do end up being fired, they will be compensated at their self-quoted price (which should leave them indifferent *ex post*). While said employee may still be able to do better by lobbying for dismissal of only 5 percent (rather than 10 percent), those potential gains may be relatively minor—not worth the costs of arguing.

²¹ This is the opposite to the “winner’s curse”: when bidding for a good with common value, bidders realize they are more likely to win if their bid is higher than the object’s true value. The act of winning then *invalidates* the underlying premise (that the value of the object exceeds that of their bid). This makes bidders bid less aggressively. In a restructuring, “winning the auction” (the participation threshold being passed) *validates* the underlying premise that the offer is sensible, which makes creditors *more willing* to accept the proposal *ex ante* (since it is only final after a cross-check).

minority to the terms of a restructuring. Such clauses are crucial to ensuring majority control over the restructuring process and preventing a minority from holding out of a deal—free-riding on the debt relief provided by others. As such, designing a restructuring mechanism that can combine usage of auctions with that of CACs would be an important objective to maximize creditor participation.

42. There are two ways to incorporate CACs in an auction-based process:

- First, an auction could be used in a non-binding, consultative way—to pulse investors' overall and relative preferences for new instruments. After better understanding these, an exchange offer can be launched, and CACs could serve to bind non-consenting holders. In theory, the auction step should increase the likelihood that CAC thresholds would be reached, given that the offer was tailored to investor desires. In this scheme, the auction would complement the informal soundings that currently take place in debtor-creditor negotiations. The downside of such an approach is that investors may try to “game” the auction through “cheap talk” as they are not committed to actually purchase what they bid (and, as noted by Hausch and Ramachandran (2000), “auctions speak louder than words”).
- Second, a restructuring could be designed to bind creditors to the results of the auction (including those who did not consent to participate) via CACs. Such a mechanism has the benefit of holding creditors to their respective bids, reducing the risk that they will attempt to engage in “cheap talk”.

43. An auction mechanism that binds all creditors—including non-consenting ones through CACs—could look as follows: In the context of an exchange offer, bondholders could be asked to consent to exchange their original bonds for the new instruments to be issued in an agreed auction that would take place along clearly specified terms. Consenting bondholders could then either decide to participate in the auction (and receive a bespoke set of bonds according to their preferences), or consent to receive a pre-specified composite “strip” of bonds (e.g. a replication of the overall repayment profile). In addition, bondholders could be asked to consent to compensate non-consenting bondholders (not participating in the auction) through the composite strip. If the respective CAC thresholds in the bonds were met, then non-consenting holders would be bound by the deal.²² Such a mechanism could be employed in conjunction with either series-by-series, or dual-limb CACs.²³

44. An auction-based format could also allow for usage of powerful single-limb voting procedures.

- Most bonds issued since 2014 contain “enhanced” CACs, featuring a menu of voting options, including a “single-limb” one. This option, which is the most potent in combatting the holdout problem, allows a majority of bondholders *across multiple bond series* to bind the minority across all

²² Non-consenting holders could still be given the opportunity to participate in the subsequent auction, although restricting non-consenting creditors to receiving the “strip” may help to incentive participation at the outset.

²³ Series-by-series CACs operate on a per-bond basis—allowing a majority of the holders of each bond to bind the minority. Dual-limb CACs include a limited form of aggregation—including both a cross-series threshold (typically 66 2/3 percent) and a per series threshold (typically 50 percent) that, if both met, bind all holders to the restructuring.

series to the terms of a restructuring. This makes the process less vulnerable to a holdout buying a blocking position in one particular bond series. However, the single-limb voting procedure also includes protections for minority bondholders, namely that the offer should be "uniformly applicable", meaning that all bondholders must be offered the same bond, or the same menu of bonds.²⁴ Partly as a result of this, single-limb voting has not yet been used in practice.

- At first sight, an auction-based process, designed to make tailored offers at the creditor-level, does not seem "uniformly applicable". But with some modifications, the requirement can be met—opening the door to single-limb voting. One option is a two-step process. First, all creditors would consent to exchange their bonds into a single new instrument, in proportion to their original claim. For example, a creditor could simply receive \$1,000 of "new instrument" per \$1,000 in principal of old bonds. This new instrument would not be tradable and only serves to enter the auction (also determining budgets). Given that all bondholders would be offered the same instrument (at the same price), "uniform applicability" would be met. In a next step, holders would use this new instrument to obtain their final claims via the auction. Similar to above, non-consenting holders bound by the first step could either be allowed to enter the auction, or only to receive a default "strip".

IV. How can the PMA be deployed in practice?

45. Under current practices, exchange offers typically come in two types:

- The offer enables creditors to exchange old bonds into a pre-specified composite package of new bonds (see the recent restructurings in Ecuador, Greece, and Ukraine), or;
- The offer enables creditors to pick a restructured bond from a menu of choices subject to availability (done in Argentina's 2020 restructuring); the pricing of the options is fixed in advance, creating a need for some mechanism to deal with excess demand.

46. By mobilizing the PMA as described in Section II, a debt operation can be completed in a much more flexible way:

- Individual creditors can construct their own composite package of new bonds, in line with their own preferences as to how they wish to contribute to the provision of debt relief (which could be a corner solution, i.e. a creditor exchanging *entirely* into the new bond with the shortest maturity).
- Prices of the various options do not have to be fixed in advance. That practice can give rise to inferior options, leading to excess demand elsewhere (creating a need for oversubscription mechanisms). Instead, the PMA can calculate market-clearing prices, which improves inter-creditor equity (as every creditor is allocated its preferred restructured claim, given market prices) and should ensure a smooth price-transition once secondary-market trading starts.

²⁴ In particular, the uniform applicability requirement will not be met if each bondholder is not offered the same amount of consideration per amount of principal as that offered to other holders of each affected series.

- The PMA allows quantities to respond to expressed demand, providing creditors with an aggregate communication device vis-à-vis the sovereign, yielding them an efficient way to influence the structure of the new debt stock (what currency, which state-contingent features, etc.; ¶36).

47. **This paper is accompanied by an HTML-tool, which can implement a PMA-based restructuring.**²⁵ The tool is adapted for demonstration purposes and imagines the restructuring of a large stock of USD-denominated bonds, held by various private creditors. Suppose that it is agreed that the following post-restructuring repayment profile is sustainable:

Debt-service profile	2024	2027	2030	2033	2036
Post-restructuring	\$5 bln	\$4.5 bln	\$4 bln	\$3.5 bln	\$3 bln

For simplicity, all post-restructuring bonds are zero-coupon. As the sovereign is looking to reduce its future FX-risk, it allows creditors to bid for local-currency bonds maturing in 2024 (alongside USD-bonds, with the restriction being that *total* 2024 debt service will equal USD5 bln, using forward rates). Creditors are then asked to express their preferences by filling out the blue parts of the following table:

Bids	2024	2027	2030	2033	2036
USD-denominated	100	109.3	119.4	130.5	142.6
<i>implied annual discount rate</i>		3%	3%	3%	3%
LC-denominated	108	n.a.	n.a.	n.a.	n.a.

Here, the creditor expresses indifference between being compensated with USD100 in 2024s (USD-denominated), or LCU108 in 2024s (LC-denominated), or USD109.3 in 2027s (USD-denominated), etc.

48. **If a creditor wishes to exchange into a portfolio of restructured bonds, they can submit fractional bids.** Such creditor could for example direct 30 percent of their budget towards shorter-dated claims (2024s or 2027s; submitting uncompetitive bids for longer-dated bonds); 70 percent could be aimed at 2033s or 2036s (with bids on 2024s, 2027s, and 2030s being uncompetitive). In this case, bids could look as below and the PMA would likely compensate the creditor for 30 percent in 2024s or 2027s (in case of 2024s potentially partly in local currency; whatever is best for the creditor) and for 70 percent in 2033s or 2036s (in USD). The more tilted bids are towards a claim, the more likely the bidder is to obtain it—with an infinite (∞) bid implying *not* getting the associated claim with certainty.

		2024	2027	2030	2033	2036
Bid #1 (30% of budget)	USD-denominated	100	109.3	300	515	900
	<i>implied annual discount rate</i>		3%	20%	20%	20%
	LC-denominated	104	n.a.	n.a.	n.a.	n.a.
Bid #2 (70% of budget)	USD-denominated	100	175	300	120	126
	<i>implied annual discount rate</i>		20%	20%	2%	2%
	LC-denominated	∞	n.a.	n.a.	n.a.	n.a.

²⁵ The tool was developed by Paul Klemperer, Edwin Lock, and DotEcon, whose contributions are gratefully acknowledged. It can be accessed at <https://pma.nuff.ox.ac.uk>

49. **The tool also allows creditors to direct part of their budget towards a default “composite strip”.** The latter delivers the creditor a package that replicates the overall repayment profile. A related construct resided at the core of recent restructurings in Greece, Ukraine, and Ecuador, and its presence creates a close connection between current practices and the proposed auction-based alternative. Creditors who do not like the auction can direct their entire budget to the composite strip, which could also serve as the default in which non-consenting creditors will be compensated. At the same time, creditors who do wish to deviate from the strip are able to allocate (part of) their budget towards customized bids—thus enriching creditors’ options compared to current practices.

50. **While the advantages of using an auction-based mechanism are expected to be largest if bids are binding, the PMA could also be used to solicit and aggregate creditor views** (How much interest is there in longer-dated paper? Is there sufficient appetite for local-currency or GDP-linked debt?). In that case, the PMA-generated outcome can be used as an initial starting point for subsequent “fine-tuning” talks. Under such a scenario the auction might be obfuscated by “cheap talk”, but unless creditors end up misrepresenting their preferences completely, useful information might still be produced which can be used in shaping the exchange offer.

V. Conclusion

51. **Auctions, and Product-Mix Auctions in particular, can be a useful aid to the sovereign debt restructuring process.** They can help discover creditors’ preferences and provide creditors with flexibility to provide debt relief in a way that is least painful to them (subject to some pre-specified amount of relief being generated in aggregate). The process also enables debtors to tailor the post-restructuring debt stock better to investors’ desires, e.g. exchanging some of the old debt into local-currency claims if there is enough appetite to make this attractive to the debtor. These features make the restructuring more efficient (and potentially quicker to resolve), from which both debtor and creditors can be expected to benefit.

52. **The same auction mechanism can also be used to empower sovereigns on the debt management front.** It offers a flexible route of implementing bond exchanges (tailoring terms of the destination bond in response to expressed creditor demand), while it can also arrange for the provision of voluntary liquidity relief by private creditors on market terms. This gives sovereigns the option to seek liquidity relief without having to make use of CACs, or facing certain credit rating downgrades. This gives countries more control over their debt management, which can be helpful in preventing deeper debt difficulties from developing.

Appendix I: Illustrating the process of market clearing

As pointed out in the main text, the Product-Mix Auction (PMA) calculates market-clearing prices (and quantities)—making demand for each good consistent with supply. In the baseline restructuring context (described in ¶33) this boils down to setting haircuts in such a way that the preferences expressed by creditors via their bids become consistent with the pre-specified repayment profile.

In line with standard market clearing logic, the auction algorithm will increase (decrease) the price of a good for which it observes excess demand (supply). Holding other characteristics equal, all investors will normally prefer being repaid early rather than late. So, in the absence of price differentials, there would be excess demand for the bonds maturing early—making the bids incompatible with the pre-specified repayment profile. In response, the auction increases the price of the early bonds up to the point where the bids fit with the pre-specified profile. The early bonds becoming more expensive means that any given investor budget will be able to buy less of them—implying that investors who do wish to receive their money back early, will experience a bigger face value haircut. Haircuts will be determined such that everybody is ultimately willingly holding the instrument they end up with.

Consider a simple example in which the restructured repayment profile is such that it only features two bonds: \$1 bln maturing in 2023 and \$2 bln maturing in 2024 (the pre-restructuring profile featuring \$2 bln in repayments for both years). Assuming a 5 percent discount rate, and analyzing the situation from 2022, the restructuring embeds an aggregate NPV-reduction of 25.6 percent. This aggregate somehow needs to be raised from creditors and the question now is: how to do so in the least-painful way?

Repayment profile	2023	2024
Pre-restructuring	\$2 bln	\$2 bln
Post-restructuring	\$1 bln	\$2 bln

Suppose that there are 200 creditors (all with equal investments, 50 percent in 2023s and 50 percent in 2024s), coming in only two types:

- *Impatient* creditors (of which there are 100) prefer early repayment. Consequently, their bids for the 2024 bond will be relatively uncompetitive (charging a 10 percent annual interest rate):
“I am indifferent between being compensated with {USD100 of bonds due in 2023 OR USD110 of bonds due in 2024}”;
- *Patient* creditors (of which there are 100) are more willing to accept a maturity extension—for simplicity supposed to be indifferent between repayment in 2023 or 2024:
“I am indifferent between being compensated with {USD100 of bonds due in 2023 OR (simply) USD100 of bonds due in 2024}”.

In this example, the PMA will:

- Supply all 100 patient creditors with a claim on the 2024 bond (as they are, relatively speaking, most willing to obtain a longer-dated claim—so for the debtor it is “cheapest” to compensate the patient creditors with the longer-dated bonds);

- Along similar lines, it will supply 71 impatient creditors with a claim on the 2023 bond (see below for more details on how the number 71 is determined);
- The remaining 29 impatient creditors will be pushed into the 2024 bond. A priori, they see this as the inferior instrument (given their impatience), but now haircuts will be set such that these 29 creditors become *exactly indifferent* between obtaining a larger claim on the 2024 bond, or a smaller claim on the bond maturing in 2023.
 - If the 100 impatient creditors were to differ in the degree of their impatience, the 2023 bond would be allocated to *the most impatient* 71. In this scenario, the haircut is determined such that the 71st impatient creditor will be indifferent between a 2023 bond, or a bond maturing in 2024.

To see how this allocation comes about, first consider a naïve strategy which proposes to allocate all 2024s to patient creditors (allocating all 2023s to the impatient ones). Alas, this will not be acceptable to impatient creditors. To see why, observe that after the restructuring, 100 patient creditors get to share \$2 bln—meaning they will be entitled to \$20 mln each. The 100 impatient creditors get to share \$1 bln—meaning they will be entitled to \$10 mln each. At this point, impatient creditors will rightfully note: “I indicated in my bid that I would be willing to accept *110 percent* of the 2023 amount to make me willing to accept compensation in the form of 2024-bonds. But now you are giving the patient creditors *200 percent* of that amount! This, in my view, gives them the better deal, so I would like to join them.”

Given this, the auctioneer will start moving impatient creditors from 2023 to 2024—up to the point where the ratio between the two payments is exactly 110 percent, consistent with their bids. This point will be reached once 29 impatient creditors have been allocated to the 2024-bond.²⁶ At that stage:

- 71 creditors will equally share \$1 bln in 2023, leading to payment of \$14.1 mln to each;
- 129 creditors will equally share \$2 bln in 2024, leading to a payment of \$15.5 mln to each.

Observe that the ratio 15.5/14.1 now exactly equals 110 percent—meaning that this pricing/ allocation is consistent with the bids submitted by all creditors. In this case, the 2023-bond gets to face a nominal haircut of 29.5 percent (with its holders being entitled to \$14.1 mln post-restructuring, versus \$20 mln pre-restructuring), while the 2024-bond gets to face a nominal haircut of 22.5 percent. Holders of both restructured bonds contribute to the provision of NPV-relief to the sovereign, but the group ending up with 2023s does so by taking a nominal haircut, while group ending up with 2024s does so partly by accepting a maturity extension (experiencing a lower haircut in return).

At this stage, a couple of comments are in order:

²⁶ Alternatively, one could also compensate each impatient creditor by 71 percent in 2023s and 29 percent in 2024s. In this simple setup, the number 71 follows from the following formula (which establishes indifference among the impatient group between 2023s and 2024s): $[100R_{2024} - 100R_{2023}Q]/[R_{2023} + R_{2024}]$, where R_t is the amount available for repayment in year t and Q is the relative compensation the impatient type asks for a 2024-bond (here 110 percent).

- Haircuts for the two groups will diverge (converge) as the impatient creditors become less (more) willing to accept compensation in the form of 2024s. With impatient creditors becoming less keen on a maturity extension, they will have to accept a larger nominal haircut (as the aggregate amount of NPV-relief that is to be raised is fixed and determined by the pre-specified repayment profile). This illustrates the incentives offered to creditors, namely the prospect of a lower nominal haircut when being more willing to accept a maturity extension.
- The allocation that the PMA will arrive at, is the exact same allocation which would have resulted had the market-clearing nominal haircuts (29.5 percent on 2023s and 22.5 percent on 2024s) been announced in advance.²⁷

²⁷ This is equivalent to imagining that Amazon would have had its IPO on December 31, 2020, with investors being able to acquire an Amazon share at a pre-announced price of \$3,256.93 (the closing price of that day). Assuming that the same set of investors would be participating (which is not guaranteed in an IPO, but will typically be the case in a restructuring where all creditors wish to exhaust their budget), *the exact same investors* should end up *holding the exact same amounts* of Amazon stock.

References

Aghion, Philippe, Oliver Hart, and John Moore (1992), "The Economics of Bankruptcy Reform", in: Olivier J. Blanchard, Kenneth A. Froot, and Jeffrey D. Sachs (eds.): *The Transition in Eastern Europe*, Chicago: University of Chicago Press.

Bebchuk, Lucian (1988), "A New Approach to Corporate Reorganization", *Harvard Law Review*, 101, pp. 775-804.

Breuer, Peter and Charles Cohen (2020), "[Time is Ripe for Innovation in the World of Sovereign Debt Restructuring](#)", IMF Blog, November 19 2020.

Buchheit, Lee, Guillaume Chabert, Chanda DeLong, and Jeromin Zettelmeyer (2020), "The Restructuring Process", in: S. Ali Abbas, Alex Pienkowski, and Kenneth S. Rogoff (eds), *Sovereign Debt: A Guide for Economists and Practitioners*, Oxford: Oxford University Press.

Buchheit, Lee and Mitu Gulati (2020), "Avoiding a Lost Decade - Sovereign Debt Workouts in the Post-COVID Era", *Capital Markets Law Journal*, forthcoming.

Carletti, Elena, Paolo Colla, Mitu G. Gulati, and Steven Ongena (2020), "The Price of Law: The Case of the Eurozone Collective Action Clauses", *Review of Financial Studies.*, forthcoming.

Choo, Eugene (2005), "Going Dutch: The Google IPO", *Berkeley Technology Law Journal*, 20, pp. 405-441.

Chung, Kay and Michael G. Papaioannou (2020), "Do Enhanced Collective Action Clauses Affect Sovereign Borrowing Costs?", IMF Working Paper No. 20/162.

Claessens, Stijn and Sweder van Wijnbergen (1993), "Secondary Market Prices and Mexico's Brady Deal", *Quarterly Journal of Economics*, 108 (4), pp. 965-982.

Clare, Andrew, Nick Motson, and Steve Thomas (2013), "An Evaluation of Alternative Equity Indices", mimeo, Cass Business School.

Cohen, Charles, S. Ali Abbas, Myrvin Anthony, Tom Best, Peter Breuer, Hui Miao, Alla Myrvoda, and Eriko Togo (2020), "The Role of State-Contingent Debt Instruments in Sovereign Debt Restructurings", SDN/20/06.

Das, Udaibir S., Michael G. Papaioannou and Christoph Trebesch (2012), "Sovereign Debt Restructurings 1950–2010: Literature Survey, Data, and Stylized Facts", IMF Working Paper No. 12/203.

Debrun, Xavier, Jonathan D. Ostry, Tim Willems, and Charles Wyplosz (2020), "Debt Sustainability", in: S. Ali Abbas, Alex Pienkowski, and Kenneth S. Rogoff (eds), *Sovereign Debt: A Guide for Economists and Practitioners*, Oxford: Oxford University Press.

DeSieno, Timothy B. (2016), "Creditor Committees in Sovereign Debt Restructurings: Understanding the Benefits and Addressing Concerns", in: Martin Guzman, Jose Antonio Ocampo, and Joseph E. Stiglitz (eds.), *Too Little, Too Late: The Quest to Resolve Sovereign Debt Crises*, New York: Columbia University Press.

Detragiache, Enrica and Pablo G. Garella (1996), "Debt Restructuring with Multiple Creditors and the Role of Exchange Offers", *Journal of Financial Intermediation* 5, pp. 305-336.

Diwan, Ishac and Kenneth Kletzer (1992), "Voluntary Choices in Concerted Deals: The Menu Approach to Debt Reduction in Developing Countries", *World Bank Economic Review*, 6, pp. 91-108.

Diwan, Ishac and Mark M. Spiegel (1994), "Are Buybacks Back? Menu-Driven Debt Reduction Schemes with Heterogeneous Creditors", *Journal of Monetary Economics*, 34, pp. 279-293.

Eckbo, B. Espen and Karin S. Thorburn (2009), "Bankruptcy as an Auction Process: Lessons from Sweden", *Journal of Applied Corporate Finance*, 21, pp. 38-52.

Fang, Chuck, Julian Schumacher, and Christoph Trebesch (2020), "Restructuring Sovereign Bonds: Holdouts, Haircuts and the Effectiveness of CACs", ECB Working Paper No. 2366.

Grossman, Sanford J. and Joseph E. Stiglitz (1980), "On the Impossibility of Informationally Efficient Markets", *American Economic Review*, 70, pp. 393-408.

Hatchondo, Juan Carlos, Leonardo Martinez, and César Sosa-Padilla (2016), "Debt Dilution and Sovereign Default Risk", *Journal of Political Economy*, 124, pp. 1383-1422.

Hausch, Donald and S. Ramachandran (2000), "Corporate Debt Restructuring: Auctions Speak Louder Than Words", in: Stijn Claessens, Simeon Djankov, and Ashoka Mody (eds.): *Resolution of Financial Distress: An International Perspective on the Design of Bankruptcy Laws*, World Bank Institute.

IMF (2020a), "[Ukraine : Ex-Post Evaluation of Exceptional Access Under the 2015 Extended Arrangement-Press Release and Staff Report](#)", Washington DC: International Monetary Fund.

IMF (2020b), "[The International Architecture for Resolving Sovereign Debt Involving Private-Sector Creditors](#)", Washington DC: International Monetary Fund.

IMF and World Bank (2021), "[Guidance Note For Developing Government Local Currency Bond Markets](#)", Washington DC: International Monetary Fund and World Bank.

Klemperer, Paul (2008), "A New Auction for Substitutes: Central Bank Liquidity Auctions, the U.S. TARP, and Variable Product-Mix Auctions", Nuffield College Working Paper, University of Oxford.

Klemperer, Paul (2010), "The Product-Mix Auction: A New Auction Design for Differentiated Goods", *Journal of the European Economic Association*, 8, pp. 526-536.

Klemperer, Paul (2018), "Product-Mix Auctions", Nuffield College Working Paper, University of Oxford.

Milgrom, Paul (2000), "Putting Auction Theory to Work: The Simultaneous Ascending Auction", *Journal of Political Economy*, 108, pp. 245-272.

Noked, Noam (2013), "Central European Distribution Corporation's Chapter 11 Plan Incorporates Dutch Auction", [Harvard Law School Forum on Corporate Governance](#).

Orszag, Peter (2020), "[Memo to the IMF on How to Respond to Sovereign Debt Challenges in the Wake of the Pandemic](#)", PIIE Blog, November 16 2020.

Van Wijnbergen, Sweder (1991), "Mexico and the Brady Plan", *Economic Policy*, 6, pp. 13-56.

Willems, Tim (2020), "[A Proposal for an Auction-Based Sovereign Debt Restructuring Mechanism](#)", VoxEU, November 16 2020.