

IMF STAFF DISCUSSION NOTE

The Role of State-Contingent Debt Instruments in Sovereign Debt Restructurings

Charles Cohen, S. Ali Abbas, Myrvin Anthony, Tom Best,
Peter Breuer, Hui Miao, Alla Myrvoda, and Eriko Togo

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Glossary

AFD	Agence Française de Développement
BPS	Basis points
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CCRT	Catastrophe Containment and Relief Trust
DOTS	Direction of Trade Statistics
DSA	Debt Sustainability Analysis
EMTA	Emerging Markets Traders Association
FX	Foreign exchange
GDP	Gross domestic product
GFN	Gross financing needs
GLW	GDP-linked warrant
HIPC	Heavily Indebted Poor Countries
ICMA	International Capital Markets Association
LIC	Low-income country
NPV	Net present value
PDVSA	Petroleos de Venezuela, S.A. (Venezuela's state-owned oil company)
PPP	Public-private partnership
SCDI	State-contingent debt instruments
SoDR	Sovereign debt restructuring
SOEs	State-owned enterprises
VRIs	Value recovery instruments
WEO	<i>World Economic Outlook</i>

EXECUTIVE SUMMARY

The COVID-19 crisis may lead to a series of costly and inefficient sovereign debt restructurings. Any such restructurings will likely take place during a period of great economic uncertainty, which may lead to protracted negotiations between creditors and debtors over recovery values, and potentially even relapses into default post-restructuring.

State-contingent debt instruments (SCDIs) could play an important role in improving the outcomes of these restructurings. Unlike traditional sovereign bonds or loans, SCDIs have payouts that are higher in good states of the world than bad states, based on the value of a state variable, such as GDP or commodity prices, which is linked to the sovereign's debt-service capacity. By tying the payments of restructured debt contracts to future outcomes, SCDIs may reduce conflicts over current valuations and facilitate more sustainable agreements between creditors and debtors.

However, the usefulness of SCDIs may be limited by their lack of appeal to sovereign debt investors. While attractive in theory, restructuring instruments that provide upside to creditors (such as GDP-linked warrants) have rarely been used in practice. Fixed-income investors have typically steeply discounted these "equity-like" instruments given their nonstandard designs, illiquidity, and idiosyncratic risk profiles; hence they have often provided poor value for their cost to borrowers.

SCDIs can target specialized situations and use improved designs to increase uptake in future restructurings. Restructurings of (increasingly significant) state-owned enterprises and public-private partnerships could benefit from the use of SCDIs similar to the debt-to-equity conversions that are common in private sector restructurings. Designing better SCDI contracts will also raise their appeal; future SCDIs should increase the use of standardized terms to promote liquidity and avoid historical shortcomings such as measurement issues, lagging indicators, and uncapped payouts. Official sector promotion of SCDIs—including endorsement of standardized termsheets, enhanced data provisioning, and recognition of their benefits in debt sustainability—could also be catalytic.

The conjuncture also provides an opportunity to consider the issuance of exchange bonds with payouts that vary with both good and bad times. The post-COVID outlook is one that leaves sovereign debtors exposed to heightened uncertainty on both the upside and downside, and even seemingly conservative baselines may prove to have been optimistic. Accordingly, "symmetric" instruments—with coupons linked to a variable (for example, commodity prices) that is outside the control of the issuing sovereign (hence avoiding measurement and manipulation risks)—should be explored.

Finally, restructurings present an important opportunity for the inclusion of disaster clauses that provide valuable insurance to vulnerable countries. Clauses that grant temporary debt relief after natural disasters were included in recent Caribbean restructurings. A restructuring offers the opportunity to introduce SCDIs to a country's renegotiated debt stock, thereby setting creditors on an equal footing and avoiding some of the obstacles to their use in new issuance. New clauses to address liquidity crises such as the one brought on by the current pandemic should also be studied further. Such clauses could be tied to future official sector debt suspensions; this would help avoid the difficulty of identifying triggers for another unforeseen global shock.

INTRODUCTION

Following the COVID-19 shock, many countries may need to undertake sovereign debt restructurings (SoDRs) during a period of great macroeconomic uncertainty. This elevated uncertainty, and the implications for sovereign recoveries, poses the risk that both sovereign debtors and their creditors would be less willing to agree to terms of SoDRs in a timely fashion. In addition to deleteriously prolonging the resolution of debt restructurings, this could either result in suboptimal agreements with long-lasting negative consequences for the borrowers and creditors or lead to repeated SoDRs in a short space of time.

Given this uncertainty, state-contingent debt instruments (SCDIs) could play an important role in facilitating speedier and less-costly SoDRs by tying the payments of restructured debt contracts to future outcomes. Sovereign SCDIs are instruments that (1) bear contractual debt service obligations linked to a predefined state variable ² (for example, GDP, exports, or commodity prices) and (2) are designed to provide additional creditor compensation in good times and/or provide some form of debtor relief in bad times, such as the occurrence of a natural disaster. By tying the debt service payments of restructured debt contracts to future outcomes, SCDIs may help avoid protracted disputes about current valuations and facilitate quicker agreements between creditors and debtors, thus allowing countries to restore debt sustainability and facilitating their return to market access.

Restructurings offer a unique opportunity for the introduction of SCDIs into a sovereign's debt portfolio. In a restructuring scenario, SCDIs can be implemented across the entire renegotiated debt stock with the consent of existing creditors, thereby eliminating the “first-mover” problem—namely, the differential treatment of legacy debt contracts that lack such clauses—which lowers their appeal in the context of new issuance. Earlier work has highlighted the usefulness of these debt instruments (Borensztein and Mauro 2002; Kim and Ostry 2018), but apart from their employment in some previous SoDRs, the take up of these instruments in “normal” times remains limited (IMF 2017). While the IMF 2017 paper highlighted a number of benefits of SCDIs, it also pointed to several factors which inhibit their take up in normal times. This note concentrates on the more limited role for SCDIs in the context of SoDRs, though it draws extensively on many of the lessons learned from earlier studies.

In the past, SCDIs have tended to be structured in one of two ways:

- *Instruments that provide only upside payouts to creditors under positive scenarios.* These value recovery instruments (VRIs) are typically structured as call options or warrants that are tied to a state variable (such as GDP or exports), which is strongly correlated with the borrower's ability to pay. Upside payouts are usually delayed into the future, and these instruments can typically be traded separately from the renegotiated debt securities.

² A *state variable* is a measurable indicator that varies over time, and as used in a contract may trigger actions on the part of contract participants (such as an increase or decrease in payments).

- *Instruments that provide downside protection to borrowers under negative scenarios.* Typically, such instruments function like insurance contracts by providing relief to borrowers (either in the forms of interest forbearance, maturity extensions, or principal forgiveness) following large negative shocks, such as natural disasters.

This note considers four questions that relate the use of SCDIs to the present conjuncture:

- (1) How can VRIs (for instance, those only offering “upside” to creditors) help facilitate rapid and orderly sovereign debt restructurings, and how should they be structured?** VRIs could play a crucial role in restructurings by bridging the gaps in views between creditors and debtors regarding the economic outlook and hence debt servicing capacity. This may allow for appropriately conservative base case scenarios that minimize the risk of future defaults. However, VRIs are often valued quite differently by creditors and sovereigns, potentially limiting their usefulness. Creditors have historically discounted these instruments severely in sovereign debt restructurings due to their lack of standardization, illiquidity, and idiosyncratic risk profiles. VRIs may be more useful in the restructuring of state-owned enterprises (SOEs) and public-private partnerships (PPPs), as these cases can be very similar to corporate restructurings, where the use of such instruments is common.
- (2) How can SCDIs which offer only “downside” protection to sovereigns, be used during restructurings to embed longer-term resilience in debt structures?** Recent restructurings in the Caribbean have provided opportunities to include “natural disaster” clauses that allow for maturity extensions and interest forbearance following severe shocks. The use of such clauses in future restructurings would likely be beneficial, as they provide valuable insurance at low cost against exogenous shocks in ways that are not easily replicable through private contracts. Such clauses may be increasingly relevant, given growing risks due to climate change and other environmental concerns.
- (3) Extending the idea of disaster clauses, should SCDIs be used to create contingent protection against future global shocks, such as the COVID-19 crisis?** Introducing “crisis” clauses in debt contracts could allow for automatic “natural disaster”-like extensions and forbearance under sufficiently negative conditions. But constructing such clauses in a manner similar to natural disaster clauses may be challenging as (1) triggering events are difficult to determine ex ante (as it would be desirable to look beyond the narrow world of “pandemics”), and (2) investor appetite would probably be low, particularly as creditors themselves also face liquidity challenges during these types of global crises. It may be more promising to consider contingency clauses linking private sector debt standstills to official sector standstills: widespread official sector standstills could serve as a credible signal of the seriousness of the situation, and private sector lenders might be more likely to accept them given the promise of official sector participation.
- (4) Is there scope to introduce SCDIs in restructurings that offer “symmetric” payouts?** The post-COVID outlook is one that leaves sovereign debtors exposed to heightened uncertainty on both the upside and downside. Accordingly, there is an economic case to consider exchange bonds in restructurings that would ensure debt sustainability in both good and bad states of the world—that is, when debt-carrying capacity will be higher or lower, respectively—through

symmetric payoffs linked to GDP. Given the data risks associated with GDP measurement, however, it might be preferable to link payouts to a proxy state variable—such as commodity prices, trading partner GDP or merchandise exports (measured from importing country side)—that is outside the control of the debtor government, but still sufficiently correlated to measures of debt sustainability. Such instruments have the potential to reduce the chance of repeated defaults in a manner mutually beneficial to both creditors and debtors. However, investor appetite for such solutions needs to be sounded out.

HOW CAN VALUE RECOVERY INSTRUMENTS HELP FACILITATE RAPID AND ORDERLY SOVEREIGN DEBT RESTRUCTURINGS?

1. VRIs have been used in some recent SoDRs to increase upside payouts to creditors and boost private creditor participation. Debt restructuring negotiations typically take place under substantial uncertainty and disagreements surrounding the debtor country's economic prospects. This uncertainty can heavily affect creditors' willingness to absorb losses. To help "sweeten" the deal offered to private creditors, VRIs have historically been used in debt restructurings to allow creditors to benefit from prospects of faster-than-anticipated economic recovery. These instruments are typically structured as derivative securities with payouts linked to a state variable such as GDP, commodity prices, or exports. As a call option on better economic outlook, VRIs allow creditors to share the "upside" of economic recovery with the debtor country. The most recent VRI is a GDP-linked warrant (GLW), which allows investors to receive extra payouts when GDP growth exceeds certain thresholds.

2. VRIs may help bridge the economic "expectation gap" between creditors and debtors and diminish the risk of future defaults. In times of high economic uncertainty, such as those brought on by the COVID-19 pandemic, VRIs could facilitate a debt restructuring process by making the payments of restructured debt contracts contingent on various economic outcomes. In this manner, the addition of VRIs may make it easier for creditors to accept new non-contingent instruments (bonds) whose financial terms reflect a conservative view of future macroeconomic developments. This may result in debt that is sustainable with higher probability and a lower post-restructuring debt overhang. Linking VRIs to metrics of debt sustainability helps promote risk sharing and reduces the risk of a future repeat default.

3. The use of VRIs in past debt restructuring cases has been sporadic. Though VRIs have been deployed only on a few occasions among a total of more than 50 external sovereign debt restructuring cases since 1990, some significant and contentious SoDRs have used VRIs to facilitate deep haircuts. VRIs were first introduced during the Brady restructurings in the 1980s,³ when

³ Brady bonds were created in March 1989 to restructure the defaulted emerging market sovereign debt in the 1980s. A menu of options including VRIs and mix of new bonds, which are tailored to the heterogeneous preferences of creditors, were offered to investors to facilitate the debt restructuring (EMTA 2011).

creditors were asked to accept haircuts on their sovereign loans. In the Brady packages for oil-exporting countries, such as Mexico, Venezuela, and Nigeria, participating creditors were offered warrants linked to the price of oil (which was closely linked to their ability to repay hard currency debt), while non-oil-exporting countries offered warrants linked to GDP or revenues of key SoEs. More recently, upside GDP-linked warrants have been featured as part of the financial packages issued to creditors in four major debt restructuring cases: Argentina (2005 and 2010), Greece (2012), and Ukraine (2015). However, in 2020 two significant debt restructurings (Argentina and Ecuador) did not include VRIs.

4. Notwithstanding the theoretical benefits of VRIs, their potentially catalytic role in sovereign debt restructurings remains constrained by implementation challenges. Substantial practical constraints limit the effectiveness of VRIs in facilitating debt restructuring, including divergent investor preferences, difficulty of pricing VRIs, and potential lack of reliable data. Debtors and creditors may remain far apart on the value of proposed VRIs, and this wedge in valuation has limited their use and left a patchy record of VRIs in past restructurings. In some notable cases VRIs were initially underpriced, leading to ex post debtor regret. The following are three major barriers to the successful implementation of VRIs:

- **Investor preferences.** The majority of Eurobond investors are institutional investors and fixed-income mutual funds. Insurance firms and pension funds generally prefer “plain vanilla” fixed-income securities with standard debt contract terms, as these are easy to understand and price, and are much more liquid than innovative and exotic instruments, which would require significant liquidity and risk premiums. Fund managers’ performance is often benchmarked to bond indices, which only include simple debt instruments with large issuance sizes. As a result, exotic instruments with limited marketability, such as VRIs, may not be highly sought out by the traditional fixed-income asset managers. The typical buyer of VRIs is more likely to be a boutique investor or macro hedge fund manager; such investors have much higher return hurdles than regular fixed-income investors. These high-return goals, in turn, put significant downward pressure on the prices of VRIs.
- **Valuation uncertainty and illiquidity of VRIs.** VRIs with payouts linked to GDP or commodity exports are difficult to price. Such instruments are viewed as exotic derivative instruments with very limited secondary market liquidity, generating a wide bid-ask spread for these instruments (up to 25 percent of mid-value for low-priced options). The lack of standardization of VRI payment structures and reference variables, initial low market value, and illiquidity make these instruments less desirable to investors. Box 1 provides case studies on GLWs in Argentina, Greece, and Ukraine.
- **Measurement issues, data reliability, and incomplete contracts.** Nonstandardized contract design, which in some instances included unclear payout calculations of VRIs, has historically led to outcomes that have somewhat tarnished the reputation of VRIs in the investment community. Mexico’s VRI (1977–80) was linked to oil export revenues but did not specify a proper exchange rate to calculate the payout, and the one used diluted payout. Bulgaria’s GLWs did not specify the exact GDP index, allowing the sovereign to choose a local currency constant price GDP to

calculate the payout in their favor. In the early 2010s Argentina was found to have reported inaccurate GDP and consumer price index data, which resulted in concerns about credibility amongst market participants.⁴ For countries with a poor track record of data reliability or institutional independence, investors may not be willing to accept VRIs.

5. VRIs have rarely been seen in official lending. Based on available information, no explicit VRIs have been included in official debt relief cases. Official creditors provide debt relief in the form of debt standstill, maturity extension, interest reduction, and outright debt forgiveness (such as the Heavily Indebted Poor Countries (HIPC) initiative). The absence of VRIs in official debt relief cases reflects the fact that attempts by official creditors to “recover value” in this manner seems contradictory to the stated objectives of such official lending. As concessional lenders, official creditors such as bilateral development aid and multilateral development loans do not intend to share the upside of the economic outlook. This said, official creditors have occasionally issued SCDIs during normal times (see Appendix II for further considerations on the use of SCDIs by official creditors).

6. Non-state-contingent alternatives to VRIs may put borrowers at risk for future restructurings. Investors may prefer simpler substitutes, such as bonds with stepped-up coupons (where the interest rate begins at a low level but resets higher after a predefined number of years) which are easier to price and have historically been used in many restructurings. These instruments automatically deliver higher payments to creditors after some pre-specified period, thereby mimicking the recovery element of VRIs. But if the step-up coupon is set too high, borrowers could be left exposed under adverse macroeconomic outcomes. In case of underperformance of the debtor economy, such instruments may put countries in a position where debt again becomes unsustainable due to the imbedded rising debt servicing cost, as they provide little downside protection to the sovereign.

7. The role of VRIs in facilitating previous debt restructuring appears to be limited. It is not clear that VRIs have shortened debt negotiations, given the unique nature of each case and the difficulty in calibrating counterfactuals. The overall duration of debt negotiations seems primarily dependent on the level of haircuts and creditor/lender dynamics (Appendix IV).

8. As VRIs are typically heavily discounted by investors due to the reasons discussed above, on average they could be more expensive than simply enriching the offer by reducing outright haircuts. Argentina’s 2005 GLWs turned out to be costly for the issuer, and Ukraine’s 2015 GLWs could end up paying out significantly more than the initial creditor haircut (see Box 1). The immediate benefit of low haircuts tied to the inclusion of VRIs must be reconciled with potentially large and fiscally burdensome ultimate payouts.

9. To make them as useful as possible in future debt restructurings VRIs should have the following features (Appendix I):

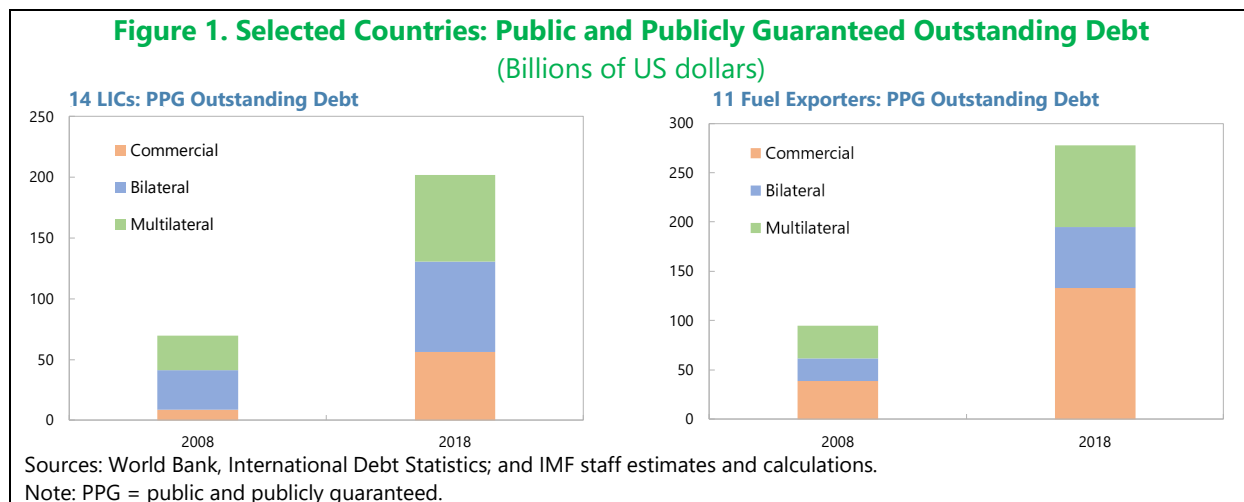
⁴ See [Press Release: Statement by the IMF Executive Board on Argentina, February 1, 2013](#).

- **Choice of state variable:** The ideal state variable for a VRI would be closely tied to sovereign repayment capacity, but free of data-manipulation concerns. Indexation lags and links to highly persistent state variables should generally be avoided as they can erode the countercyclical properties of a SCDI. In this context there may be scope for the introduction of SCDIs linked to state variables that are outside of government control. In addition, linking the state variable to coupon payments rather than the principal smooths payments over time and reduces refinancing risk.
- **Payout structure:** Poorly designed payout structures may have serious consequences for sovereign borrowers. VRI payouts to creditors under upside scenarios must not be so large as to preclude the sovereign from taking advantage of good times to rebuild buffers against future idiosyncratic risks. Accordingly, there is a case for floors and caps on upside payments, while avoiding GLWs structured as “far out of the money” options. Such instruments are likely to be severely discounted by investors but still carry a tail risk to the borrower of large and disruptive payouts, particularly if they are issued without caps (as in the case of the GDP warrants issued in Ukraine’s 2015 restructuring). For instruments that offer downside protection, there is also a theoretical risk of procyclicality for the creditors in bad states of the world, where (local) bond holders would have their returns impaired. However, this risk (1) would be limited if most holders are external or externally funded and (2) in any case must be balanced against the ability of governments in such circumstances to divert funds to much needed social welfare or health expenditures.
- **Detachability:** VRIs have tended to be detachable so that the restructured bond itself remains a fixed-income instrument. If bond index compilers determine that the VRI is more akin to an equity instrument, the bond may not qualify for entry into a bond index. This said, if there is a wider pool of standardized exchange bonds, it may be possible for exchange bonds (including the VRI) to also be included in indices.

10. An important design challenge is balancing the benefits of standardization against the imperatives of debt sustainability and bespoke investor preferences. From the perspective of promoting a liquid secondary market for VRIs, which can be greatly beneficial for both issuers and investors in future restructurings and perhaps even in normal times, there is a strong case for standardized VRIs – i.e. with a common state variable and relatively simple payment structure – that can support familiarity and facilitate investor pricing. It may also increase the likelihood of the instruments being included in a benchmark index. Set against this, the best measure of repayment capacity for a VRI can differ depending on the circumstances of the debtor country, while investors can insist on very specific VRI features. These can lead to the issuance of complex and nonstandard payout formulas in individual cases. How these tradeoffs are resolved in individual cases will depend partly on the international financial community’s interest in seeing deeper markets develop in these kinds of instruments (this is discussed later).

11. VRIs may be helpful in restructuring the debt of SOEs and PPPs to limit their impact on sovereign debt. Both direct lending and contingent liabilities to the sovereign from SOEs and PPP infrastructure projects appear to have become more common in the period leading up to the

current crisis, and potentially account for large shares of external debt, though the available data are still patchy. Staff estimates show that 14 major low-income countries' (LICs) aggregate debt-to-GDP ratio has increased by 14 percentage points while their SOE debt more than tripled from 2008 to 2018 (Figure 1). There has been an even more dramatic rise in SOE lending to energy producers, to which lenders likely feel most comfortable lending against productive assets.



12. SOE and PPP debt restructurings can more closely parallel corporate restructurings, where the use of debt-to-equity conversions or warrants is common. In such cases, reaching an agreement on valuations can be more straightforward, given the role of analysts in assessing and forecasting corporate profitability and the availability of market benchmarks for valuing companies in the same industry. This is more relevant for SOEs and PPPs that operate on a commercial basis, as SOEs that exist primarily to provide public goods without profit motivation may have difficulty in attracting equity investors.⁵ While the use of SCDIs in quasi-public sector cases restructurings is only in its infancy, there are multiple reasons why their use should be encouraged in the future, as we should expect more such cases to appear:⁶

- **Investors in SOEs may be more inclined to accept illiquid equity-like claims, having originally been long-term investors with the expertise to value the underlying cash flows.** In many SOE and PPP cases, lenders have significant bargaining power owing to their claims (either secured or unsecured) on productive assets. This means that VRIs may be key to facilitating rapid and orderly restructurings, particularly in times of high volatility of underlying state variables (such as oil prices).

⁵ For SOEs and PPPs with explicit government guarantees, the use of SCDIs is less relevant. However, they should still be considered for nonguaranteed borrowing or for cases wherein the sovereign is also in distress.

⁶ One recent example is the restructuring of Chad SOE's (Société des Hydrocarbures du Tchad) \$1.4 billion oil-backed debt with Glencore in 2018, where the amortization schedule of restructured debt is linked to oil prices to provide the borrower flexible repayment grace periods.

- **VRIs that are structured as debt-to-equity conversions reduce debt overhang.** This in turn may help facilitate sufficiently high ex post investment by investors (often crucial in capital-intensive industries such as energy production).
- **VRIs can help avoid the downside of costly procyclical sovereign project guarantees** (for example, a guaranteed baseline of electricity demand for power plants or highway traffic volume for toll roads). These guarantees can be replaced by VRIs (such as revenue sharing agreements) which delay the payout—with upside potential—to a future date.

13. Even in the context of SOE and PPP restructurings, there are limits to the use of VRIs:

- **A significant fraction of SOE investors are not interested in SCDIs.** In some cases, these investments may be intermediated by entities such as development banks or import- export banks. Such institutions have typically preferred more standard maturity extensions or grace periods.
- **An inability to restructure SOEs because of the presence of insider control may make foreign investors reluctant to take equity stakes.** In addition, a restructuring that gives external lenders equity stakes in SOEs may entail significant political risks, particularly if the lender is a foreign official creditor.
- **Strong transparency requirements and other public safeguards need to be established to prevent misuse of VRIs.** In the case of PPPs, poor disclosure (or no disclosure at all) of PPP contracts or contingent liabilities may create space for opportunistic renegotiations and negatively affect the public interest. In such instances, in the absence of necessary contractual transparency, it is probably better to face the liabilities without changing contractual risk allocation.

14. Overall, VRIs should be considered in deep debt restructurings involving large uncertainty about economic outcomes but bearing in mind the implementation obstacles and risks that have previously limited their effective use. If a significant number of restructuring cases emerge in the current economic environment, it may offer the opportunity to mainstream the use of well-designed and standardized VRIs. However, substantial challenges are involved that have led to a somewhat poor track record for these instruments. If VRIs are not properly designed and valued (becoming a giveaway to creditors), they may not yield risk-sharing benefits commensurate to the additional debt burden they create. The effectiveness of VRIs to facilitate an orderly and rapid debt restructuring to minimize large costs associated with debt default should be explored taking account of investor preference, characteristic of debt contracts, and incentive compatibility between debtor and creditor. In general, VRIs may be better suited to SOE/PPP restructuring cases, but the political and contractual risks described above merit close attention.

Box 1. Market Valuation of GDP-Linked Warrants: Argentina, Greece, and Ukraine

The prices of Argentine, Greek, and Ukrainian GDP-linked warrant (GLWs) were initially low and have been highly volatile since issuance, fluctuating greatly with the changing economic outlook (Table 1).

Moreover, these instruments are also highly illiquid as evidenced by their large bid-ask spreads. For example, the bid-ask spread for Greek and Argentine GLWs were 22 and 33 percent to their respective mid prices on July 1, 2020.

Argentine GLWs were offered to partially compensate investors for the steep net present value (NPV) haircuts (77 percent) of old sovereign debt in 2005. Each bondholder was given GLWs, which the market initially valued at about 2 cents on the dollar.

Argentine GLWs ultimately proved costly for the issuer despite their initially low market value. The GLW payments were based on GDP level rather than GDP growth. Since Argentina grew rapidly in the years following the debt exchange, the base GDP level was exceeded early. This resulted in high payments on the warrants, representing more than 30 percent of the total servicing of interest on public sector debt in 2012. In recent years the price of the warrants has collapsed along with the drop in GDP.

Greek GLWs were issued to its bond investors as part of a 2012 debt exchange offer, which also carried steep NPV haircuts (65 percent). Initially, investors attributed little value to the Greek GLWs, and the price of GLWs slumped to a low of 0.25 cents on the dollar in the first months after Greece's restructuring. While the Greek warrants also had the potential for large payouts, the triggers are now unlikely to be met due to the low level of nominal GDP and slow GDP growth rate in Greece.

The essentially uncapped nature of Ukraine GLWs could potentially result in large fiscal costs far exceeding initial debt relief. In 2015, Ukraine restructured its debt with a 20 percent NPV reduction, equal to US\$3.6 billion. In return, it issued to creditors GLWs in US\$3.6 billion notional value that are linked to both the level and growth rate of Ukraine GDP. These would deliver to investors a relatively modest internal rate of return to investors of 3 percent on their initial write-down under a 4 percent growth scenario. However, the rate of return jumps to more than 13 percent under a 5 percent growth scenario, which would also involve substantial fiscal costs of more than 55 basis points of GDP per year.

In all these cases, investors seemed to undervalue the future benefits of GLWs, as evidenced by the initial low market value of VRIs. To compensate for this, sovereigns may need to promise better terms, raising the probability of costly GLW payments. It therefore remains unclear to what extent the VRIs succeeded in bringing in more investors to close the debt restructuring while at the same time leading to fair risk sharing ex post.

**Box 1 Table 1. Descriptive Statistics of GDP-Linked Warrant Prices
(Referencing the notional of 100, January 2013–July 2020)**

	Ukraine	Greece	Argentina
<i>Initial price after offering</i>	49.6	0.20	2.0
<i>Maximum</i>	109.43	1.44	11.94
<i>Minimum</i>	28.69	0.14	0.55
<i>Average</i>	57.10	0.57	7.37

HOW CAN SCDIs BE USED DURING RESTRUCTURINGS TO EMBED LONGER-TERM RESILIENCE IN DEBT STRUCTURES?

15. To increase resilience, SCDIs must be designed to reduce debt service in bad times (for example, a recession, or the occurrence of a natural or public disaster). SCDIs can be broadly divided into two categories: debt instruments featuring continuous adjustment of debt service payments (for instance, a GDP-linked bond, where payments are indexed to nominal GDP), and those involving discrete adjustment, (for instance, instruments with natural disaster clauses where debt service relief is triggered by a predefined natural disaster event, such as a hurricane of given intensity or where the maturity or grace period extends in the face of a shock to exports, as in the case of some official bilateral loans).

16. The case for SCDIs, as a countercyclical and risk-sharing tool, has been around for some time and remains appealing. Earlier work has highlighted the use of these debt instruments in previous SoDRs.⁷ SCDIs offering contingent debt service standstills and/or maturity extensions can provide liquidity relief for issuers facing severe liquidity shocks triggered by natural and public health disasters.⁸ This can lower the risk of liquidity problems becoming full-blown and costly sovereign debt crises and is, therefore, beneficial to creditors, borrowers, and the global financial system more broadly.

17. SCDIs of this type have seen successful adoption during recent SoDRs involving Caribbean countries that are exposed to hurricanes and other natural disasters, including floods and earthquakes. Restructured debt in both Grenada (2015) and Barbados (2018) have included natural disaster or “hurricane” clauses (Box 2). These are designed to provide cash flow relief after a natural disaster event when financing needs are greatest and new sources are scarce, thereby enabling the countries to redirect funds intended for debt service to more immediate needs, reducing the economic impact of the natural disaster. Future restructurings represent opportunities to support their wider usage, along with recent efforts to standardize these clauses.⁹ In a restructuring scenario, SCDIs can be implemented across the entire renegotiated debt stock with the consent of existing creditors, thereby eliminating the “first-mover” problem—namely, the differential treatment of legacy debt contracts that lack such clauses—which lowers their appeal in the context of new issuance.

⁷ See for example Borensztein and Mauro (2002) and IMF (2017).

⁸ Since the changes to the scheduled debt service payments are predefined in the debt contract, these changes do not themselves constitute a “credit event” that would trigger credit default swap contracts or cross-default clauses in other debt contracts.

⁹ The International Capital Markets Association (ICMA) has published model hurricane clauses for use in sovereign bonds (see for example, <https://www.icmagroup.org/assets/documents/Resources/Indicative-Heads-of-Terms-for-Hurricane-Bonds---Bullet-271118.pdf>).

18. These types of SCDIs would likely continue to be useful in future SoDRs, including for future liquidity shocks triggered by public health disasters. Clauses based on commodity prices could also provide a trigger that is exogenous (similar to hurricanes) and that is relevant for commodity-exporting countries. A variant of these SCDIs already exist in the form of the countercyclical loans issued by the Agence Française de Développement's (see Appendix II). Borrowing spreads of third-party countries could also provide an exogenous trigger. For example, allowing a debt service suspension in the event of a systemic sudden stop, defined as an increase in the average spread of other countries beyond a certain threshold. In the context of a pandemic, debt instruments could be designed with public health disaster clauses, where the trigger for such an event could be set similar to those of the window of the Catastrophe Containment and Relief Trust (for example, cumulative GDP/revenue loss caused by a pandemic exceeding a given magnitude). However, previous experience indicates market participants may not have appetite for such instruments beyond a narrow set of cases, particularly when shocks are global in nature (further discussion in Section III).

19. The experience with the use of natural disaster clauses in Grenada and Barbados points to some important features that might increase their future use:

- **Verifiable trigger event assessed by an independent body.** Both Barbados and Grenada are members of Caribbean Catastrophe Risk Insurance Facility (CCRIF) whose parametric-based assessment is used to determine when the natural disaster event has been triggered. This setup gives confidence to both creditors and borrowers regarding the integrity of the information used to determine natural disaster event.
- **Applicability to a wide variety of debt contracts and creditors.** The natural disaster clauses in the Grenada SoDR are included in both domestic and external commercial and official creditor debt contracts; while in Barbados these clauses are included in both domestic and external commercial debt contracts. As a result, a large portion of the debt stock in both countries now embodies insurance against natural disasters.
- **Protection of small sovereign issuers against large idiosyncratic and exogenous shocks.** SCDIs with natural disaster clauses have so far been adopted only by small states with relatively concentrated debt holders for whom the liquidity of the restructured instruments might not be too significant a consideration for holding the SCDIs. Extending the use of these debt instruments to sovereign debt restructuring cases involving more countries with these characteristics seems likely and would be beneficial. However, extending the use of these debt instruments to sovereign debt restructuring cases involving larger countries may prove more challenging. This is likely to be so where tradeable commercial debt is a large share of the SoDR. In these circumstances investors who may give more value to the liquidity of restructured debt instruments will tend to be more reluctant to support the use of SCDIs that include "nonstandard" clauses for fear that such clauses might limit their liquidity (Section I).
- **Size and duration of liquidity relief.** Both the size and duration of liquidity relief influence the extent to which the restructured SCDIs help mitigate the risk of a more costly debt restructuring.

The Caribbean experience suggests that even when the duration of debt relief is limited, SCDIs may be beneficial as they can provide relief on multiple occasions—debt relief can be triggered up to a maximum of three separate occasions in the Barbados and Grenada debt contracts (Box 2; Appendix III). Moreover, the Barbados experience also shows that when a significant share of the outstanding debt portfolio contains SCDIs with natural disaster clauses, the liquidity relief can be very substantial.

Box 2. Natural Disaster Clauses in Caribbean Sovereign Debt

Grenada

Grenada's first debt restructuring of 2004–06 was triggered by Hurricane Ivan, but it was not able to secure debt sustainability. A second debt restructuring took place during 2013–15. To strengthen Grenada's financial protection from extreme weather events, new debt contracts include a clause that allows a deferral of debt service payments on the restructured debt for up to 12 months in the event of a qualifying hurricane. The trigger for such a natural disaster event is a payout by the Caribbean Catastrophe Risk Insurance Facility (CCRIF) for losses that exceed US\$15 million (except for Paris Club debt, whereby creditors opted for a more flexible trigger). Grenada's hurricane provisions allowed for a maximum of three triggers. The deferred interest is capitalized, and deferred principal is distributed equally on top of scheduled payments until final maturity. The hurricane clause would provide significant cash flow relief in case of a natural disaster and improve the risk profile of the debt by reducing the likelihood of a follow-up debt restructuring. Private creditors noted that the inclusion of the hurricane provisions made the new instruments difficult to price and trade. For now, the hurricane provisions remain untested as the conditions for a trigger have not yet been met. The 2015 restructuring deal with private bondholders also included a contingent revenue-sharing provision whereby a payment by the government would be made if the proceeds from Grenada's Citizen-by-Investment program exceeded a threshold of US\$15 million. Such payments were made in 2018 and 2019.

Barbados

In 2018–19, Barbados restructured its public debt for the first time in the country's history. Barbados is at risk of extreme weather events, as well as earthquakes, and the government effectively used the debt restructuring to strengthen its insurance against these events, in addition to existing instruments, such as its insurance under the CCRIF. The natural disaster clause included in most of the new debt instruments (both in the domestic and external debt restructuring) would allow for capitalization of interest and deferral of scheduled amortization falling due over a two-year period following the occurrence of a major natural disaster. The trigger for a natural disaster event for the new domestic debt is a payout above US\$5 million by the CCRIF. Similarly, the new external debt instruments also link the threshold for triggering the natural disaster clause to CCRIF payouts, using differentiated thresholds depending on the type of natural disaster (hurricane, flood, or earthquake). However, for the new external debt instrument, holders of at least 50 percent of the aggregate principal amount of the bonds outstanding at the time Barbados elects to defer payments can block the activation of the clause. The new external debt instrument is traded in the secondary market, but there has been virtually no trading of debt instruments on the domestic market following the restructuring. No new external debt has been issued since the debt restructuring.

MIGHT SCDIs BE USEFUL TO AVOID A WAVE OF DEFAULTS STEMMING FROM A GLOBAL LIQUIDITY SHOCK?

20. Amid uncertainty about the economic impact of the COVID-19 pandemic, financial market volatility spiked in some cases to levels last seen during the global financial crisis.

As the price of equities and debt plummeted, market liquidity deteriorated dramatically, including in traditionally deep markets, such as that of US Treasuries. For many emerging market sovereigns, debt rollovers were highly challenging prior to the widespread central bank interventions, which helped restore market functioning.

21. SCDIs that prompt automatic debt standstills under “pandemic” or other global crisis conditions would have helped developing countries cope with the market illiquidity caused by the COVID-19 outbreak.

Gelpern, Hagan, and Mazarei (2020) advocated the use of SCDIs with standstill clauses, which—had they been introduced years ago—could have helped to secure binding standstills during the current COVID-19 pandemic crisis.¹⁰ This could be considered an extension of “natural disaster” clauses to a broader context, and the widespread inclusion of pandemic clauses could be supported by the international community, including the official sector, in the same manner as the inclusion of collective action clauses in bond contracts.

22. Despite the benefit to borrowers of automatic debt standstills in a crisis, complicating factors would make such clauses difficult to implement in general:

- **Triggering events for such clauses are very difficult to delineate.** An effective “crisis” clause would need to look beyond previous crisis episodes and, given the extreme-tail nature of the risks in question, consider a much larger set of potential catalysts. However, outlining triggering events—inclusive of all potential shocks and without ambiguity of interpretation—has been a challenge even for relatively narrowly defined shocks, such as natural disasters. For instance, the “hurricane-linked” clauses, used by Grenada and Barbados, which allow a deferral of principal and/or interest payments for a specified time period following a natural disaster, are triggered by a modeled loss—as measured by the minimum amount of insurance claim made—after the occurrence of a specified event (earthquakes, rainfall, hurricanes).¹¹ If the type or severity of the natural disaster is not covered by the parameters outlined in the insurance policy, or the insurance payout falls below the minimum amount, the “hurricane-linked” clause is not triggered. The pool of potential shocks that would activate a “crisis” clause would arguably be significantly larger than in a natural disaster clause, necessitating the transfer of a larger set of

¹⁰ For details, see Gelpern, Hagan, and Mazarei (2020).

¹¹ Reference to minimum insurance payout by the CCRIF SPC (formerly the Caribbean Catastrophe Risk Insurance Facility), which is a nonprofit risk pooling facility that is owned, operated, and registered in the Caribbean for Caribbean governments.

risks to investors. In return, investors would likely require higher yields, potentially making it an expensive instrument for the sovereign.

- Global shocks affect both borrowers and lenders, making the use of such clauses much less appealing to lenders.** In the “hurricane-linked” clause, an idiosyncratic shock (for instance, a hurricane) would impact the borrower, but is not likely to affect the global lender. The COVID-19 pandemic is a global phenomenon, subjecting every economy to greater fiscal costs and borrowing needs at the same time. In contrast to the “hurricane-linked” clause, the shock of the COVID-19 pandemic is systemic, affecting borrowers and lenders alike. Bonds with the “pandemic” clause are likely to generate limited investor interest, as investors would run the risk of losing bond cash flows exactly at the same time when their investment portfolios suffer losses. The lack of investor appetite would drive up premiums and coupon rates, making the instrument less appealing to the borrower, particularly in juxtaposition with limited payouts.

23. Preliminary experience with a form of pandemic bonds has highlighted some of the challenges in this area. Unlike the traditional bond with a “hurricane” clause which offers liquidity relief, or other types of pandemic bonds that could suspend payment obligations in the event of a pandemic, a pandemic catastrophe bond is a type of insurance-linked security which pays insurance (bond principal) only if a catastrophe (pandemic) protected by the bond occurs. It offers highly attractive yields to investors at the risk of losing the principal payment amount and provides a quick payout to the borrower when the catastrophe occurs. In 2017 the World Bank issued the first “pandemic” bond (Box 3). The bond provided coverage for the current COVID-19 pandemic. Despite the bond payout being triggered about four months after the outbreak of the pandemic, the bond suffered from the typical challenges associated with these types of catastrophe bonds: insured event trigger complexity; high coupon rate; and limited payout. These deficiencies have contributed to the World Bank’s recent decision to discontinue issuing these instruments.

Box 3. World Bank Pandemic Bond Program: Trigger, Price, Payout, and Challenges

In July 2017, the World Bank issued the first “pandemic” bond as part of its effort to transfer catastrophe risks in low-income countries to the capital markets. The transaction was launched in two tranches: Class A included US\$225 million in bonds and US\$50 million in swaps, and Class B included US\$95 million in bonds and US\$55 million in swaps. Class A covered the flu and coronavirus, and Class B covered filovirus, coronavirus, Crimean Congo, Rift Valley, and Lassa Fever. Coronavirus was covered by both tranches, with Class A covering coronavirus at a higher level of severity than Class B. The bond offered insurance protection to eligible countries (to be paid out of investors’ principal), but at high cost. Class A offered a coupon of 6M LIBOR + 6.5 percent and could lose up to 16.67 percent of its principal. Class B offered a coupon of 6M LIBOR + 11 percent and could lose all its principal. This “pandemic” bond was sold to insurance companies, pension funds, and asset managers.

The bond payout was triggered when an outbreak reached predetermined levels of contagion and speed of virus spread and after crossing international borders. The trigger was determined using publicly available data as reported by the World Health Organization. In April 2020, the trigger was satisfied and the maximum amount US\$195.84 million for coronavirus was paid out.

In hindsight, the pandemic bond included the typical challenges of market-based catastrophe risk transfer: trigger complexity, high coupon rate, and limited payout.

- The trigger was based on the complex pandemic data, further complicated by the vast under-reporting of infections due to the lack of virus testing and/or domestic politics.
- Initially, its low correlation with the global capital markets made catastrophe bonds attractive to investors. But with the onset of the COVID-19 outbreak, valuation of pandemic bonds proved to be highly correlated with the performance of the global financial markets. This high correlation (or low diversification benefit) dampened investor appetite, resulting in high coupons, which in turn reduced the issuer's incentives to issue such instruments.
- The bond's payout was too small and too slow. The trigger was met four months after the breakout of the COVID-19 pandemic. The payout constituted about 43 percent of the principal, compared to the World Bank's accumulated payments of US\$107.2 million in premiums since the bond's issuance for the maximum payout of US\$195.8 million for COVID-19. The World Bank has decided not to renew the bond after the current pandemic bonds and swaps matured on July 15, 2020.

24. Because of these issues, it may be more useful to consider a clause linked directly to the potential crisis itself, rather than its precipitating factors:

- **Clauses based on signals of market disruption should be considered.** Temporary debt suspension and maturity extension could also be triggered by a narrowly defined signal of a breakdown in market functioning, such as a massive and idiosyncratic jump in aggregate emerging market (EM) bond yields (as measured by a broad EM bond index such as Emerging Market Bond Index Global—EMBIG). Investor interest in such a scheme would need to be explored: while this contingency clause could benefit investors by avoiding costly defaults, many EM investors (such as mutual funds) could also be facing liquidity pressures due to large redemptions in such a scenario.
- **Clauses based on commensurate action by the official sector may be most promising.** Private sector debt service could be suspended automatically if a predefined set of official creditors (such as the Paris Club or the G20) suspended debt service. This would create a contractual link from the official sector's debt service suspension to private sector participation that would not require any action by the debtor country. As private investors are less inclined to invest in instruments whose repayment is conditional on the possible reprofiling of another class of debt over which they have no control, this new risk could have an impact on a country's borrowing costs. However, official sector debt suspension could serve as a credible signal for the seriousness of the situation, and the private sector might be willing to accept such a provision and commit ex ante to liquidity relief given the simultaneous participation of official sector lenders.

IS THERE SCOPE TO INTRODUCE SCDIs IN RESTRUCTURINGS THAT OFFER “SYMMETRIC” PAYOUTS?

25. In the current environment of heightened upside and downside uncertainty facing countries undertaking restructurings, there may be scope for exchange bonds that provide symmetric payoffs. As discussed above, a common response to uncertainty in past restructurings has been to agree on a “conservative” baseline and issue a VRI that provides for higher payouts in a more favorable scenario. However, with the depth and persistence of the ongoing global recession highly uncertain, it may be more difficult than usual to agree on a baseline that would reduce the risk of a (costly) repeat restructuring to an acceptably low level. Delaying a restructuring agreement until uncertainty is resolved would also impose substantial costs on both debtors and creditors. In this context, symmetric SCDIs could permit agreement to be reached around a more favorable baseline, while providing downside protection against the materialization of global risks. From a political economy perspective, debtor countries may also find this symmetric structure preferable ex post, since it may imply lower “upside” repayments (relative to a more favorable baseline). Box 4 discusses why the present conjuncture of heightened global economic uncertainty might be particularly conducive to the emergence of symmetric SCDIs. To the extent that such instruments are introduced in restructurings and perform well, this could help mainstream their use in new bond issuance (for instance, outside of restructuring contexts).

26. The choice of state variable for such instruments would need to take on country-specific considerations. There is often a tradeoff between a metric being outside the control of the debtor sovereign and it being well correlated with debt sustainability, potentially introducing the risk of bad outcomes and repeat defaults. In addition, instruments with exotic metrics may be less palatable to investors. Hence, alternative measures (such as externally measured exports) should also be explored, and market appetite for such structures needs to be investigated.

Box 4. The Usefulness of Symmetric SCDIs in a Restructuring Context

There are a range of reasons why SCDIs that offer both upside to creditors and downside protection to creditors may be more attractive in SoDRs than in normal times:

- Debtors in a restructuring often express more pessimistic expectations than creditors about the evolution of the economy and capacity to repay. While this may partly reflect negotiation dynamics, it creates an opening for upside SCDIs to bridge the gaps between these (subjective) probability distributions, and to be valued more highly by creditors than debtors.
- Even if debtors and creditors share the same probability distribution for the economic outlook, SCDIs provide a mechanism to increase expected returns for creditors without increasing the probability of default, by promising higher payments only in good states of the world. Such mechanisms are particularly useful when the economic outlook is more uncertain, as a higher probability of downside surprises reduces the scope for non-contingent payments.
- Countries that could benefit from issuing SCDIs (offering downside protection) in normal times may fear that their issuance would send an adverse signal of their capacity to repay, whereas countries undergoing restructuring usually acknowledge upfront their inability to repay under the existing terms.
- To have a meaningful impact on the probability of default, and thereby reduce risk premiums on conventional debt, SCDIs (which offer downside protection) typically need to account for a substantial share of the debt stock. This can be achieved in “one shot” in a restructuring, whereas SCDIs included in new issuance can only gradually replace maturing debt.
- If creditors’ demand a high premium for bearing the risk associated with state-contingent payouts, debtors may find them more attractive when risk premiums on conventional debt are already high, particularly if the state contingency reduces the risk of default.

27. There may be scope to use standardized “external” state variables that could mitigate manipulation concerns. Staff analysis shows that major EM recessions over the past 20 years have generally been associated with global shocks. This insight is particularly relevant at present, because much of the medium-term uncertainty facing individual sovereigns today stems from global factors. Thus, while creditors in a restructuring are often focused on capturing country-specific upside risks, at present it may be possible to capture a large share of country-level uncertainty through “global” state variables. Such variables would be outside the control of the debtor sovereign, increasing their attractiveness for creditors who—as noted in the previous sections—have historically been wary of GDP-linked VRIs. Notable candidates include the following:

- *Global commodity prices, for commodity exporters.*¹² Commodity prices are highly correlated with GDP and revenues in commodity exporters, but (perhaps aside from a few very large producers) are not subject to manipulation concerns. There is also a deep and liquid market for medium-term oil futures (although markets for longer-dated futures are thinner), which could help with pricing, and a universe of investors with a natural hedge. Chad’s 2018 restructuring of loans from a commodity trader, featuring both upside and downside elements linked to oil receipts, is

¹² These instruments need not be collateralized by the underlying commodity exports, which would avoid the liquidity risks and debt resolution challenges that can be generated by large collateralization transactions.

an example of this approach, and provided important liquidity relief with the collapse of oil prices at the beginning of the COVID-19 crisis.

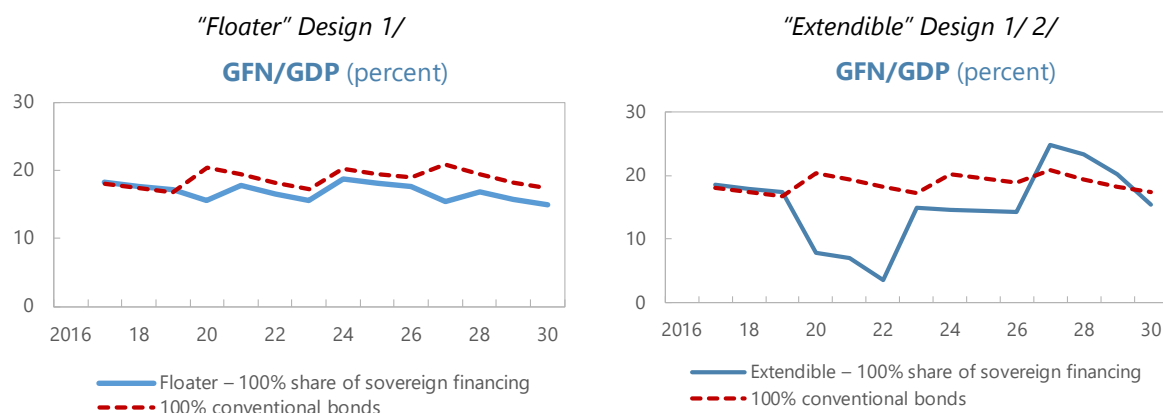
- *Trading partner GDP, for non-commodity-exporting small open economies.* As noted in IMF (2017), trading partner GDP is correlated with own country GDP, the most common measure of sovereign repayment capacity (the historical correlation in currently stressed EM sovereigns is about 0.5, on average). Careful consideration in individual cases would be needed to ensure that (1) trading partner GDP is sufficiently correlated with domestic GDP and the current account to provide the needed insurance, and (2) it is politically feasible to tie a country's financial obligations to the GDP (and therefore the macroeconomic policies) of its trading partners.
- *Merchandise exports, when reliance on manufacturing exports is high.* This variable may be correlated with debt serviceability, particularly in the case of foreign exchange debt. Where there are concerns about the reliability/coverage of the debtor country's trade statistics, the state variable could be constructed based on reporting of importer countries for the IMF Direction of Trade Statistics (DOTS). However, merchandise exports would be less useful as a proxy for repayment capacity for countries that rely heavily on services exports and remittances; including many of the economies hit hardest by the pandemic.

28. A “floater” design could be considered, in which the coupon rate on the exchange bond would be linked to the above state variables, subject to a floor and cap. Such a design was proposed in IMF (2017) whereby the bond's nominal interest rate would scale linearly with the contract state variable (between a minimum and a maximum value).¹³ The contract could be structured to make the interest rate more or less sensitive to growth, depending on investor preferences. Unlike existing VRI warrants, the expected growth rate would fall somewhere in the middle of the distribution of values; hence the coupon would be expected to both rise and fall with growth rates, generating built-in counter-cyclical fiscal costs to the sovereign.

29. An alternative (or supplementary) design option would involve using the state variable to trigger a contractual maturity extension. This would be similar to the logic of the Agence France Development's countercyclical loans with extendible grace periods. Thus, if the state variable fell below a specified threshold (say trading partner GDP growth of –2 percent), principal payments on the bonds would be deferred for a prespecified period (say, three years), delivering the debtor sovereign substantial liquidity relief in the immediate aftermath of the large global shock. For recessions driven by common/global factors, both designs could potentially provide substantial liquidity relief to the issuer (with larger near-term benefits in the case of the “extendible,” Figure 2), with the “floater” design also providing some solvency relief through the reduction in average interest payments. As discussed above, market-based indicators of stress, such as global EM spread levels, could also be used for this.

¹³ An [Excel tool](#) allows debt managers and investors to explore the implications of illustrative “floater” and “extendible” designs.

Figure 2. Illustrative Impacts on Public Gross Financing Needs of “Floater” and “Extendible” Designs Under Global Shocks



Source: IMF staff calculations.

Note: GFN = gross financing needs.

1/ For simplicity, it is assumed that the decline in GDP in the country concerned is in line with that of the instrument’s state variable (e.g., trading-partner GDP).

2/ It is assumed for illustrative purposes that a three-year maturity extension is triggered by the decline in GDP in 2020. The original bond is assumed to have five-year maturity, interest and discount rate of 5 percent.

CONCLUSION

30. In this period of great macroeconomic uncertainty VRIs could play an important role in facilitating speedier and less-costly sovereign debt restructurings by tying the payments of restructured debt contracts to future outcomes. However, their usefulness may be limited by their diverging valuation by creditors and sovereigns. Creditors have historically discounted these instruments severely given their illiquidity, idiosyncratic risk profiles, and lack of correlation with fixed-income investment portfolios. VRIs may be more useful in the restructuring of SOEs and PPPs, which may be more similar to corporate restructurings, where the use of such instruments is common. In designing new VRIs it will be important to learn from historical examples and choose appropriate state variables that minimize measurement issues, avoid lagging indicators, and structure payouts properly (including through the use of floors and caps).

31. Debt restructurings present an important opportunity for the use of SCDIs—such as natural disaster clauses—to provide future downside protection to sovereign debtors. As was included in recent Caribbean SoDRs, such clauses would likely be useful in future restructurings as they provide valuable insurance at low cost against exogenous shocks in ways that are not easily replicable through private contracts. Such clauses may be increasingly relevant given growing risks due to climate change and other environmental concerns, and their use could potentially be expanded to larger countries and broader sets of shock criteria (including public health disasters)—bearing in mind that market appetite for the use of SCDIs in these cases may be much more limited.

32. Using SCDIs to avoid defaults stemming from future global liquidity shocks (such as the COVID-19 crisis) will be challenging, but some potential avenues should be explored.

Given the dual challenges of identifying potential triggers and incentivizing investor participations, contingency clauses linking private sector debt standstills to official sector standstills may be the most promising: widespread official sector standstills could serve as a credible signal of the seriousness of the situation, and private sector lenders might be more committed ex ante given the promise of official sector participation.

33. The conjuncture also provides a rare opportunity to explore the idea of restructuring exchange bonds with “symmetric payouts.” The uncertainty facing sovereigns is both upside and downside, and even seemingly conservative baselines can provide optimistic ex post. Accordingly design options for a floating rate fixed-principal instrument with coupons linked to a state variable that can serve as a good proxy for repayment capacity should be explored. This structure would effectively complement downside protection linked to natural disasters (like hurricane clauses) and could avoid the manipulation risk traditionally associated with GDP-linked bonds by drawing on state variables outside the control of the debtor authorities.

34. Overall, while SCDIs are not a panacea for the inherent challenges of a debt restructuring, they can play a bigger role going forward, including with official sector support. Previous attempts to develop liquid SCDI markets in *normal* times have not been successful, in part, due to first mover problems on the sovereign side (stigma of issuing an instrument that provides debt relief in downturns), and on the creditor side (first buyers of SCDIs risk subordination to other fixed income creditors). These problems do not apply in restructuring contexts: stigma concerns are less relevant, and the entire debt stock can turn over, avoiding subordination. This suggests a greater potential of developing liquid SCDI markets in the present conjuncture. To actualize this potential, the official sector can consider (i) endorsing standardized SCDI termsheets developed by reputable legal and market professionals (akin to the approach adopted for enhanced CACs); (ii) enhancing data provision to facilitate the use of common state variables not subject to manipulation risk; (iii) explicitly recognizing the resilience afforded by downside or symmetric SCDIs in assessments of debt sustainability; and (iv) incorporating standardized SCDIs in official debt restructurings to signal support for the instrument class.

Appendix I. Detailed Considerations in the Design of VRIs in Future Restructurings

The design of VRIs needs to strike a balance between the interests of debtor sovereigns and their creditors. To effectively bridge differences in a restructuring, VRIs need to provide investors with an opportunity for higher returns if the creditor’s repayment capacity turns out to be stronger than anticipated. But it is also important that they avoid exposing the sovereign to excessive upside payments that may be difficult to meet. Investors that plan to exit their positions upon completion of a restructuring may also prioritize a “market-friendly” VRI design that maximizes secondary market valuations.

There is a general tension between the desire for market-friendly designs and the need to tailor VRIs to the circumstances of individual debtors and their creditors. From the perspective of promoting a liquid secondary market for VRIs, there would be strong advantages to standardized VRIs with relatively simple payment structures, which would encourage investors to develop greater familiarity with their pricing. Set against this, the best measure of repayment capacity for a VRI can differ depending on the circumstances of the debtor country, while complex and nonstandard payout formulas may sometimes be needed to ensure that total repayments remain within the agreed restructuring envelope.

Choice of State Variable

In principle, the ideal state variable for a VRI would be closely tied to sovereign repayment capacity, but exogenous (from the sovereign’s perspective) and free of data-manipulation concerns. In practice, achieving all three of these objectives is often challenging; for example, GDP warrants have faced concerns that they can encourage data manipulation and disincentivize reforms, whereas more exogenous variables may not provide the desired link to repayment capacity. Similarly, while “real” variables may sometimes be better than nominals as proxies for repayment capacity, they can be even more subject to measurement (and manipulation) concerns.

Indexation lags, and links to highly persistent state variables should generally be avoided as they can erode the countercyclical properties of a SCDI. Moreover, they can prove politically unpopular when upside payments occur well after the event that triggered their payout. For example, with Argentina’s GDP warrants the link to the level of GDP necessitated ongoing payments for growth in the early years after issuance—which proved politically very difficult, and the indexation lag led to high payments even in years when the economy was in recession.

There may be scope for the introduction of novel instruments linked to state variables that would avoid some of the pitfalls of previous cases.

- For natural resource exporters (oil, minerals, etc.), the SCDI could be linked to underlying commodity prices and production levels (provided production levels can be independently ascertained). This is reasonable since the lion’s share of exports receipts from these activities generally accrue to the sovereign and constitute a significant share of government revenues. This

argument could be extended to other (for instance, agricultural) commodity exporters, although less so when export receipts do not accrue mainly to the sovereign. Another concern with agricultural commodities is their vulnerability to idiosyncratic shocks (for example, a country's soybean exports may be adversely affected by a weather shock even if the world soybean price is high).

- For small open economies, state variables based on trading-partner outturns could potentially prove useful, particularly in the current context. Where concerns about data manipulation are particularly severe, measures of exports (possibly based on trading-partner import reporting) could prove useful. Similarly, in the current context in which the speed and pace of the global recovery is uncertain, trading partner GDP may be particularly useful. See discussion in Section III.

At the same time, to the extent that these new measures are less familiar to investors, they may cut against the desire for instruments that are more liquid and easier to price.

Payout Structure

Careful consideration should be given to the complexity of the payout formula. Past restructurings have often used complex, nonlinear links to the state variable, partly because of the desire for “detachable” instruments that do not payout in the baseline. However, such complexity appears to have been unpopular with investors, for whom simple and easy to understand formulas are likely to be preferable. Nonlinear structures may also generate excessive payouts if an upside scenario materializes, as in the case of the GDP warrants issued in Ukraine's 2015 restructuring.

The design of the VRI around the state variable will critically influence its valuation.

- The first consideration is the baseline or central projection of the state variable. As discussed above, the use of VRI is justified in cases where future uncertainty is so great that it is difficult to make a credible baseline projection, and the terms and valuation of the restructured coupon bond will have been derived reflecting a conservative baseline assumption, with investors potentially incurring “excess loss.” But a conservative baseline means that a realization of a small upside risk will result in a positive payoff to bondholders which could defeat the purpose of the conservative baseline addressing uncertainty.
- The second consideration, therefore, is the need for floor/bounds above the baseline. This is also critical to ensure that the VRI does not strip the government from its ability to conduct counter-cyclical fiscal policy, for instance to save during good times in order to build buffers for bad times, including preserving its ability to make interest payments during the next downturn.
- The third consideration is the establishment of a cap, particularly where the state variable is volatile, but also where the objective is not to provide for an equity like instrument. That is, the main goal is to enable investors to recover some value from the large upfront principal or interest haircut they have accepted upfront while remaining in the realm of value enhancement for a fixed-income instrument. More generally, the VRI should be seen as part of a package in

which the present value of the “excess loss” incurred by bondholders upfront is partly compensated by the expected present value of the VRI.

The floor and cap for triggers and payments will determine the expected payoff of the instrument. An instrument with frequent but low-value payments may have a similar valuation as one with infrequent but high-value payments. Fixed income investors generally prefer the former. From a risk-sharing perspective, the country would prefer to transfer payments from the bad to the good states. However, there are other ways of coping with risk, including using the good times to build buffers. More generally, caution should be used to avoid over-committing payments in the good states for the VRI, as the country may still be subject to other idiosyncratic risks.

There are other design considerations that influence the valuation, including:

(1) Whether the state variable will be associated with the principal or coupon rate. The state variable could uplift the principal when the positive shock materializes within the set parameters and a fixed-rate coupon could be paid on the variable principal amount (generally known as “linkers”). The alternative is that the state variable is linked to the coupon, so that the coupon rate increases during the period when the positive shock materializes. For reasons discussed above, including the need for a cap, as well as for simplicity, associating the state-contingent instrument to the coupon rate seems preferable.

(2) Whether the payoff valuation will be binary or continuous. The contingency could be set in which a predetermined fixed rate will be paid if conditions are met (binary), or the exact coupon rate varies within the range of the floor and the cap (continuous). One concern about binary instruments is that they could increase incentives for misreporting around the trigger threshold.

(3) Whether the VRI will be part of the restructured bond or is detachable: VRIs have tended to be detachable so that the restructured bond remains a fixed-income instrument. If bond index compilers determine that the VRI is more akin to an equity instrument, the bond may not qualify for entry into the bond index.

Valuation

A theoretical valuation can be obtained by the discounted present value of all possible realizations of the VRI. While methodological issues surrounding valuation methods are beyond this paper, alternative Monte Carlo simulations can be conducted that generates a distribution of outcomes of the state variable. The predetermined formula that would trigger the state-contingent payout can be applied to generate multiple payout paths. Each of these payout paths is discounted to the present and the mean of the present values would be the expected valuation. The value of the instrument will depend on what discount rate is used. An asymmetric VRI with upside payments should have a lower default risk than the regular bonds (since payments are concentrated on good states where the country is less likely to default). That suggests that using the same discount rate as the one used for bonds will underestimate the true value of the VRI. But on the other hand, creditors have argued that other factors, including the bespoke nature of the instrument which reduces liquidity, and difficulties in valuation demand a premium on the fair-value discount rate.

Appendix II. Considerations in the Use of SCDIs by Official Sector Creditors

The use of SCDIs by official creditors in the context of SoDRs is less common. However, official creditors have issued SCDIs during “normal” times. For example, the Agence Française de Développement’s “floating grace period” loans and Petrocaribe loans, which are bilateral loans with predetermined flexible financing terms extended by Venezuela to countries to purchase oil produced by PDVSA (Petrleos de Venezuela, S.A.), Venezuela’s state-owned oil company. The first allowed for a grace period when export earnings fall below a certain threshold (but these have never been triggered). The terms of the Petrocaribe loans were linked to oil prices.

The same problems that limit the private use of SCDIs apply to the official sector, but could be attenuated given the nature of the latter:

- **Liquidity:** Official sector lenders typically maintain their exposure over the long term, unlike most private investors. Even private investors that plan to follow a “buy and hold” strategy still need to worry about contingencies when they need to close a position. As a result, official borrowers may not be as concerned about an illiquid SCDI.
- **Lack of commonly used pricing model:** On a related point, one concern of private investors is the lack of agreement over the pricing/valuation of an SCDI. As a result, even if an investor perceives great value in the SCDI, it may be reluctant to pay that amount for fears it will need to sell and future buyers will not value it under the same assumptions. If an official creditor is willing to hold the exposure of the SCDI throughout its term, it only needs to worry about the uncertainty surrounding its own valuation, not of other investors.
- **Political economy considerations:** If an official creditor faces domestic political economy pressures regarding its assistance, a VRI could help buy political support. By pointing out a potential upside to its assistance, it may be easier to build political support at home.
- **Size:** The risk-sharing benefits of SCDIs only materialize if there is a significantly large use of these instruments. Large official sector lenders could create a critical demand for the VRI that would be hard to achieve (outside of a restructuring) among decentralized private lenders.
- **Natural hedge:** Some official lenders may be ideally placed to share risk with borrowers. For example, both an oil importing creditor and an oil-exporting borrower would benefit from sharing the risk of shocks to oil prices. While the same is true for some private investors, the combination of large size and a natural hedge makes official holding of commodity-related instruments one of the lowest hanging fruits for the development of SCDIs/VRIs.

Appendix III. Value Recovery Instruments and State-Contingent Instruments Issued during Recent SODRs

Appendix Table: State-Contingent Instruments

Type	Country	Haircut ^{1,2} Nominal/NPV	Currency of Denomination	Period Covered (years)	Main Trigger	Formula for Payout/Deferral	Caps/Exercise Limits
Upside	Argentina (2005 & 2010) - GDP-linked warrant	29.8%/76.8%	Local and Foreign Currency	20	Real GDP level	• Pays out 5% of real GDP in excess of reference level	Total payments capped at 48% of notional principal
	Greece (2012) - GDP-linked warrant	53.5%/64.6%	Local Currency	27	Real GDP growth	• Pays out 1.5 times real GDP growth in excess of reference growth rate	Annual cap at 1%
	Ukraine (2015)- GDP-linked warrant	20%/28%	Foreign Currency	20	Real GDP growth, level of GDP in USD	• Pays out 15% of real GDP growth between 3–4% • Pays out 40% of real GDP growth in excess of 4% • No payments unless nominal GDP is higher than USD 125.4bn	Annual cap at 1% of GDP from 2021–25; uncapped from 2026–40
	Grenada (2015) - CBI³ revenue-linked payments in 2030 bond	50% (of which 25% upfront)/54%	Local and Foreign Currency	15	CBI revenues	• Pays out 25% of CBI proceeds between USD 15mn–50mn • Pays out 35% of CBI revenues in excess of USD 50mn	Discounted ⁴ value of total payments capped at 35% of outstanding principal value
Downside	Grenada (2015) - Hurricane Clause⁵ in 2030 bond	50% (of which 25% upfront)/54%	Local and Foreign Currency	13	"modeled" Hurricane damage	• 6-month deferral if modeled loss is greater than USD 15mn, less than USD 30mn • 12-month deferral if modeled loss is greater than USD 30mn	Can be triggered a maximum of 3 times
Downside	Barbados (2018) - Natural Disaster Clause⁶ in a portfolio of domestic-currency long-term bonds	0%/43%	Local Currency	15–35	"modeled" Natural disaster damage	• 24-month deferral if modelled loss is greater than USD 5mn	Can be triggered a maximum of 3 times
Downside	Barbados (2018) - Natural Disaster Clause⁷ in 2029 bond	25%/44%	Foreign Currency	8	"modeled" Natural disaster damage	• 24-month deferral if modeled loss is greater than USD 5mn • 24-month deferral if modeled loss is greater than USD 7.5mn	Can be triggered a maximum of 3 times

Source: Bloomberg Finance L.P.

^{1/} These haircuts calculations do not account for the value of the state-contingent instruments.

^{2/} Sources for haircut estimates are Cruces and Trebesch (2013), Zettelmeyer, Trebesch, and Gulati (2013), IMF (2015, 2017), and Anthony, Impavido, and van Selm (2020). For Barbados, the nominal haircut percentage on domestic currency long-term bonds refers to debt instruments held by private creditors.

^{3/} These refer to revenues from Grenada's 'Citizenship by Investment' program.

^{4/} Payments to be discounted back to May 2015 using average yield on the 2030 bond in the year in which they occur.

^{5/} Similar clauses were included in restructured debts with the Import-Export Bank of Taiwan and the Paris Club.

^{6/} The natural disaster clause covers earthquake, "flooding," and "hurricane" events.

^{7/} The natural disaster clause covers earthquake, "flooding," and "hurricane" events. The modelled loss for earthquake and flooding is USD 5mn and the modelled loss for hurricane is USD 7.5mn.

Appendix IV. Duration of Sovereign Debt Restructuring

Bond Restructuring/Debt Exchange Cases				Collective Action Clauses		Haircut	Length of Negotiation (in month)	
Country	Exchange Offer Date	Bonds Exchanged	Governing Law	Included?	Used?		From announcement or default	From start of negotiation
1994 Panama	Aug-94	Eurobonds	Foreign laws	No	No	15%	84	16
1996 Panama	May-96	Eurobonds						
1997 Russia	Dec-97	Commercial bonds					23	
1998 Pakistan	Aug-98	Bank loans						11
1998 Ukraine	Sep-98	Domestic with nonresidents	Local law	No	No	12%	2	1
1999 Ukraine	Aug-99	Commercial bonds						4
1999 Pakistan	Nov-99	External bonds	English law	Yes	No	15%	12	4
1999 Russia	Mar-99	LC domestic with nonresidents	Local law	No	No	46%	10	10
2000 Ecuador	Jul-00	Brady bonds and Eurobonds	New York law	No	No	38%	25	3
2000 Ukraine	Feb-00	External bonds	Luxembourg/German law	Yes	Yes	18%	3	3
2000 Russia	Feb-00	FC domestic	Local law	No	No	52%	10	4
2000 Russia	Aug-00	FC external	English law	Yes	No	51%	21	16
2002 Moldova	Aug-02	External bonds	English law	Yes	Yes	37%	5	4
2003 Uruguay	Apr-03	Domestic, external bonds	Mostly local law	Yes	Yes	10%	3	3
2004 Dominica	Apr-04	Domestic and external	English law	Yes	No	54%	15	7
2004 Moldova	Apr-04	External bonds						34
2004 Serbia & Montenegro	Jun-04	External debt					44	34
2005 Dominican Republic	Jun-05	Bank loans	New York law				18	
2005 Grenada	Sep-05	External and domestic bonds	New York and local law	No	No	34%	14	12
2005 Argentina	Jan-05	External bonds	Eight governing laws	No	No	77%	42	18
2005 Dominican Republic	Apr-05	External bonds	New York law	No	No	5%	14	13
2006 Iraq	Jan-06	Commercial loans				82%	20	7
2006 Belize	Dec-06	Private external debt	New York law	Yes	Yes	24%	7	6
2009 Ecuador	Apr-09	External bonds	New York law	No	No	68%	7	7
2009 Côte d'Ivoire	Sep-09	External Brady bonds	New York law	No	No	55%	25	25
2010 Seychelles	Feb-10	External bonds	English law	Yes	Yes	56%	19	11
2012 Greece	Feb-12	Domestic and external bonds	Mostly local law	Yes	Yes	65%	9	9
2012 St. Kitts and Nevis	Feb-12	Domestic and external bonds	Local law	Yes	Yes	63%	10	9
2012 Côte d'Ivoire	Nov-12	External bonds	New York law	Yes	Yes	6%	23	1
2013 Belize	Feb-13	2029 Superbond	New York law	Yes	Yes	32%	8	8
2015 Grenada	Nov-15	Domestic and international bonds	NY law and local law	Yes	Yes	50%	33	33
2015 Ukraine	Dec-15	International bonds	English law	Yes	Yes	23%	-	11
2016 Ukraine	Mar-16	External commercial loans	n.a.	n.a.	n.a.	n.a.	-	14
2016 Mozambique	Apr-16	EMATUM bond	n.a.	n.a.	n.a.	-6%	-	10
2017 Belize	Mar-17	2038 Superbond(2.0)	NY law	Yes	Yes	20%	-	4
2017 Mongolia	Mar-17	International bonds	English law	No	n.a.	-3%	-	1
2018 Chad	Jun-18	Glencore (UK) loans	n.a.	n.a.	n.a.	27%	-	16
2018 Barbados	Oct-18	Domestic debt (private sector-held)	Local law	No	Yes	29%	-	4
2019 Mozambique	Sep-19	International bonds	English law	Yes	Yes	11%	32	36
2019 Barbados	Dec-19	International bonds, Credit Suisse loan	English law	Yes	Yes	24%	18	18
2020 Ecuador	Aug-20	International bonds	NY law	Yes	Yes	42%	-	5
2020 Argentina	Sep-20	International bonds	NY and English law	Yes	Yes	36%	4	9
2020 Argentina	Sep-20	Domestic debt	Local law	No	n.a.	n.a.	5	10
Average						40%	18	10

Sources: Anthony, Impavido, and van Selm (2020), Asonuma and Trebesch (2016) updated data set, Cruces and Trebesch (2013) updated data set, IMF country reports, Moody's (2018), and relevant bond prospectuses.

References

- Anthony, M., G. Impavido, and B. van Selm. 2020. "Barbados' 2018-19 Sovereign Debt Restructuring—A Sea Change?" IMF Working Paper WP/20/34, International Monetary Fund, Washington, DC.
- Asonuma, T., and C. Trebesch. 2016. "Sovereign Debt Restructurings: Preemptive or Post-Default." *Journal of the European Economic Association* 14 (1): 175–214.
- Asonuma, T., M. Xin Li, M. Papaioannou, S. Thomas, and E. Togo. 2017. "Sovereign Debt Restructuring in Grenada: Causes, Processes, Outcomes, and Lessons Learned." IMF Working Paper WP/17/171, International Monetary Fund, Washington, DC.
- Bolton, P., L. Buchheit, P. Gourinchas, M. Gulati, C. Hsieh, U. Panizza, and B. Weder di Mauro. 2020. "Born Out of Necessity: A Debt Standstill for COVID-19. CEPR Policy Insight No. 103. Center for Economic and Policy Research, Washington, DC.
- Borensztein, E., and Mauro, P. 2002. "Reviving the Case for GDP-Indexed Bonds." IMF Policy Discussion Paper PDP/02/10, International Monetary Fund, Washington, DC.
- Costa, A., M. Chamon, and L. Ricci. 2008. "Is There a Novelty Premium on New Financial Instruments? The Argentine Experience with GDP-Indexed Warrants." IMF Working Paper WP/08/109, International Monetary Fund, Washington, DC.
- Cruces, J. J., and C. Trebesch. 2013. "Sovereign Defaults: The Price of Haircuts." *American Economic Journal: Macroeconomics* 5 (3): 85–117.
- Emerging Markets Traders Association (EMTA). 2011. "The Brady Plan." New York.
- Gelpern, A., S. Hagan, and A. Mazarei. 2020. "Debt Standstills Can Help Vulnerable Governments Manage the COVID-19 Crisis." Peterson Institute for International Economics, Washington, DC.
- Griffith-Jones, S., and D. Hertova. 2013. "Growth-Linked Bonds." CESifo DICE Report, Center for Economic Studies, Munich.
- International Capital Markets Association (ICMA). 2018. "Indicative Heads of Terms for Hurricane Bonds—Bullet 271118." Zürich.
- International Monetary Fund (IMF). 2015. "The Fund's Lending Framework and Sovereign Debt—Further Considerations." Washington, DC.
- International Monetary Fund (IMF). 2017. "State-Contingent Debt Instruments for Sovereigns." Board Paper, Washington, DC.

Kim, J. I., and J. D. Ostry. 2018. "Boosting Fiscal Space: The Roles of GDP-Linked Debt and Longer Maturities." IMF Research Department Paper No.18/04, Washington, DC.

Miyajima, K. 2006. "How to Evaluate GDP-Linked Warrants: Price and Repayment Capacity." IMF Working Paper WP/06/85, International Monetary Fund, Washington, DC.

Moody's Investors Service. 2018. "Sovereign—Global: Sovereign Default and Recovery Rates 1983–2017." New York.

Xafa, M. 2014. "Sovereign Debt Crisis Management: Lessons from the 2012 Greek Debt Restructuring." CIGI Paper No. 33, Centre for International Governance Innovation, Waterloo, Canada.

Zettelmeyer, J., C. Trebesch, and M. Gulati. 2013. "The Greek Debt Restructuring: An Autopsy." *Economic Policy* 28 (75): 513–63.