

Cassimon, Danny; Essers, Dennis; Presbitero, Andrea

Working Paper

Debtor (non-) participation in sovereign debt relief: A real option approach

NBB Working Paper, No. 442

Provided in Cooperation with:

National Bank of Belgium, Brussels

Suggested Citation: Cassimon, Danny; Essers, Dennis; Presbitero, Andrea (2023) : Debtor (non-) participation in sovereign debt relief: A real option approach, NBB Working Paper, No. 442, National Bank of Belgium, Brussels

This Version is available at:

<https://hdl.handle.net/10419/298344>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Working Paper Research

September 2023 No 442

Debtor (non-)participation in sovereign debt relief:
A real option approach

by Danny Cassimon, Dennis Essers and Andrea Presbitero



Publisher

Pierre Wunsch, Governor of the National Bank of Belgium

Statement of purpose

The purpose of these Working Papers is to promote the circulation of research results (Research Series) and analytical studies (Documents Series) made within the National Bank of Belgium or presented by external economists in seminars, conferences and conventions organised by the Bank. The aim is therefore to provide a platform for discussion. The opinions expressed are strictly those of the authors and do not necessarily reflect the views of the National Bank of Belgium.

The Working Papers are available on the website of the Bank: <http://www.nbb.be>

© National Bank of Belgium, Brussels

All rights reserved.

Reproduction for educational and non-commercial purposes is permitted provided that the source is acknowledged.

ISSN: 1375-680X (print)

ISSN: 1784-2476 (online)

Abstract

Developing countries have recently proved reluctant to participate in sovereign debt moratoria and debt relief initiatives. We argue that debtors' (non-)participation decisions can be understood through the lens of real options. Eligible countries compare the net benefits of participating in a debt relief initiative now with the value of waiting to potentially execute their participation option later, when they may have more information on the benefits and costs. We corroborate the real option framing with anecdotal evidence and through a survival analysis that exploits cross-country and time variation in the requests to participate in the Debt Service Suspension Initiative (DSSI), which provided temporary debt moratoria during the COVID-19 pandemic. Structured along the policy levers suggested by the real option framework, we discuss a number of ways in which participation in debt relief initiatives can be made more attractive to debtor countries.

Keywords: sovereign debt, sovereign debt relief, Debt Service Suspension Initiative, Common Framework, real options, survival analysis.

JEL Classifications: H63, F34, F55.

Authors:

Danny Cassimon, University of Antwerp.

e-mail: danny.cassimon@uantwerpen.be.

Dennis Essers, Economics and Research Department, National Bank of Belgium.

e-mail dennis.essers@nbb.be.

Andrea Presbitero, International Monetary Fund and CEPR.

e-mail: apresbitero@imf.org.

We thank Tamon Asonuma, Francisco Roldán and Ryota Nakatani, as well as participants in the DebtCon6 conference (Princeton University) and in an IMF seminar, for helpful comments and suggestions.

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the National Bank of Belgium, the IMF, its Executive Board, IMF management, or any other institution with which one of the authors are affiliated. All errors and omissions are our own.

Non-technical summary

If left unaddressed, sovereign debt problems may intensify over time and eventually result in defaults that have large economic costs for the indebted countries themselves and for their creditors. So why then is the restructuring of sovereign debt often marked by long delays? Part of the answer may lie in coordination difficulties among foreign creditors. However, also on the side of highly indebted governments there appears to be reluctance to restructure their debt obligations. Limited and postponed participation in recent international debt relief initiatives is a case in point. When the G20 launched the Debt Service Suspension Initiative (DSSI) to assist low-income countries with temporary suspensions of debt repayments during the COVID-19 pandemic, only about two thirds of 73 eligible debtor countries decided to take part – and some jumped in sooner than others. Even more strikingly, the G20's Common Framework for Debt Treatments beyond the DSSI, set up to guide more comprehensive debt restructurings, has so far convinced only a handful of debtor countries to apply, despite high numbers of eligible countries finding themselves in or close to debt distress.

This paper argues that debtor countries' decisions (not) to participate in initiatives such as the DSSI and Common Framework can be well understood through the concept of 'real options'. Such a real option approach applies the logic of models used in pricing financial (option) instruments to real sector investment decisions. In our case, the basic intuition is that, in considering when to execute their option of participating in a debt relief initiative, eligible debtor countries will only go ahead now when the expected net benefit of doing so exceeds the value of waiting and being able to gather more information about those net benefits (keeping the possibility of participating later). The value of the real option depends on a few key parameters or drivers: most notably, the expected benefits of participation (temporary debt service savings under the DSSI, or the regaining of debt sustainability under the Common Framework); the expected costs (including damages to financial market reputation and administrative/negotiation costs); the uncertainty about the benefits and costs (such as doubts about the exact perimeter and treatment of debt claims that fall under the initiatives, and about market reactions to the treatment); and the opportunity costs of not (yet) participating (like the foregone suspension of debt service, or even missed investments). For example, higher uncertainty about the benefits of the DSSI or Common Framework for the debtor increases option value and therefore leads to more postponement in the participation decision.

We first validate our real option characterisation with press statements by debtor government officials on the reasons underlying participation or non-/late participation in the DSSI and Common Framework. Key real option value drivers – expected benefits, expected costs and uncertainty – appear to have played an important role in those deliberations. Second, we conduct a 'survival' or 'time-to-event' analysis using variation in the timing of debtor requests (if any) to participate in the DSSI. In line with the real option framing, we find that debtor countries that stood to benefit more from DSSI participation, due to higher expected debt service savings or larger exposures to willing official bilateral creditors, or countries that faced less of a hurdle in having to request an IMF arrangement first, were quicker to apply for DSSI support. Conversely, debtor countries that had more to lose in terms of market reputation, because of larger exposures to bondholders or better credit ratings, were less likely to make an early DSSI request.

Finally, we show how a real option framework could help structuring ongoing discussions on how to make future DSSI- or Common Framework-(like) debt treatments more attractive to eligible debtor countries. A first set of potential policy interventions works through the levers of increasing the expected benefits and/or reducing the expected costs of debtor participation in a debt treatment. This includes temporary debt service standstills during debt restructuring negotiations, increased emphasis on post-treatment growth, the protection of new financing, and capacity building support. Other policy proposals focus on the reduction of uncertainty for the debtor. This encompasses the clarification of various technical issues, including debt treatment procedures, indicative timelines and perimeters, the methodology for assessing and enforcing 'comparability of treatment', and the likely credit rating reactions. Above all, actual progress on the ongoing restructuring cases would boost the confidence of debtor countries in seeking debt treatments under the Common Framework and beyond.

TABLE OF CONTENTS

1.	Introduction.....	1
2.	DSSI and Common Framework participation decision as real options.....	4
2.1.	An overview of the DSSI and Common Framework	4
2.2.	A real option application	8
2.3.	A qualitative validation	15
3.	Survival analysis of DSSI participation.....	19
3.1.	Sample and variables.....	19
3.2.	Methodology	21
3.3.	Descriptives	23
3.4.	Estimation results and discussion	25
4.	Making debt relief initiatives more attractive to debtors	31
4.1.	Policy interventions using NPV levers	31
4.2.	Policy interventions using non-NPV levers	34
5.	Conclusion.....	40
	References	42
	Appendices.....	47
	National Bank of Belgium - Working Papers Series.....	53

1 Introduction

If I put myself in the shoes of a Finance Minister of a high-debt country and I have to go to the Prime Minister or the President to tell her or him about my recommendation of going to the Common Framework or not, I would wait until the very, very last minute. I would gamble. And the reason is... I could not give my boss clarity on what the process would be.

Reza Baqir, Managing Director of Alvarez & Marsal, former Governor of State Bank of Pakistan, and former Head of IMF Debt Policy Division

Dealing with sovereign debt problems head-on is better for both debtors and creditors than waiting until those problems fester and a hard default is inevitable, as the latter often entails large economic and social costs ([Asonuma and Trebesch, 2016](#); [Farah-Yacoub et al., 2022](#)). When the G20 launched the Debt Service Suspension Initiative (DSSI) in May 2020 to assist low-income countries with temporary debt moratoria during the COVID-19 pandemic, only about two thirds of eligible debtor countries decided to take part—and some sooner than others. The follow-up Common Framework for Debt Treatments beyond the DSSI, targeted to the same countries but devised to guide negotiations towards more comprehensive debt treatments, had convinced only four countries to participate at the time of writing. How to make sense of debtor countries’ reluctance to participate in such debt relief initiatives? Participation in the DSSI in particular may seem like a no-brainer at first sight. And while the threshold for participation in the G20 Common Framework is understandably higher, as the process is much more involved, motivations for debtor hold-out from the Framework remain understudied.

The contributions of the paper are threefold. First, we argue that debtors’ (non-) participation decisions with respect to the DSSI’s debt service standstill and to starting debt restructuring negotiations under the Common Framework can be understood through the lens of ‘real options’: eligible countries compare the net benefits of participating in

such debt treatments now with the value of waiting in order to potentially execute their participation option at a later point, when they may have a more informed view on the likely benefits and costs. We present anecdotal evidence, based on statements in the press by debtor government officials, that supports our real option framing. Second, we exploit cross-country and time variation in DSSI participation requests to empirically validate the role played by different real option value drivers, employing survival or time-to-event analysis techniques. Third, we use the real options framework and the different policy levers it suggests to discuss, in a structured way, various potential policy interventions that could make (future) DSSI- or Common Framework-like debt treatments more attractive for debtor countries to join—and to join earlier rather than later. Rather than formulating fully elaborated policy recommendations, our focus lies on demonstrating how thinking in terms of real options helps one to identify potential avenues for improving the attractiveness of debt treatments for eligible debtors.

To our knowledge, we are the first to apply the insights from real option theory to sovereign debt relief, building on our earlier work ([Essers and Cassimon, 2022](#)). That notwithstanding, the literature on sovereign debt restructurings has studied related issues of negotiation duration and delays (see [Graf von Luckner et al., 2021](#), for an overview). It often takes a long time to conclude a debt restructuring—let alone a *decisive* restructuring that successfully resolves a debt crisis—, as evident from patterns of serial default and serial restructurings within the same default spell ([Asonuma, 2016](#); [Reinhart and Trebesch, 2016](#)). To explain such delays, some (mostly theoretical) studies point to problems of inter-creditor coordination that may result in strategic holdout and/or litigation behaviour ([Pitchford and Wright, 2012](#); [Ghosal and Miller, 2015](#); [Bi et al., 2016](#); [Schumacher et al., 2021](#)), or to changing economic conditions in creditor countries ([Asonuma and Joo, 2020](#)). Other studies bring in the debtor’s perspective too, looking at coordination failures between the debtor and its creditors, due to information asymmetries ([Bai and Zhang, 2012](#); [Ghosal et al., 2019](#)), or at commitment problems and ‘gambling for re-

demption' dynamics (Bi, 2008; Benjamin and Wright, 2013, 2019). Similarly, we take a debtor-centred point of view.¹

Empirically, our paper is closest to Trebesch (2019), which focuses on the role of domestic political instability in the debtor country to explain negotiation delays in sovereign debt restructurings with external private creditors. Trebesch (2019) uses similar survival analysis techniques.² By zooming in on the DSSI, we analyse a more homogeneous sample of eligible debtor countries deliberating over a standardised (non-negotiable) debt treatment implemented over the same short time span. Another difference with Trebesch (2019) is that we focus on the initiation of the request, rather than on the duration of the whole process.

Finally, our work is complementary to Lang et al. (2023), who study the effects of the DSSI on the sovereign bond spreads of eligible countries, rather than the participation decision of eligible debtors. In particular, Lang et al. (2023) show that widespread concerns about potential adverse effects coming from the stigma of receiving debt relief were misplaced. Their analysis of daily sovereign bond spreads around the original announcement of the DSSI shows that countries eligible for the DSSI experienced larger declines in borrowing costs compared to similar, ineligible countries.

The paper proceeds as follows. Section 2 gives a brief history of the DSSI and Common Framework, demonstrates how debtor countries' participation decisions can be conceptualised as real options, and presents supporting anecdotal evidence. Section 3 validates our real option framing empirically by applying survival analysis to data on eligible debtors' (non-)participation in the DSSI. Based on the policy levers suggested by the real option framework, Section 4 discusses various potential policy interventions that could make debt treatments more attractive to debtors. Section 5 concludes.

¹Of course, as we will show, the debtor's calculus takes into account what can be expected from its creditors.

²Other studies in the area of public finance that employ survival analysis include, for example, Agnello et al. (2018, 2021).

2 DSSI and Common Framework participation decision as real options

2.1 An overview of the DSSI and Common Framework

In response to the economic repercussions of the COVID-19 pandemic for the world's poorest countries and urged by the IMF and World Bank, on 15 April 2020 the G20 launched the DSSI, which entered into force on 1 May. The DSSI provided a temporary and 'net present value (NPV)-neutral' suspension of debt service payments on claims owed to all official bilateral creditors, meaning that lenders would be fully repaid and would receive interest on the deferred sums. Therefore, strictly speaking, it does not constitute debt *relief*. Originally, the DSSI would only suspend the debt service due between May and December 2020, which was to be repaid over three years after a one-year grace period. In November 2020, the initiative was extended to also cover debt service from January to June 2021, to be repaid over five years (again after a one-year grace). A final extension, for debt service through December 2021, was granted in April 2021. The DSSI formally expired at the end of December 2021.

The DSSI was open to all IDA countries (eligible to borrow from the World Bank's concessional International Development Association) and least developed countries (LDCs, as defined by the United Nations) that had no arrears vis-à-vis the IMF or World Bank. In practice, this amounted to 73 eligible countries, i.e. 72 IDA countries plus Angola (an LDC). In order to benefit from the DSSI, eligible countries needed to make a formal request to their creditors and be involved in, or at least have made a request for an IMF financing arrangement, including under the IMF's emergency facilities (which do not entail full-fledged reform programmes). DSSI beneficiaries committed to use the freed-up resources to address the COVID-19 crisis, subject to IMF-World Bank fiscal monitoring; to disclose their public debt composition; and to respect IMF and World Bank limits on

contracting new non-concessional debt during the suspension period.

Beyond official bilateral creditors, the G20 called upon private creditors to participate in the DSSI “on comparable terms”.³ While the initial response of private creditors, represented by the Institute of International Finance (IIF), to the DSSI proposal seemed cautiously positive, by the end of May 2020, private creditors had made their strong reservations about the initiative very clear. The IIF stressed that private sector participation in the DSSI should be entirely voluntary, with respect for fiduciary duties and other contractual and legal obligations, and with sufficient freedom to tailor the exact modalities of any debt service relief (Bolton et al., 2020).

Ultimately, private creditors provided large volumes of new financing to DSSI-eligible countries but did not participate in any debt service suspension. In fact, very few debtor countries that opted to join the initiative requested such private creditor participation, mostly for fear of negative implications for their credit ratings and financial market access.⁴ Even if several countries that requested DSSI support did see their credit ratings being put on negative watch, in and of itself the official debt service moratorium under the DSSI did not trigger severe adverse market reactions. On the contrary, Lang et al. (2023) find that sovereign bond spreads significantly decreased for eligible countries, especially for those with greater amounts of (potential) debt service relief and weaker fiscal positions, suggesting the beneficial effect runs through the DSSI’s easing of near-term liquidity problems. A less benign reading of these results is that the relative increase in bond prices is due to the DSSI’s implicit subsidy from official bilateral creditors (temporarily waiving their claims) to private creditors (which continued to be paid in full).

Multilateral development banks (MDBs) were kept outside of the DSSI perimeter but were asked by the G20 to “further explore options for the suspension of debt service,

³See the original DSSI term sheet at <https://www.tresor.economie.gouv.fr/Articles/009a4adf-23c2-4283-b88f-83ce405e1272/files/ec1895a7-ac0d-4eaf-a300-e8d8a057a2fd>.

⁴Only Grenada, Chad and Zambia are reported to have requested private creditor participation in the DSSI, without success.

while maintaining their advantageous credit rating and low cost of funding”. In July 2020, a joint MDB study, led by the [World Bank \(2020\)](#), clarified that the MDBs were already providing significant net positive financing flows over a long time period and that joining the DSSI would put their preferred creditor status at risk. This line of argument was followed through and no MDB debt service relief was given.

In the end, 48 out of the 73 eligible countries made requests to take part in the DSSI.⁵ Between May 2020 and December 2021, the DSSI resulted in an estimated USD 8.9 billion of suspended debt service owed to official bilateral creditors—mostly G20 creditors, but also some creditors outside the G20 that agreed to participate on comparable terms (notably Kuwait and the United Arab Emirates). The total of USD 8.9 billion deferred included USD 3.4 billion falling due in 2020 and USD 5.5 billion in 2021 ([World Bank, 2022](#)). This was substantially less than the initially projected USD 12.9 billion, in part due to the mixed implementation record of some bilateral creditors and data issues with earlier estimates ([Brautigam and Huang, 2023](#)).⁶

Together with the DSSI’s first extension, and with the approval of the Paris Club, in November 2020 the G20 introduced the Common Framework for Debt Treatments beyond the DSSI, in response to growing concerns about debt distress. The Common Framework aims to facilitate timely and orderly debt treatments for DSSI-eligible countries on a case-by-case basis and, again, at the request of the debtor country.⁷ The need for a debt treatment and the required restructuring/financing envelope is determined based on the parameters of a full-fledged IMF-supported programme including conditionality, on the

⁵This number includes Uganda, which signed a DSSI deal with the Paris Club but—due to a lack of time to conclude bilateral agreements—ultimately paid its original debt service; and Malawi, which also appears to have requested but not received DSSI relief, for unclear reasons ([Brautigam and Huang, 2023](#)).

⁶See <https://www.bi.go.id/en/G20/Documents/G20-Communique.pdf> for the earlier projected figure. Conversely, [Brautigam and Huang \(2023\)](#) put the total deferred amount *higher*, at USD 13.1 billion, due to their inclusion of USD 4.1 billion savings for Angola from voluntary debt reprofiling by the China Development Bank and ICBC.

⁷This sets the Common Framework apart from the standardised Heavily Indebted Poor Countries (HIPC) initiative where the participation of eligible debtor countries was assumed, and only a few countries decided to opt out ([Essers and Cassimon, 2022](#)).

accompanying IMF–World Bank debt sustainability assessment (DSA), and on the collective assessment of the participating official bilateral creditors. These bilateral creditors coordinate among themselves and negotiate with the debtor country under the form of an ad hoc creditor committee.

In principle, the Common Framework can be used to implement anything from a short-term debt reprofiling up to a deep debt restructuring with large NPV reductions or nominal debt write-offs, in case that would be needed to restore debt sustainability. However, the G20’s Common Framework term sheet restricts such debt writeoffs to “the most difficult cases” and notes that due consideration must be given to creditors’ domestic approval procedures.

Similar as under the DSSI, the debtor country must disclose all necessary information on their public debt, “while respecting commercially sensitive information.” In order to promote broad creditor participation and fair inter-creditor burden-sharing, a debtor country that agrees to the key parameters of a debt treatment with its official bilateral creditors that participated in the negotiations is bound by the usual ‘comparability of treatment’ clause, i.e. the debtor will be required to seek an at least as favourable debt treatment from all its other official bilateral creditors and private creditors. Under the Common Framework, comparable treatment is not simply encouraged as under the DSSI, but rather a formal requirement, for which the debtor country bears responsibility. Again in line with the DSSI, the MDBs are not expected to participate in the Common Framework debt treatments (for now), but asked to explore how best to help meet the longer-term financing needs of developing countries while protecting their own credit ratings and low cost of funding.⁸

At the moment of writing, G20 and Paris Club creditors had received four requests for debt treatments under the Common Framework: from Chad (in January 2021), Ethiopia,

⁸Table A.1 in Appendix A summarizes the main differences and similarities between the DSSI and the Common Framework.

Zambia (both in February 2021) and, most recently, Ghana (in January 2023). The four Common Framework cases were at different stages of implementation. In November 2022, Chad became the first Common Framework participant to conclude a debt treatment, involving only a limited reprofiling of debt service, but with official bilateral creditors and the largest private creditor (commodity trading company Glencore) committing to reconvene should downside risks to debt sustainability materialise ([IMF, 2023](#)). In June 2023, Zambia and its official bilateral creditors reached an agreement on a debt treatment which should result in a substantial NPV reduction of debt. The exact level of new interest rates and the length of debt maturity extensions was made contingent on a future joint IMF-World Bank assessment of Zambia’s debt carrying capacity.

2.2 A real option application

As described above, not all debtor countries eligible for the DSSI decided to enter into the initiative—far from it—and some debtors that eventually participated did so much later than others. Furthermore, despite high numbers of eligible countries finding themselves in or close to debt distress, only a handful of them have appealed to the Common Framework for support. How can we rationalize this?

When debtor countries have to decide on their participation in a debt relief initiative like the DSSI or the Common Framework, they will consider the likely benefits of participation as well the costs. The main benefit of DSSI participation is the temporary debt service savings. As such, participation is more beneficial if those savings are substantial. This in turn depends on the composition of debt service: benefits increase with the scheduled debt service owed to official bilateral creditors that committed themselves to implement the DSSI. Arguably, to the extent that the DSSI eases liquidity pressures, benefits are also higher for debtor countries that find themselves at greater risk of debt distress ([Lang et al., 2023](#)).

The potential benefits of the Common Framework appear to be much broader, in terms of improved resource availability through debt service relief, the overcoming of debt overhang through debt stock relief, and ultimately the regaining of debt sustainability—although all this critically depends on the kind of debt treatment that is concluded.

Conversely, the (perceived) costs of DSSI participation include potential reputational harm, possibly involving a credit rating downgrade and leading to higher future borrowing costs. Fears about adverse reputational effects were not far-fetched: some countries' credit ratings were indeed put on negative watch upon joining the DSSI, even without them signalling that they would seek debt service suspension from their private creditors.⁹ Such costs can be assumed to be higher for countries with larger commercial debts and more front-loaded debt repayment profiles (requiring an earlier return to the market for debt rollover). Stigma related to the DSSI-required request for IMF assistance may constitute an additional cost. Vanuatu, for example, decided to withdraw from the DSSI as it did not wish to request IMF financing (IMF and World Bank, 2020).

There were also considerable administrative costs, since the deferral process required reconciliation between debtor and creditor records and the creation of new legal documentation with the revised payment terms for each loan. This can be time-consuming, especially for debtors with many different creditors. For example, by June 2022 Pakistan had signed no less than 93 deferral agreements with 21 creditors.¹⁰ In several countries, DSSI implementation contracts were still being negotiated and reconciled well beyond December 2021 (Brautigam and Huang, 2023). Finally, there is the cost of extra reporting obligations to the IMF and World Bank for fiscal monitoring.

The reputational and administrative costs associated with participation in the Common Framework are likely to be (much) more severe than in the case of the DSSI, with

⁹For example, Moody's placed Ethiopia, Pakistan, Cameroon, Senegal, and Cote d'Ivoire under review for a credit rating downgrade when they requested DSSI support (Brautigam and Huang, 2023). Once it became clear that none of these countries would ask their private creditors to join in the effort, the rating reviews were concluded without downgrades (Smith, 2021).

¹⁰See <https://www.brecorder.com/news/40180253>, quoted in World Bank (2022).

the expectation of a (typically) deeper debt treatment impacting credit ratings and market access, and a much more involved, less-standardised process, including in-depth negotiations with an official creditor committee and private creditors.

Since debtor countries had freedom in timing their (potential) entry into the DSSI (and more so the Common Framework), they likely also took into account the uncertainties associated with the benefits and costs of participation, as well as the opportunity costs of postponing their participation decision.

Especially at the start of the DSSI, there was substantial uncertainty, mainly relating to the reputational costs of the DSSI. Lack of clarity about credit ratings and cross-default clauses led some countries to continue to pay their debt service to official bilateral creditors even after applying for DSSI relief ([Brautigam and Huang, 2023](#)). On the benefits side, doubts emerged initially about the perimeter of the suspended debt service and the exact terms under which (especially non-Paris Club) bilateral creditors would participate. A few countries allegedly withdrew their DSSI requests to selected bilateral creditors after these imposed additional conditions, such as limits on new financing or a requirement to first clear arrears ([IMF and World Bank, 2020](#)).

Over time, the uncertainty for candidate DSSI participants decreased. Private creditors and credit rating agencies clarified their positions, as did several non-Paris Club creditors. The exact terms of the DSSI, including the prohibition of extra fees and the treatment of arrears and payments on syndicated loans, were further specified in two addenda to the original DSSI term sheet, issued at the time of the DSSI extensions. Moreover, the experiences of actual DSSI-participating debtor countries, including the limited impact on borrowing costs, could be observed by candidate debtors.

Postponing the decision to participate in the DSSI also involved opportunity costs under the form of the foregone suspension of certain debt service payments. Indeed, the payment suspension only applied to debt service due after the debtor's DSSI request; it was not applied retroactively to debt service paid before the request.

Due to its case-by-case nature and the relative open-ended character of its debt treatment negotiations, the Common Framework is subject to even greater uncertainty surrounding the benefits and costs of participation. Especially at the current juncture, with all but one of the first few cases still to be completed, and with progress on the other cases being much delayed, debtors contemplating the Common Framework may feel discouraged by excessive uncertainty. Opportunity costs too may be larger than under the DSSI. In case the debtor suffers from debt overhang, holding out from a debt treatment under the Common Framework would imply missing out on investment.

Conceptually, debtor countries' DSSI (or Common Framework) participation decisions can be well understood using a real option approach. Real option theory argues that when decision-makers are confronted with choices that entail uncertain costs and/or benefits, their decisions can be characterised in a similar way as exercising a dividend-paying call (stock) option (see e.g., [McDonald and Siegel, 1986](#); [Dixit and Pindyck, 1994](#); [Trigeorgis, 1996](#)): when the debtor country decides to participate (in the DSSI), it exercises its option, thereby incurring some (uncertain) costs in order to reap the (uncertain) benefits. In case there is some flexibility in timing this decision, the real option approach demonstrates that optimal timing of execution may diverge from the traditional NPV rule of investment analysis: rather than deciding to invest whenever benefits exceed costs, uncertainty may lead to waiting even when net benefits are currently positive. The investment decision is postponed in the hope of acquiring more information about the risky future. This would allow for a better-informed decision later on and reduce the chances of getting trapped in a loss-making situation when the adverse risks do materialise.

More specifically, decision-makers (DSSI-eligible debtor countries in our case) will compare the value of going ahead now (i.e. the *NPV* or net benefit of participating in the DSSI, equal to some benefits V minus costs I associated with participation) with the current value of the option (say C , indicating the value of waiting now in order to potentially execute later; basically the value of being able to gather more information about

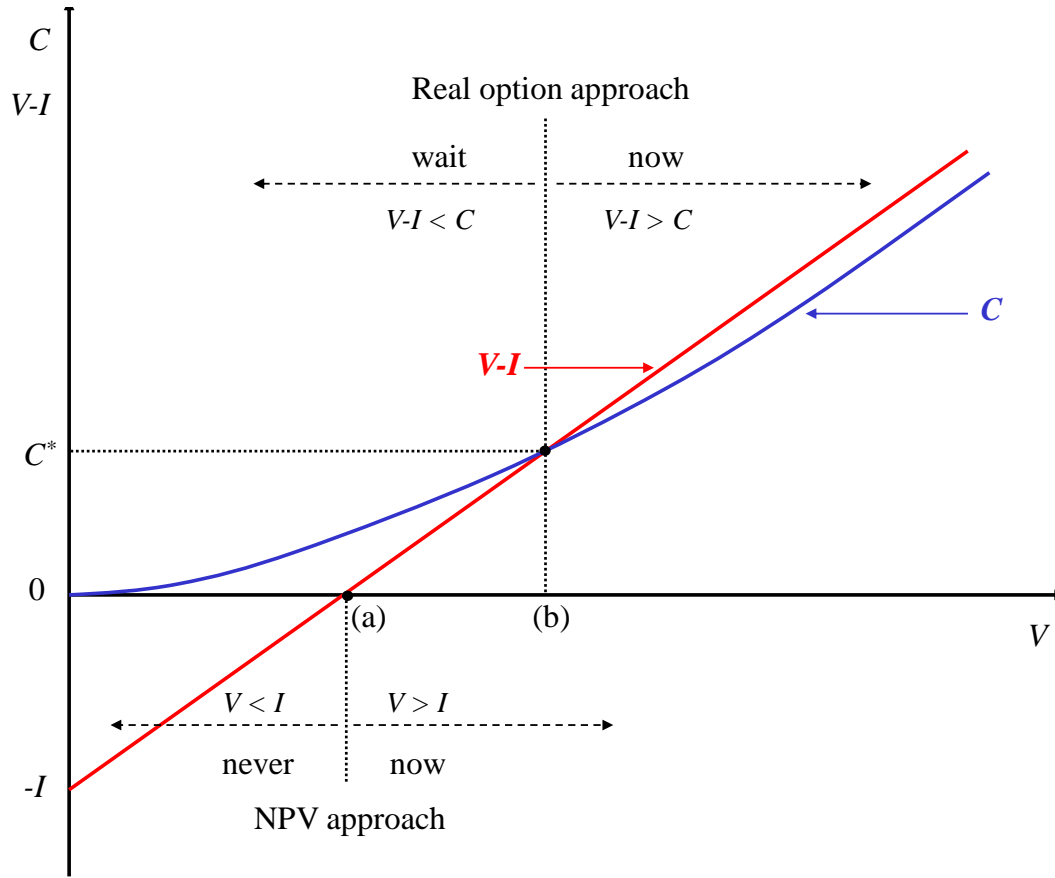
the likely consequences of DSSI participation). They will only proceed now if the former exceeds the latter ($V - I \geq C$). Otherwise, they will prefer to wait (i.e. to postpone their decision of whether or not to participate in the DSSI). Note that the possibility of exercising the option only exists under the assumption of some positive opportunity costs of non-execution (say q). Without opportunity costs, decision-makers would wait forever.

Figure 1 illustrates the foregoing graphically. It plots the *NPV* ($V - I$) and the option value C as a function of the underlying asset value, i.e. the benefits V (the debt service savings implied by DSSI participation and, possibly, the reduction of debt distress risk). An NPV approach would suggest going ahead with the decision once benefits V surpass costs I (from negative reputational effects and perhaps from having to approach the IMF for assistance as a precondition), beyond point (a). However, in the presence of uncertainty (about the likely benefits and costs of DSSI participation), the decision to go ahead would be postponed until the *NPV* exceeds the positive value of waiting (which allows for more information gathering about the benefits and costs), as from point (b) onward.

Option value C can be derived using conventional (financial) option models. In the simplest of such models, C is determined based on a few key parameters or ‘value drivers’: the benefits V and costs I ; some proxy of the uncertainty of benefits and costs (typically captured by the standard deviations of their distributions, σ); the remaining time until maturity of the option (t); a (typically exogenous) risk-free interest rate (r); and the opportunity cost of waiting (the dividend payment that is foregone as long as the option is not exercised, q).¹¹

¹¹To get an intuition of why the (call) option value curve typically has a convex shape, note that the option value C is the sum of *intrinsic* value and *time* value (Hull, 2012). The intrinsic value component is defined as $\max(0, V - I)$, where $V - I$ is the value the option would have if it is exercised immediately. If this difference of benefits and costs is already positive, the option is said to be ‘in the money’. The option’s time value refers to the statistical probability that the net benefits will further increase during the remaining lifetime of the option. Typically, this time value is very low at low levels of V , increases as V rises and comes closer to I and starts exceeding I , and then decreases again at high levels of V (since at that point the probability that V will further increase becomes quite low). This typical pattern of the time value results in the convexity of the option value curve. Note also that it is the presence of opportunity costs (q) that will make that the option value curve C intersects with the *NPV* curve; in the absence of opportunity costs the curves will only converge in the limit.

Figure 1: Real options vs. net present value



Source: Adapted from [Cassimon et al. \(2016\)](#).

Table 1 gives for each value driver the financial options definition, the real options analogy applied to the DSSI or Common Framework participation decision, and the directional impact of the driver on option value. As shown, higher expected benefits and lower expected costs render the option more valuable to its holder. Uncertainty and a longer time-to-expiry impact option value positively, while higher opportunity costs have a negative effect.¹² Table A.2 in Appendix A compares the interpretation of the main option value drivers for the DSSI and the Common Framework, summarizing the discussion at the start of this section. In Appendix B, we provide a more technical exposition of an

¹²Uncertainty increases option value, since the option allows the holder to benefit from (expected) upsides, while offering protection from (expected) downsides.

option valuation model, for illustrative purposes.

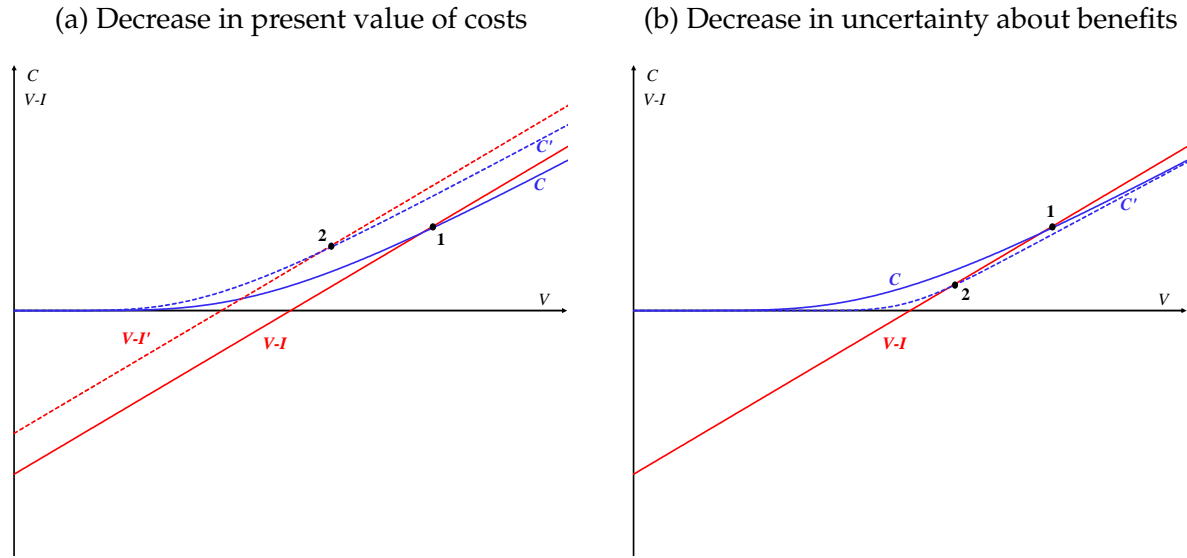
Table 1: Option value drivers

Symbol	Impact on option value (C)	Financial options definition	Real options analogy, applied to DSSI or Common Framework (CF) participation
V	+	Underlying asset price	Present value of expected DSSI/CF benefits
I	–	Strike price	Present value of expected DSSI/CF costs
σ	+	Volatility of underlying asset return	Uncertainty about DSSI/CF benefits (and/or costs)
t	+	Time to maturity	Time left before DSSI expires
r	+	Risk-free rate	Risk-free rate
q	–	Dividend yield	Opportunity costs of holding out from DSSI/CF

Source: Own elaboration.

Figure 2 visualises what happens to the participation decision when some of the option value drivers change. In the left panel, we show the example of a decrease in the present value of the expected DSSI costs. *Ceteris paribus*, this boosts option value, moving curve C upward and increases the NPV, shifting $V - I$ to the left. The net result is that the point from which $V - I \geq C$ moves leftward (from point 1 to 2), implying earlier exercise of the option of joining the DSSI (i.e. a faster participation). In the right panel of Figure 2, uncertainty about the benefits of the DSSI decreases. This lowers the option value curve and does not affect the NPV curve as such. Again, the participation decision would now be taken earlier (point 2 lies to the left of point 1).

Figure 2: Real option sensitivity to parameter changes



Source: Own elaboration.

2.3 A qualitative validation

Our real option characterisation of debtor countries' decisions of whether or not to participate in the DSSI or Common Framework is supported by anecdotal evidence. Statements in the press by officials from both participating and non-participating countries illustrate the importance of key real option value drivers—expected benefits, expected costs and uncertainty—in debtors' deliberations.

DSSI (non-)participation

Several DSSI-eligible countries with market access were quick to rule out participation because of the reputational costs this could imply (Smith, 2021). For example, in April 2020, Benin's Minister of Economy and Finance, Romuald Wadagni, wrote an opinion piece on the DSSI stating: "[T]hese solutions will further tarnish the reputation of our governments and jeopardize their access to future financing. Our countries will suffer from an implied deterioration of their perceived credit quality, which could impact their access to capital markets... A morato-

*rium, whether desired or imposed, could even be considered in some loan documents as an event of default by private creditors, even if it only concerns bilateral public creditors. In addition to sanctions from rating agencies for defaulting on loan repayments, all our countries' efforts to improve both the business climate and the perception of risk... would be simply destroyed".*¹³ Similarly, Paul Kagame, Rwanda's President, believed that the (small) benefits of a debt moratorium did not weigh up against the potential market access implications and expressed his preference for (larger) emergency financing: *"We shouldn't be looking for excuses to cancel debt for its own sake. If there is another idea that would achieve the same results, that is welcome. Stimulus is stimulus, no matter the mechanism".*¹⁴ Both Benin and Rwanda had only relatively recently secured access to the Eurobond market (with first-time issuances in 2019 and 2013, respectively).

Some eligible countries with market access did request DSSI support. Pakistan was among the very first eligible countries to apply for DSSI support, planning to use the debt service savings for COVID-related purposes. Yet, from the very outset, the country's Ministry of Finance attempted to quell any negative market reactions to its request, emphasising that it would not request a payment freeze from the private sector.¹⁵ Senegal too, represented by its Minister for Economy and Planning, Amadou Hott, clarified that *"there is no need to force any participation from private creditors... Our priority is to maintain our relationship with private creditors that are key long-term partners to bridge our financing gap".*¹⁶

There have also been a few countries that have changed tack over time. For example, at the time of the first leg of the DSSI, Kenya deemed the debt service savings from participating not sufficiently large to go ahead, in view of a potential credit rating downgrade, and decided to wait. In May 2020, Kenyan Treasury Secretary Ukur Yatani de-

¹³See <https://www.theafricareport.com/26786/coronavirus-africa-needs-neither-debt-relief-nor-moratoriums>.

¹⁴See <https://www.ft.com/content/93293b6a-f167-45b9-8ad2-594e4c26fd50>.

¹⁵See <https://www.ft.com/content/d3fecf74-9256-435e-aaa4-08cb1f9761a3>.

¹⁶See <https://www.bloomberg.com/news/articles/2020-11-25/senegal-cautions-against-private-debt-relief-for-african-nations>.

clared: *“We fear we might unnecessarily create a crisis... The G20 debt relief initiative does not offer optimal benefit given the structure of Kenya’s debt portfolio... Kenya is taking a cautious approach of seeking debt relief from bilateral creditors to safeguard its sovereign credit rating”*.¹⁷

As time progressed, however, Kenya’s option value of waiting decreased as uncertainties about the DSSI’s effects on the country’s market access diminished through the observance of the experiences of earlier DSSI participants and by talking to creditors and IMF staff (who had also recommended that the DSSI would help close the country’s fiscal gap; Brautigam and Huang, 2023). Moreover, Kenya’s financial situation deteriorated quickly and the three main rating agencies placed its credit rating on negative watch, making reputational damage less of an issue. By November 2020, Mr. Yatani had clearly made a switch: *“We have been reluctant in the past because of the attendant unintended consequences in terms of those holding private debt... But now after getting a bit of assurance that it is a matter that can be managed, we are now strongly considering joining the arrangement”*.¹⁸ In January 2021, Kenya actually joined the DSSI for its second round. Also Guinea-Bissau switched from holding out in the first round of the DSSI to participating in the second round. This may have been related to the publication of a new IMF–World Bank DSA of the country in between, which showed an increase in the risk of debt distress from moderate to high.

Common Framework (non-)participation

In January 2021, Chad became the first country to avail itself to the Common Framework. Carrying a heavy external debt burden and being highly dependent on oil for its hard currency earnings and government revenues, the country found itself in a dire situation when oil prices plunged in the wake of the pandemic. At the time of the official announcement of the request, Chad had already secured an IMF staff-level agreement on a new four-year programme.¹⁹ Given that Chad had not issued any publicly traded exter-

¹⁷See <https://www.reuters.com/article/us-health-coronavirus-kenya-exclusive-idUSKBN22R25A>.

¹⁸See <https://www.reuters.com/article/kenya-debt-g20-idUKL8N2I43LV>.

¹⁹See <https://www.reuters.com/article/us-chad-debt-idUKKBN29W2MC>.

nal debt and had no credit rating, concerns about the reputational costs of applying for debt relief were moreover limited. In fact, the country owed most of its external debt to commodity trading company Glencore, whose claims had already been part of two previous debt restructurings, most recently in 2018. Chad was also the last country to have completed the HIPC process, in 2015.

When Zambia followed Chad's example to request Common Framework support in February 2021, the country had already defaulted on multiple Eurobonds, next to debt payment deferrals with its official bilateral creditors under the DSSI and with the China Development Bank. Hence, fear for further negative market reactions was no longer an obstacle. On the contrary, Zambian Minister of Finance, Bwalya Ng'andu, clarified that *"Zambia is committed to transparency and equal treatment of all creditors in the restructuring process... Our application to benefit from the G20 Common Framework will hopefully reassure all creditors of our commitment to such treatment"*.²⁰

Ethiopia also signed up to the Common Framework in February 2021, looking to *"reduce debt vulnerabilities and lower the impact of debt distress"*. Despite the Common Framework's comparability of treatment requirement, however, Ethiopia's Ministry of Finance downplayed the consequences for its private creditors: *"It would be a fair burden-sharing between all our official bilateral creditors and then, based on that, we will look at whether we need to reach out to private creditors, which is very unlikely"*.²¹

There are clear indications that the slow progress and uncertain prospects of those first three cases under the Common Framework have been holding off other eligible debtors from applying. For example, in a November 2021 interview, Mauritania's Economy Minister, Ousmane Mamoudou Kane declared: *"In principle, the prerequisites of the Common Framework are attractive...[but] we need to better understand what to expect from the framework and to see what the successful examples are"*.²² Ghana eventually requested a Common

²⁰See <https://www.reuters.com/article/us-zambia-debt-idUSKBN2A50XL>.

²¹See <https://www.ft.com/content/4992e00e-557a-4c06-858b-e7e15bbf10ac>.

²²See <https://www.bloomberg.com/news/articles/2021-11-09/lack-of-progress-in-g-20-debt-deals-a>

Framework debt treatment in January 2023. Alledgedly, according to anonymous sources close to the Ghanese authorities, “[they had] been hesitating due to the long delays faced by other countries using the process” and “had sought reassurances that the negotiations can be expedited before proceeding”.²³

3 Survival analysis of DSSI participation

3.1 Sample and variables

To empirically test our framing of debtor countries’ DSSI participation decisions as real options, we use a survival or time-to-event analysis. The ‘event’ is here the request of an eligible debtor to participate in the original DSSI. Our goal is to explain the timing of that event based on variables proxying the main real option value drivers: the (perceived) benefits, the (perceived) costs of DSSI participation, as well as the uncertainty surrounding the initiative and the opportunity costs of holding out.

Our country sample starts from the 73 eligible DSSI countries, of which 43 participated in the first leg of the DSSI (covering debt service due between May and December 2020). From this sample we exclude five small economies (all DSSI non-participants) for which no detailed debt service data is available from the World Bank.²⁴ For 36 out of 43 DSSI participants, we were able to obtain the exact date when the request for DSSI support was made to the Paris Club.²⁵ Table A.3 in Appendix A shows the final sample of debtor

deterrent-for-mauritania.

²³See <https://www.reuters.com/world/africa/ghana-poised-request-debt-relief-under-g20-common-framework-sources-2023-01-04/>.

²⁴The excluded countries are Kiribati, Marshall Islands, Micronesia, South Sudan and Tuvalu. They were not required to report their debt statistics to the World Bank’s databases because they received only IDA grants and did not have any outstanding obligations to the World Bank. South Sudan was already in debt distress and the other four countries were at high risk of distress. Capacity issues may have deterred these small economies from requesting DSSI support.

²⁵The participation status of Uganda and Malawi is not entirely clear (Brautigam and Huang, 2023). Afghanistan, Burundi, Fiji, The Gambia, and Tonga all participated in the DSSI according to World Bank data, but they did not file a request with the Paris Club. They may have directed their DSSI requests to individual Paris Club or non-Paris-Club creditors. As we have no information on the timing of their requests,

countries we employ.

Our main explanatory variables are the following. As a measure of the benefits of the DSSI in terms of temporary debt relief we take the (potential) debt service savings as a percentage of GDP for the year 2020 from the World Bank’s DSSI overview table (estimated as of April 2021). This World Bank estimate, based on debtor-reported data, is the closest proxy we have for the projected official bilateral debt service that fell under the perimeter of the first phase of the DSSI. Higher envisioned debt service savings should make DSSI participation more attractive. Moreover, from the World Bank’s International Debt Statistics (2021 edition), we calculate the shares of total external debt service that were projected to be paid to either official bilateral creditors (excluding China) or to Chinese (official and non-official) creditor agencies in 2020. The idea here is that having a higher exposure to official bilateral creditors implies larger and more certain benefits from DSSI participation, as most of these bilateral creditors were quick to subscribe to the DSSI. And while there may have been somewhat more uncertainty about its intentions, at least initially, China did commit itself to the DSSI, representing an opportunity for DSSI-eligible debtors with a high exposure to Chinese creditors.²⁶ Arguably, these two debt service share variables can also be seen as (rough) proxies for the opportunity costs of waiting to file a DSSI request.

Another key (perceived) benefit of the DSSI was the lowering of the risk of external debt distress. This is obviously most valuable for eligible countries with a higher risk of debt distress at the time the DSSI was launched. Hence, we construct a dummy variable that takes the value 0 for eligible countries deemed to be at low risk of debt distress,

these seven countries are dropped from our empirical analysis. Overall, these countries’ characteristics appear not be systematically different from those of the DSSI participants that remain in the sample. If anything, the dropped countries had lower market access (Fiji being the only country with debt service due to external bondholders), which works against finding evidence of reputational concerns hampering DSSI participation. All of our baseline and additional estimation results, discussed in Section 3.4, are robust to adding Uganda and Malawi to the sample as DSSI *non*-participants.

²⁶In fact, the DSSI was the first-ever coordinated debt relief initiative to which China explicitly committed itself (Brautigam and Huang, 2023).

according to the latest pre-DSSI IMF–World Bank DSA, and the value 1 for countries at moderate/high risk of or already in debt distress.

Since one of the key perceived costs of DSSI participation was the prospect of reputational harm, we also consider the projected share of external debt service going to international bondholders in 2020, again calculated from the World Bank’s International Debt Statistics. The underlying argument is that for countries with a higher exposure to bondholders the perceived risks of any reputation losses from participating in the DSSI were larger. Alternatively, we look at eligible countries’ latest pre-DSSI sovereign credit ratings. Higher ratings signal a better market reputation and could therefore imply greater aversion for entering into an initiative potentially harming that reputation. Based on the average of ratings from S&P, Moody’s and Fitch, we construct a dummy variable that takes the value 0 for countries that were either unrated or had a credit rating below B levels and the value 1 for countries with a B-level rating.²⁷

Another perceived cost we take into account is that of having to request an IMF arrangement, a formal requirement for DSSI participation that may take some time to fulfill and could possibly carry stigma. This requirement is of course only a concern for countries that did not yet have an active IMF arrangement at the time of the DSSI launch. We therefore create a dummy taking the value 1 if a country had already received a COVID-19-related emergency financing package (under the Rapid Credit Facility and/or Rapid Financing Instrument) or if it was involved in a regular, full-fledged IMF arrangement (typically an Extended Credit Facility) as of 1 May 2020.

3.2 Methodology

We start our analysis by applying the non-parametric Kaplan-Meier estimator. This estimator is a popular choice in descriptive time-to-event analysis because of its intuitive

²⁷The highest rating in the sample is BB-/Ba3 (Bangladesh).

interpretation. It allows us to plot ‘failure functions’, which correspond to the cumulative proportion of eligible countries that have requested to participate in the DSSI at each point in time, as observed from the start of the DSSI (set to 15 April 2020, the official launch date) to its end (censored at 15 December 2020). Such failure functions $F(t)$ are the complement of the Kaplan-Meier survivor functions $S(t)$ and can be computed as:

$$\hat{F}(t) = 1 - \hat{S}(t) = 1 - \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_j} \right)$$

where t_j denotes the day at which the DSSI request occurs for country j ; d_j are the number of countries that ‘fail’, i.e. that request DSSI support, at time t_j ; and n_j is the number of countries at risk of ‘failure’, i.e. that have not (yet) made a request, just prior to t_j . We can plot these Kaplan-Meier failure functions for different categories of countries and test their equality using a log-rank test. This will provide us with a first idea on the extent to which the variables we identified can help us to distinguish between (early) DSSI participants and non-participants.

Moving to multivariate analysis, we start by estimating semi-parametric Cox proportional hazard models (cf. [Trebesch, 2019](#)). In the Cox model, the hazard function can be written as:

$$h(t) = h_0(t) e^{X\beta}$$

where $h_0(t)$ is the baseline hazard function, i.e. the hazard when all covariates are set to zero; X is our set of (time-invariant) covariates; and β is the vector of parameters to be estimated. The Cox model is very flexible, as it leaves the functional form of $h_0(t)$ unparametrised and to be determined by the data, and is estimated using maximum likelihood.

We also estimate alternative proportional hazard models, i.e. the Weibull, exponential and Gompertz models. These are parametric models, since they assume a certain func-

tional form for the baseline hazard. In the Weibull model, the baseline hazard is specified as increasing or decreasing monotonically over time, or $h_0(t) = pt^{p-1}$, with shape parameter p estimated from the data. If $p = 1$, the Weibull model collapses to the exponential model, where $h_0(t) = 1$, i.e. a constant baseline hazard. The Gompertz model is characterised by hazard rates that either increase or decrease exponentially with time, or $h_0(t) = e^{\gamma t}$, with γ estimated from the data. If $\gamma = 0$, the Gompertz model again collapses to the exponential model.

3.3 Descriptives

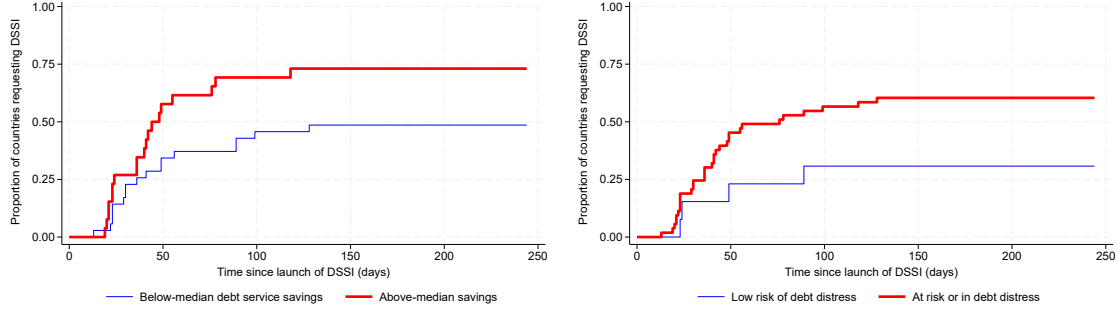
Figure 3 plots the Kaplan-Meier failure functions for different categories of DSSI-eligible countries. The results are in line with the arguments about the benefits and costs of DSSI participation outlined above.

More specifically, countries that stood to benefit from above-median external debt service savings were, at almost any time since the launch of the DSSI, more likely to request DSSI support than those countries that could expect below-median debt service savings. Countries that were already at moderate/high risk of or in debt distress at the time of the DSSI were also quicker to make a request than those marked by low debt distress risk. The differences in the likelihood of requesting DSSI support are especially large for countries with pre-DSSI involvement in an IMF arrangement versus countries without such an arrangement, with substantially longer delays in the second group. Also countries with higher shares of their external debt service going to official bilateral or Chinese creditors appear to have acted more quickly, whereas countries with top-quartile shares of debt service flowing to international bondholders or with relatively good (B-level) credit ratings seem to have been slightly more reluctant to request participation in the DSSI.

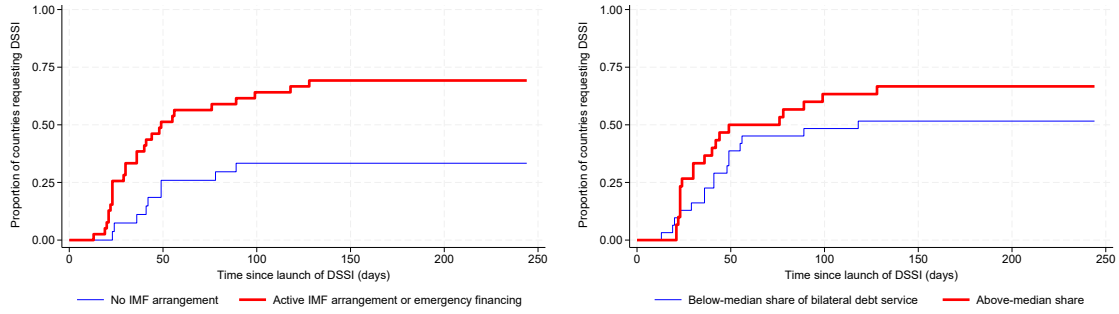
Log-rank tests for the equality of survivor/failure functions show that the differences in panels (a), (b) and (c) are statistically significant at the 10% level or lower.

Figure 3: Kaplan-Meier failure functions for the timing of DSSI requests

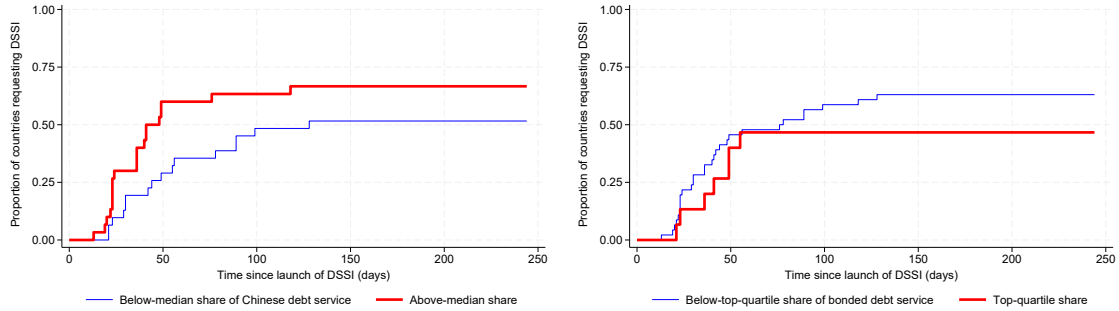
(a) Debt service savings in 2020 (% of GDP) (b) Pre-DSSI risk of external debt distress



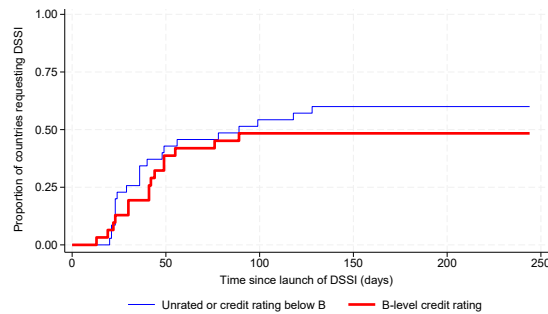
(c) Pre-DSSI involvement in IMF arrangement (d) Share of bilateral (excl. China) debt service in 2020



(e) Share of Chinese debt service in 2020 (f) Share of bonded debt service in 2020



(g) Pre-DSSI credit rating



Notes: For variable definitions, see main text. The sample excludes DSSI-eligible countries with no information on the timing of their DSSI requests.

3.4 Estimation results and discussion

Baseline

Table 2 shows the estimation results obtained from the multivariate Cox proportional hazard models. Instead of the raw coefficient estimates, we report exponentiated coefficients also known as ‘hazard ratios’ or ‘relative hazards’, which correspond to the effects of one-unit changes in the corresponding variables. Hazard ratios larger than one imply that a positive change in the variable in question results in a higher hazard and therefore a shorter survivor time / earlier ‘failure’, i.e. in this context, a faster request for DSSI support. Hazard ratios smaller than one imply that an increase in the variable is associated with a longer time before DSSI support is requested (if it is requested at all).

Despite the relatively small sample, the results from the univariate Kaplan-Meier analysis broadly survive in a multivariate setting. Countries that stood to benefit more from DSSI participation, due to higher debt service savings or larger exposures to willing bilateral creditors (and to a lesser extent Chinese creditors), or that faced less of a hurdle in having to request an IMF arrangement first, were quicker to make a DSSI request. Conversely, countries that stood more to lose in terms of market reputation, proxied by larger exposures to bondholders or better pre-DSSI credit ratings, were less likely to make a (quick) DSSI request.

Additional tests suggest that the Cox model is appropriate for our analysis. Most importantly, the null hypothesis of proportional hazards—a key assumption of the model—cannot be rejected based on the Schoenfeld residuals. Also tests of overall model fit using Cox-Snell residuals do not indicate any problems.²⁸

²⁸These test results are available from the authors upon request.

Table 2: Baseline estimations: Cox proportional hazard models

	(1)	(2)	(3)
Debt service savings	2.2377*** (0.5956)	2.3002* (1.1222)	1.4224 (0.4988)
Risk of external debt distress	2.1039† (1.1897)	2.0798† (1.0950)	2.2714† (1.1555)
IMF arrangement	2.3450** (0.8538)	3.2423*** (1.2699)	3.0887*** (1.2859)
Share of bilateral debt service		1.0301* (0.0162)	1.0407*** (0.0142)
Share of Chinese debt service		1.0098 (0.0159)	1.0215* (0.0131)
Share of bonded debt service		0.9744* (0.0138)	
Credit rating			0.7119 (0.2405)
Number of countries	60	59	59
Number of DSSI requests	36	36	36
Log pseudo-likelihood	-126.6483	-120.2649	-121.0731
Akaike information criterion	259.2965	252.5297	254.1462
Bayesian information criterion	265.5796	264.9949	266.6114

Notes: The table reports the hazard ratios for the variables of Cox proportional hazard models. For variable definitions, see main text. The sample excludes DSSI-eligible countries with no information on debt service or on the timing of their DSSI requests. Column (1) excludes Bhutan, and columns (2) and (3) also exclude Haiti, as outliers. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, † $p < 0.2$.

Alternative estimators

Table 3 shows the estimation results from the alternative Weibull, exponential and Gompertz proportional hazard models. Reassuringly, the estimated hazard ratios are qualitatively, and in most cases also quantitatively, very similar to those of the baseline Cox model and across the three alternative models. If anything, statistical significance of the estimates is higher in these parametric models. The shape parameter p in the Weibull model is not significantly different from 1, and the Gompertz model's auxiliary parameter γ is not significantly different from 0, which explains why the results are close to those of the exponential model.

Robustness: additional variables

To further test the robustness of our estimation results, we extend the Cox proportional hazard model with extra variables. Table 4 reproduces the baseline results (column (1) corresponds to column (2) of Table 2) and compares them with a selection of model specifications where additional variables are introduced one by one (to avoid overspecification in our limited sample).²⁹

First, in column (2) of Table 4) we split our original IMF arrangement variable into two separate dummies, one for countries that had requested emergency financing before the launch of the DSSI and a second for countries involved in a regular, full-fledged IMF arrangement at the time. It turns out that both types of arrangement are equally significant drivers of early DSSI requests.

Second, we consider a set of macroeconomic controls. Column (3) adds 2019 (pre-DSSI) log GDP per capita (taken from the IMF's World Economic Outlook database) to the baseline specification. Poorer countries in the eligible pool were quicker to make a DSSI request, perhaps unsurprisingly so. Columns (4) and (5) suggest, somewhat counterintuitively, that countries with higher expected economic growth for the year 2020 (i.e. the growth forecast obtained from the April 2020 edition of the IMF's World Economic Outlook) and a better expected fiscal balance for 2020 (expressed as a percentage of GDP) were more rather than less likely to participate early in the DSSI. Other macroeconomic variables, such as the expected current account balance or inflation, have no statistically significant relation with DSSI participation. Most importantly, we find that controlling for macro-economic conditions does not meaningfully alter the baseline results.

²⁹Other estimation results mentioned in the text are available from the authors upon request.

Table 3: Alternative estimators: Exponential, Weibull and Gompertz proportional hazard models

	(1) Exp.	(2) Exp.	(3) Exp.	(4) Weib.	(5) Weib.	(6) Weib.	(7) Gomp.	(8) Gomp.	(9) Gomp.
Debt service savings	2.8530*** (0.8517)	2.9993** (1.4566)	1.6946† (0.5873)	2.6086*** (0.7419)	3.0720** (1.5218)	1.7150† (0.6106)	2.0914*** (0.4924)	2.1790** (0.8393)	1.4054 (0.3981)
Risk of external debt distress	2.4478† (1.5586)	2.4310† (1.4155)	2.5330* (1.4225)	2.3637† (1.4865)	2.4515† (1.4640)	2.5466† (1.4562)	2.0947† (1.1998)	2.1008† (1.1268)	2.2601† (1.1576)
IMF arrangement	2.9091** (1.3404)	4.0686*** (1.7889)	3.8955*** (1.8141)	2.6795** (1.1885)	4.1508*** (2.0068)	3.9673*** (1.9883)	2.1841** (0.8051)	3.0234*** (1.1921)	2.8732** (1.1829)
Share of bilateral debt service		1.0413** (0.0181)	1.0539*** (0.0154)		1.0419** (0.0189)	1.0547*** (0.0165)		1.0314** (0.0150)	1.0409*** (0.0131)
Share of Chinese debt service		1.0080 (0.0169)	1.0223* (0.0134)		1.0079 (0.0172)	1.0225* (0.0138)		1.0085 (0.0135)	1.0190* (0.0108)
Share of bonded debt service		0.9707* (0.0157)			0.9703* (0.0159)			0.9760* (0.0132)	
Credit rating			0.5930† (0.2336)			0.5884† (0.2296)			0.6814 (0.2108)
Shape parameter p				0.8657	1.0263	1.0233			
Auxiliary parameter γ							-0.0117	-0.0088	-0.0090
Number of countries	60	59	59	60	59	59	60	59	59
Number of DSSI requests	36	36	36	36	36	36	36	36	36
Log pseudo-likelihood	-84.6621	-74.5903	-75.1947	-84.0885	-74.5728	-75.1811	-77.1590	-71.0451	-71.5811
Akaike information criterion	177.3242	163.1806	164.3895	178.1769	165.1456	166.3623	164.3180	158.0902	159.1621
Bayesian information criterion	185.7016	177.7234	178.9322	188.6486	181.7659	182.9826	174.7897	174.7105	175.7824

Notes: The table reports the hazard ratios for the variables of, respectively, exponential (columns 1-3), Weibull (columns 4-6) and Gompertz (columns 7-9) proportional hazard models. For variable definitions, see main text. The sample excludes DSSI-eligible countries with no information on debt service or on the timing of their DSSI requests. Columns (1), (4) and (7) exclude Bhutan, and the other columns also exclude Haiti, as outliers. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, † $p < 0.2$.

Third, we try to take into account the COVID-19-related health situation of countries, since the pandemic is one of the factors that motivated the launch of the DSSI in the first place, and because the (domestic) spread of COVID-19 could be seen as another source of uncertainty. However, our survival model with pre-determined, time-invariant variables is not well suited for these purposes. Ideally, the impact of COVID-related factors is studied in a more dynamic setting. Indeed, by the end of April 2020, reported COVID cases in the eligible DSSI countries were still very low, with a few exceptions. Simply taking these numbers at face value and adding for each country the cumulative number of confirmed COVID cases per million people as of 30 April 2020 (available from the WHO) further reduces sample size and does not change our baseline estimation results. Neither does the introduction of the Oxford COVID-19 government response stringency index, as constructed by [Hale et al. \(2021\)](#).³⁰ For these reasons, in column (6) of Table 4 we look at an indirect measure of how prepared country's public health budgets were to face the pandemic at the start of the DSSI, i.e. 2019 government health expenditures as a percentage of GDP (sourced from the World Bank's World Development Indicators). We find that countries that spent less on health were faster to sign up for the DSSI, arguably because they in particular could use the extra COVID-targeted money.³¹

Finally, there is a possibility that political economy factors also played some role in DSSI participation decisions, even though the risk of severe political harm from requesting a short debt service standstill may be limited. Based on the Database of Political Institutions ([Cruz et al., 2021](#)) and additional hand-coding, we construct a dummy that equals 1 if a country's chief executive was up for re-election between May and December 2020. We find no significant relation of this political economy variable with DSSI requests when added to the baseline specification, while all other estimates remain virtually unchanged.

³⁰Controlling for the number of COVID deaths or people vaccinated is not feasible, due to limited data availability and reliability of mortality statistics for our country sample, and the fact that the first vaccination campaigns only started in 2021.

³¹We obtain similar results when expressing 2019 government health expenditures as a percentage of total government expenditures instead.

Table 4: Robustness: Cox proportional hazard models with additional variables

	(1)	(2)	(3)	(4)	(5)	(6)
Debt service savings	2.3002* (1.1222)	2.9895** (1.4732)	2.5780** (1.2299)	2.9257** (1.4815)	2.6552* (1.4682)	2.7620* (1.4597)
Risk of external debt distress	2.0798† (1.0950)	1.5424 (0.8698)	2.1000† (1.0988)	2.9300** (1.5228)	2.7916* (1.6218)	1.9778 (1.0542)
IMF arrangement	3.2423*** (1.2699)		3.2433*** (1.2804)	3.5140*** (1.4909)	3.6868*** (1.3776)	3.1955*** (1.3278)
Share of bilateral debt service	1.0301* (0.0162)	1.0132 (0.0159)	1.0269* (0.0163)	1.0274* (0.0168)	1.0230† (0.0164)	1.0211 (0.0186)
Share of Chinese debt service	1.0098 (0.0159)	1.0069 (0.0162)	1.0135 (0.0167)	1.0051 (0.0171)	1.0083 (0.0171)	1.0027 (0.0173)
Share of bonded debt service	0.9744* (0.0138)	0.9727** (0.0125)	0.9741* (0.0144)	0.9505** (0.0195)	0.9730** (0.0135)	0.9606** (0.0155)
Emergency IMF arrangement		2.8542*** (0.9473)				
Regular IMF arrangement		2.6898*** (0.9267)				
GDP per capita (log)			0.6789* (0.1401)			
Forecasted real GDP growth				1.1984** (0.0974)		
Forecasted fiscal balance					1.1952*** (0.0600)	
Government health expenditures						0.7043** (0.0961)
Number of countries	59	59	59	58	58	56
Number of DSSI requests	36	36	36	36	36	35
Log pseudo-likelihood	-120.2649	-117.5598	-118.5922	-116.2400	-114.4291	-112.1060
Akaike information criterion	252.5297	249.1197	251.1843	246.4801	242.8582	238.2119
Bayesian information criterion	264.9949	263.6624	265.7271	260.9032	257.2813	252.3894

Notes: The table reports the hazard ratios for the variables of Cox proportional hazard models. For variable definitions, see main text. The sample excludes DSSI-eligible countries with no information on debt service or on the timing of their DSSI requests as well as Bhutan and Haiti, as outliers. Column (4) also excludes Guyana as an outlier. Column (5) excludes Somalia, and column (6) excludes Somalia, Kosovo and Yemen, for data availability reasons. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, † $p < 0.2$.

4 Making debt relief initiatives more attractive to debtors

Next to helping us better understand past DSSI and Common Framework (non-)participation, the real option framing can also be used to structure discussions on the design of (future) DSSI- or Common Framework(-like) debt treatments. Indeed, our real option lens suggest different policy levers, linked to the different real option value drivers (cf. Table 1) that international creditor fora (such as the G20 and Paris Club) or international financial institutions (such as the IMF and World Bank) could pull to make debt relief initiatives more attractive for debtors to join—and to join earlier rather than later. Figure 4 gives a general overview, distinguishing between, on the one hand, the levers linked to V and I that affect the NPV of debtor participation in a debt treatment (as well as option value C) and, on the other hand, the non-NPV levers linked to σ , q and t that only impact option value C (but not the NPV). In the remainder of this section we will discuss both types of levers and map potential policy interventions to them.³² Again, our main focus is not to make the case for one or the other specific reform, but rather to point to some potential reform areas highlighted by our real option framing.

4.1 Policy interventions using NPV levers

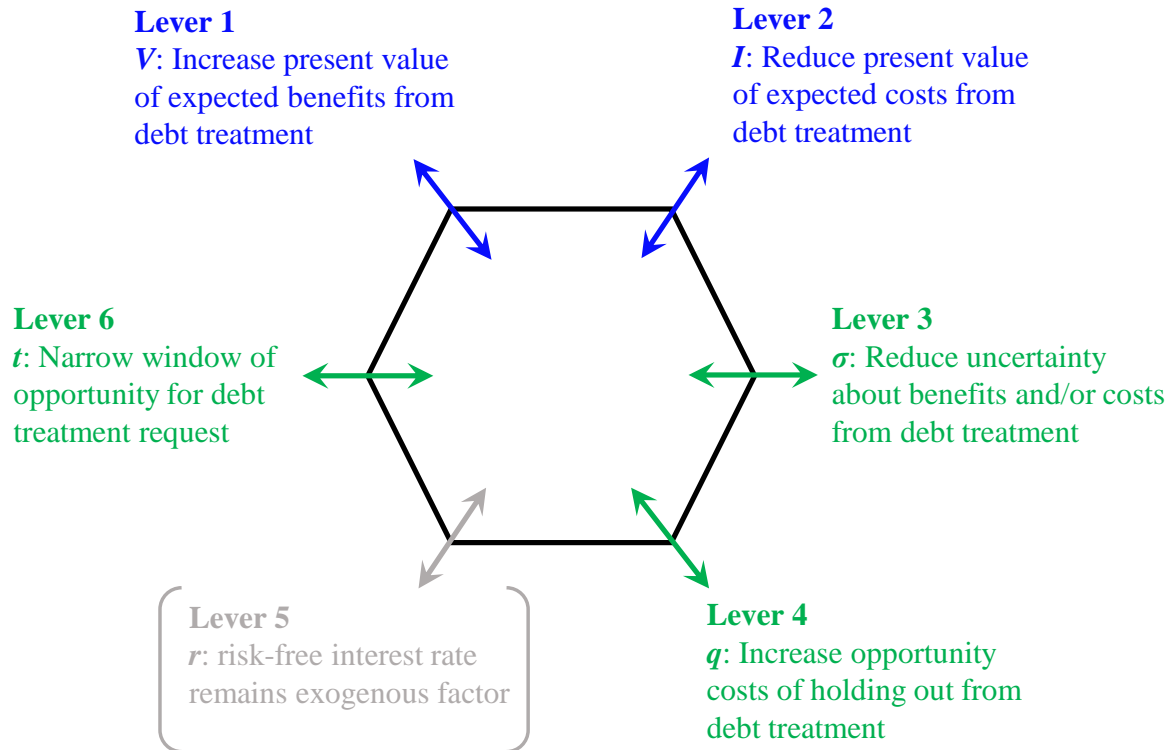
The most obvious way of incentivising debtor governments to participate in any debt treatment is to increase the expected benefits and/or to reduce the expected costs of the treatment.

Expected benefits

The benefits of requesting debt relief could be enhanced by granting a DSSI-like debt service standstill to applicants for the duration of debt treatment negotiations, as has been suggested by the heads of the IMF and World Bank for the Common Framework

³²We do not discuss the risk-free interest rate r , as it can be considered exogenous in our context.

Figure 4: Real option-based policy levers to encourage (earlier) debt treatment requests



Source: Own elaboration, drawing on real option approaches in other contexts, e.g. [Leslie and Michaels \(1997\)](#) and [Cassimon et al. \(2016\)](#).

([Georgieva and Pazarbasioglu, 2021](#); [Malpass, 2022](#)). Besides providing early relief, such a standstill would be costly for creditors and could therefore speed up the negotiations towards an actual debt restructuring, bringing any benefits forward in time. The exact modalities of the standstill matter, however. Official creditors may not be willing to agree to selective standstills that only apply to them and let private creditors off the hook, as was ultimately the case under the DSSI. Conversely, more comprehensive standstills involving private creditors are harder to enforce and their larger benefits for debtors could be (partly) nullified by increases in perceived reputational costs, with the net effect on NPV possibly insufficient to convince more eligible debtors to come forward. A potential middle way solution would be to suspend only official debt service and deduct any interim payments that are made to private creditors from the debtor's new obligations to

those creditors after the terms of the final debt treatment have been agreed upon.

Expected benefits can also be boosted by designing deep-enough debt treatments that leave sufficient headroom for investment in future growth and by helping debtor governments craft appropriate (realistic) growth strategies through the accompanying IMF programmes. [Baqir et al. \(2023\)](#) argue that this requires a shift in primary programme focus from meeting macroeconomic targets to achieving growth-enhancing structural reforms.

Until very recently, Chinese officials have repeatedly called for the participation of the MDBs—in particular the World Bank—in debt restructurings (under the Common Framework and beyond), accepting haircuts alongside bilateral and private creditors where needed. However, this would undermine MDBs’ de facto preferred creditor status, which guarantees their favourable credit ratings and access to low-cost market financing, and could ultimately threaten their lending capacity going forward ([World Bank, 2020](#); [De Marchi, 2022](#)).³³ It also ignores the fact that the claims of MDBs on low-income countries already carry highly concessional terms, with low interest rates and long maturities ([Setser, 2023](#)).

Expected costs

Expected costs related to the potential loss of market access could be mitigated by making available sufficient official lending in the wake of a debt treatment. New financial inflows could be promoted by putting in place a clear cut-off date after which such new financing would be protected from restructuring. Moreover, the stigma (or general resistance)

³³See also <https://www.fitchratings.com/research/sovereigns/chinas-stance-on-multilateral-debt-relief-could-weaken-mdbs-preferred-creditor-status-04-04-2023>. The main MDBs as well as the IMF did participate in debt relief under the HIPC Initiative and MDRI, but were largely compensated for the costs by their shareholders, i.e. bilateral creditors and donors ([Essers and Cassimon, 2022](#); [Chuku et al., 2023](#)). As a dominant bilateral creditor, China would benefit substantially from any dilution of the share of debt relief costs directly borne by bilateral creditors in case the MDBs would participate, while the country’s underweighted share (relative to its GDP) in the capital of these institutions would limit the extra indirect costs linked to compensation ([De Marchi, 2022](#)).

associated with seeking IMF assistance could perhaps be lowered by careful design of the programme conditionalities. Conditionality needs to be ambitious but, if it is to work properly as a commitment device, also debtor government-owned and socially acceptable (Baqir et al., 2023). Administrative costs of a debt treatment, due to additional reporting and reconciliation requirements and payment document revisions, could be lessened through technical assistance and capacity building.

4.2 Policy interventions using non-NPV levers

Uncertainty

A key non-NPV lever to incentivise eligible debtors to come forward earlier is the reduction of uncertainty, regarding both the expected benefits and costs of debt treatments.

For starters, a further clarification of the debt treatment procedures and the indication of the timeline for the various process steps involved are needed to anchor debtor countries' expectations (Georgieva and Pazarbasioglu, 2021; Malpass, 2022). In July 2022 the Paris Club Secretariat published a compendium of guidelines for debtor countries considering a request for debt treatment with the Paris Club.³⁴ Among other things, this compendium describes in detail i) the preconditions for entering into informal and formal discussions with the Paris Club, ii) the various parties that are expected to participate in Paris Club meetings, iii) the information-sharing requirements, and iv) the indicative timelines for the provision of financing assurances to the IMF by Paris Club creditors, for signing bilateral agreements between the debtor and individual Paris Club creditors, and for the conclusion of negotiations with non-Paris Club official and private creditors. So far, the G20 has not been able to agree upon a similar set of guidelines for the Common Framework.

³⁴Unfortunately, the document is buried somewhere on the Paris Club website. See <https://clubdeparis.org/en/file/4016/download?token=ij07bxc5>.

Tighter (but not overly strict) deadlines for key steps, such as the formation of an official creditor committee, financing assurances, and the completion of a memorandum of understanding for the actual debt treatment, could perhaps instill a sense of urgency on creditors and contribute to greater predictability for debtors. Greater transparency on (and, where needed, adjustments to) creditors' domestic processes and approval procedures would be helpful too.³⁵

An acceleration of debt restructuring negotiations would also require improved debt transparency ([World Bank, 2021](#)), from both debtors (supported by technical assistance if necessary) and creditors, as well as early engagement by the IMF and World Bank on macroeconomic projections and DSAs. It should be clear from the outset which information can be shared, at which stage, and with whom.

Another element that would benefit from clarification is the perimeter of the debt eligible for treatment. This includes how non-government debt carrying government guarantees would be handled, as well as arrears, syndicated loans, collateralisation and the like—issues that created uncertainties for debtors (and creditors) during the DSSI, especially in its early months ([IMF and World Bank, 2020](#)). Questions about how debtors are expected to treat debt owed to domestic creditors have also emerged. Domestic debt falls outside the direct scope of the Common Framework, but the way it is dealt with has obvious consequences for the efforts required from external creditors for the debtor country to attain overall public debt sustainability.

In order to shed more light on the potential costs of debtors' participation in debt relief initiatives, in terms of consequences for credit ratings and market access, a continued dialogue with rating agencies and private creditor organisations will be key. The IMF

³⁵For example, as China is not a member of the Paris Club or OECD and aided by confidentiality clauses, many of the past Chinese deals restructuring overseas claims have remained 'hidden' from official statistics ([Horn et al., 2022](#)). Moreover, China's management and governance of debt restructuring is fragmented between various institutions (with different agencies representing China in G20 working groups, at the IMF, and in actual Common Framework negotiations, respectively), and lacks established rules and mechanisms for oversight, coordination and inter-agency compensation ([Chen and Mustapha, 2021](#); [Brautigam and Huang, 2023](#)).

seems well placed to act as an intermediary or even to facilitate a direct debtor-creditor (or debtor-rating agency) dialogue (Committeri et al., 2021).

The assessment and enforcement of ‘comparability of treatment’ is one of the most contentious aspects of debt restructuring, and another key source of uncertainty, not only for creditors but also for debtor governments, as they bear the final responsibility for it (Georgieva and Pazarbasioglu, 2021; Malpass, 2022). Comparability of treatment should ultimately serve the purpose of fair burden sharing among external creditors and prevent free-riding behaviour by certain creditors or creditor classes. However, its exact definition remains opaque (Reichert-Facilides, 2023).

Traditionally, the Paris Club has taken a (self-declared) ‘broad-based approach’ in its assessment of whether a debtor country undergoing debt treatment has met the comparability of treatment requirement: treatments across creditors are compared based on changes in nominal debt service, the debt reduction in NPV terms, and the extension of the duration of claims.³⁶ Higher creditor efforts on one of those parameters may be seen as compensating for lower efforts on another parameter, and the Paris Club may grant exceptions on a case-by-case basis, when there are mitigating factors that argue against demanding comparable treatment from a particular creditor or on a particular debt instrument (including when these represent only a small proportion of the debt burden). Debtors are expected to regularly report to the Paris Club on the progress made in negotiating with their various creditors.

That notwithstanding, several details of the Paris Club methodology are left unspecified, including the appropriate discount rate to be used in NPV calculations. Moreover, the degree to which the Paris Club has actually enforced comparability of treatment in practice can be questioned. There appear to be no cases where Paris Club debt treatments were revoked due to a breach in comparability—even if quantitative evidence indicates

³⁶See <https://clubdeparis.org/en/communications/page/what-does-comparability-of-treatment-mean> and <https://clubdeparis.org/en/file/4016/download?token=ij07bxc5>.

that, on average, Paris Club creditors have faced significantly larger NPV reductions on their claims than private creditors (especially bondholders) in debt restructurings ([Schlegel et al., 2019](#)).³⁷

Arguably, increased creditor heterogeneity has made the assessment and enforcement of comparability of treatment even more important and, at the same time, more challenging ([Committeri et al., 2021](#)). The G20's Common Framework communique makes reference to the same three parameters for the assessment of comparability of treatment as the Paris Club (i.e. nominal debt service, NPV, and duration), but without giving any further details (like those found in the Paris Club Secretariat's guidelines). This has resulted in more opaqueness, including confusion about who will judge whether or not comparability of treatment is fulfilled.³⁸

Several proposals have been advanced to address comparability challenges. For example, in the context of the Common Framework, the World Bank has proposed to replace the Paris Club's multi-factor (and therefore discretionary) approach with a more standardised and transparent NPV formula using a single market-based discount rate, and to involve private creditors sooner in the negotiation process ([Rivetti, 2022](#); [Gill, 2022](#)).³⁹ Greater coordination of negotiations across different creditor classes is argued to speed up the overall debt restructuring and to lead to deeper restructurings than in the current two-stage set-up (i.e. if one believes that official creditors are wary of committing to deep debt relief in the first stage in the absence of similar assurances from—and limited leverage on—private creditors in the second stage).

Similarly, the sovereign advisory firm [Lazard \(2022\)](#) argues for a single assessment

³⁷As [Rivetti \(2022\)](#) points out, the Paris Club's Memoranda of Understanding (MoU) do not contain claw-back provisions. Rather than the possible annulment of the MoU, it is the risk of upholding the accompanying IMF arrangement that acts as the main deterrent for debtor countries to forsake their comparability of treatment duties.

³⁸[Lazard \(2022\)](#) believes it is the official creditor committee, formed on an ad hoc basis for each country case, which will set the rules and perform the assessment.

³⁹A simple NPV formula would still allow for a menu of debt restructuring options (including various combinations of reduced principal payments, lowered interests, and maturity extensions) from which official and private creditors with heterogeneous preferences could choose ([Essers and Cassimon, 2022](#)).

metric, depending on the nature of debt problems: an NPV measure using a fixed 5% discount rate when debt is unsustainable, and a proportional contribution to the financing envelope in case of a temporary liquidity constraint. The IMF would assess whether the application of comparability of treatment is satisfactory. [Reichert-Facilides \(2023\)](#) believes the NPV discount rate should preferably be confirmed by a majority vote across all affected creditors, together with the other practical restructuring terms.

With respect to the enforcement of comparability of treatment, [Talero \(2022\)](#) and [Gill and Buchheit \(2022\)](#) discuss a number of targeted legislative actions aimed at incentivising private creditor participation in the Common Framework—including a codification of ‘good faith’ negotiations, immunising sovereign assets from attachment, limiting recovery value for holdout (‘vulture fund’) creditors, and the retrofitting of collective action clauses into existing debt contracts.

In order to avoid the situation where Paris Club bilaterals, non-Paris Club bilaterals and private creditors all suspiciously await each other’s debt relief commitments and to help enforce comparability, [Buchheit and Gulati \(2023\)](#) and [Lazard \(2023\)](#) propose the introduction of cross-creditor group ‘most favoured creditor’ clauses in the debt restructuring documentation. Such a clause would commit the debtor country—if it restructures its debts held by either (the supermajority) of its private creditors, its Paris Club creditors, or any of its other bilateral creditors, and then later grants better terms to one or both of the other creditor groups—to offer those better terms to all.

Without making a judgement on each of the foregoing proposals’ respective merits, greater clarity on the methodology to assess comparability of treatment and on the way it will be enforced would *ceteris paribus* make the outcome of debt treatment negotiations more predictable for the debtor.

At the moment of writing, issues such as debt treatment steps and timelines, the debt perimeter, and comparability of treatment were all being discussed in the Global Sovereign Debt Roundtable (GSDR), a new forum co-chaired by the IMF, World Bank and

the G20 Presidency which brings together a select group of official bilateral creditors, private creditor representatives and debtor countries.⁴⁰ The GSDR was launched in February 2023 with the aim of building greater common understanding among key stakeholders involved in debt restructurings, both within and outside the Common Framework, and finding solutions to current shortcomings (transcending specific debt treatment cases). While the GSDR may be able to resolve some of the technical problems raised, demonstration effects matter too—and arguably more so than “abstract discussions”(Setser, 2023). A more efficient handling of and actual progress on the ongoing debt treatment cases would be conducive to reducing uncertainty for other debtor candidates and boost their confidence in applying.

Opportunity costs and time window

Policy interventions that increase the benefits to the debtor of an early request for debt treatment, such as the introduction of a non-retroactive debt service standstill triggered by the request, would also increase the opportunity costs of holding out from a debt treatment.

The lever of narrowing the real option time window may be less relevant for the Common Framework’s case-by-case approach. There is no sunset clauses in place for the Common Framework, and there seems to be no good reason for introducing one, especially not in the absence of a potential successor framework. However, one could argue that the window-of-opportunity lever was used when the DSSI was extended a second time in April 2021. At that time, the G20 communicated very clearly that this would be the final extension and the DSSI would expire at the end of 2021. This move aimed at incentivising countries to move toward more permanent solutions for their debt situations, including Common Framework debt treatments, while still providing some flexibility and liquidity

⁴⁰See <https://www.imf.org/en/News/Articles/2023/04/12/pr23117-global-sovereign-debt-roundtable-cochairs-press-stmt>.

to countries coping with the COVID crisis ([IMF and World Bank, 2021](#)).

5 Conclusion

This paper argues that debtor countries' decisions of whether and when to participate in sovereign debt relief initiatives such as the DSSI or Common Framework can be understood through the lens of real options: eligible countries compare the net benefits of participating in a debt treatment now with the value of waiting in order to potentially execute their participation option at a later point in time, when they may have a more informed view on the likely benefits and costs.

Press statements by debtor government officials indeed corroborate the importance played by key real option value drivers in their deliberations on debt treatments under the DSSI and Common Framework—especially expected benefits, expected costs and the uncertainty about the benefits and costs of participation.

A survival analysis of eligible countries' (non-)participation in the DSSI further validates our real option framing. We find that debtor countries that stood to benefit more from DSSI participation, due to higher expected debt service savings or larger exposures to willing bilateral creditors (and to a lesser extent Chinese creditors), or countries that faced less of a hurdle in having to request an IMF arrangement first, were quicker to request DSSI support. Conversely, debtors that had more to lose in terms of market reputation, proxied by larger exposures to bondholders or better pre-DSSI credit ratings, were less likely to make a (early) DSSI request.

Finally, we show the usefulness of the real option framework in organising discussions on how to make (future) DSSI- or Common Framework-(like) debt treatments more attractive to eligible debtors. There are NPV-related policy levers that work through increasing the expected benefits and/or reduce the expected costs of debtor participation in a debt treatment, such as a temporary debt service standstill during debt restructuring ne-

gotiations, an increased focus on post-treatment growth, the protection of new financing, and capacity building support. In addition, the real option logic points to non-NPV policy levers that affect the option value of waiting—most notably the reduction of uncertainty for the debtor. This encompasses the clarification of numerous technical issues, including debt treatment procedures, timelines, perimeters, the methodology for assessing and enforcing comparability of treatment, and the likely credit rating reactions. Above all, actual progress on the ongoing cases would boost the confidence of debtor countries in seeking debt treatments under the Common Framework and beyond.

References

- Agnello, L., Castro, V., and Sousa, R. M. (2018). The legacy and the tyranny of time: Exit and re-entry of sovereigns to international capital markets. *Journal of Money, Credit and Banking*, 50(8):1969–1994.
- Agnello, L., Castro, V., and Sousa, R. M. (2021). On the duration of sovereign ratings cycle phases. *Journal of Economic Behavior & Organization*, 182(February):512–526.
- Asonuma, T. (2016). Serial sovereign defaults and debt restructurings. *IMF Working Paper*, 16/65.
- Asonuma, T. and Joo, H. (2020). Sovereign debt restructurings: Delays in renegotiations and risk averse creditors. *Journal of the European Economic Association*, 18(5):2394–2440.
- Asonuma, T. and Trebesch, C. (2016). Sovereign debt restructurings: Preemptive or post-default. *Journal of the European Economic Association*, 14(1):175–214.
- Bai, Y. and Zhang, J. (2012). Duration of sovereign debt renegotiation. *Journal of International Economics*, 86(2):252–268.
- Baqir, R., Diwan, I., and Rodrik, D. (2023). A framework to evaluate economic adjustment-cum-debt restructuring packages. *Finance for Development Lab Working Paper*, 2.
- Benjamin, D. and Wright, M. L. J. (2013). Recovery before redemption: A theory of delays in sovereign debt renegotiations. *Mimeo*.
- Benjamin, D. and Wright, M. L. J. (2019). Deconstructing delays in sovereign debt restructuring. *Oxford Economic Papers*, 71(2):382–404.
- Bi, R. (2008). “Beneficial” delays in debt restructuring negotiations. *IMF Working Paper*, 08/038.
- Bi, R., Chamon, M., and Zettelmeyer, J. (2016). The problem that wasn’t: Coordination failures in sovereign debt restructurings. *IMF Economic Review*, 64(3):471–501.
- Bjerk Sund, P. and Sensland, G. (2002). Closed form valuation of American options. *Norwegian School of Economics and Business Administration Discussion Paper*, 2002.9.

- Black, F. and Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*, 81(3):637–654.
- Bolton, P., Buchheit, L. C., Gourinchas, P.-O., Gulati, M., Hsieh, C.-T., Panizza, U., and Weder di Mauro, B. (2020). Sovereign debt standstills: An update. *VoxEU.org*, 28 May.
- Brautigam, D. and Huang, Y. (2023). Integrating China into multilateral debt relief: Progress and problems in the G20 DSSI. *SAIS-CARI Briefing Paper*, 9.
- Buchheit, L. C. and Gulati, M. (2023). Enforcing comparable treatment in sovereign debt workouts. *Capital Markets Law Journal*, 18(1):71–77.
- Cassimon, D., Engelen, P.-J., and Van Liedekerke, L. (2016). When do firms invest in corporate social responsibility? A real option framework. *Journal of Business Ethics*, 137(1):15–29.
- Chen, H.-Y., Lee, C.-F., and Shih, W. (2010). Derivations and applications of Greek letters: Review and integration. In Lee, C.-F., Lee, A. C., and Lee, J., editors, *Handbook of Quantitative Finance and Risk Management*, chapter 30, pages 266–290. Boston, MA: Springer.
- Chen, Y. and Mustapha, S. (2021). China’s approach to sovereign lending and debt restructuring: A primer for African public debt managers. *Collaborative Africa Budget Reform Initiative Briefing*, October.
- Chuku, C., Samal, P., Saito, J., Hakura, D., Chamon, M., Cerisola, M., Chabert, G., and Zettelmeyer, J. (2023). Are we heading for another debt crisis in low-income countries? Debt vulnerabilities: Today vs the pre-HIPC era. *IMF Working Paper*, 23/79.
- Committeri, M., Alves, I., Arthur, J., De Marchi, R., Essers, D., Keeney, M., Kosterink, P., Lieber, A., Martinez-Resano, J. R., Osińska, J., Spadafora, F., Vasil, R., and Vonessen, B. (2021). The IMF’s role in sovereign debt restructurings. *ECB Occasional Paper*, 262.
- Cruz, C., Keefer, P., and Scartascini, C. (2021). Database of Political Institutions 2020. *Inter-American Development Bank Research Department*.
- Damodaran, A. (2005). The promise and peril of real options. *NYU Working Paper*, S-DRP-

05-02.

- De Marchi, R. (2022). Public debt in low-income countries: Current state, restructuring challenges and lessons from the past. *Banca d'Italia Occasional Paper*, 739.
- Dixit, A. K. and Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton, NJ: Princeton University Press.
- Essers, D. and Cassimon, D. (2022). Towards HIPC 2.0? Lessons from past debt relief initiatives for addressing current debt problems. *Journal of Globalization and Development*, 13(2):187–231.
- Farah-Yacoub, J. P., Graf von Luckner, C., Ramalho, R., and Reinhart, C. M. (2022). The social costs of sovereign default. *World Bank Policy Research Working Paper*, 10157.
- Georgieva, K. and Pazarbasioglu, C. (2021). The G20 Common Framework for Debt Treatments must be stepped up. *IMF Blog*, 2 December.
- Ghosal, S. and Miller, M. (2015). Writing-down debt with heterogeneous creditors: Lock laws and late swaps. *Journal of Globalization and Development*, 6(2):239–255.
- Ghosal, S., Miller, M., and Thampanishvong, K. (2019). Waiting for a haircut? A bargaining perspective on sovereign debt restructuring. *Oxford Economic Papers*, 71(2):405–420.
- Gill, I. (2022). It's time to end the slow-motion tragedy in debt restructurings. *Brookings Future Development Blog*, 25 February.
- Gill, I. and Buchheit, L. C. (2022). Targeted legislative tweaks can help contain the harm of debt crises. *Brookings Future Development Blog*, 27 June.
- Graf von Luckner, C., Meyer, J., Reinhart, C. M., and Trebesch, C. (2021). External sovereign debt restructurings: Delay and replay. *VoxEU.org*, 30 March.
- Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., and Tatlow, H. (2021). A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nature Human Behaviour*, 5(April):529–538.
- Horn, S., Reinhart, C. M., and Trebesch, C. (2022). Hidden defaults. *AEA Papers and*

- Proceedings*, 112(May):531–535.
- Hull, J. C. (2012). *Options, futures, and other derivatives* (8th edition). Boston, MA: Prentice Hall.
- IMF (2023). Chad: First and second reviews under the Extended Credit Facility arrangement, requests for waivers of non-observance of performance criteria and modification of performance criteria. *IMF Country Report*, 23/7.
- IMF and World Bank (2020). Implementation and extension of the Debt Service Suspension Initiative. *Note prepared for the Development Committee Meeting*, 16 October.
- IMF and World Bank (2021). World Bank Group and International Monetary Fund support for debt relief under the Common Framework and beyond. *Note prepared for the Development Committee Meeting*, 9 April.
- Lang, V., Mihalyi, D., and Presbitero, A. F. (2023). Borrowing costs after sovereign debt relief. *American Economic Journal: Economic Policy*, 15(2):331–358.
- Lazard (2022). How to make sovereign debt restructurings more effective: Hold warring parties to a better standard of “comparability”. *Policy Brief*, May.
- Lazard (2023). Getting sovereign debt restructurings out of the rut in 2023: Three concrete proposals. *Policy Brief*, February.
- Leslie, K. J. and Michaels, M. P. (1997). The real power of real options. *McKinsey Quarterly*, 1997(3):97–108.
- Malpass, D. R. (2022). Remarks by World Bank Group President at the 2022 Spring Meetings: “Making Debt Work for Development”. *Speeches & Transcripts*, 13 April.
- McDonald, R. and Siegel, D. (1986). The value of waiting to invest. *Quarterly Journal of Economics*, 101(4):707–728.
- Merton, R. C. (1973). Theory of rational option pricing. *Bell Journal of Economics and Management Science*, 4(1):141–183.
- Pitchford, R. and Wright, M. L. J. (2012). Holdouts in sovereign debt restructuring: A theory of negotiation in a weak contractual environment. *Review of Economic Studies*,

79(2):812–837.

- Reichert-Facilides, D. (2023). Enforcing comparability of treatment: Why, what, how, where? And which remedies? *Mimeo*, April.
- Reinhart, C. M. and Trebesch, C. (2016). Sovereign debt relief and its aftermath. *Journal of the European Economic Association*, 14(1):215–251.
- Rivetti, D. (2022). Achieving comparability of treatment under the G20’s Common Framework. *World Bank Equitable Growth, Finance & Institutions Notes*, February.
- Schlegl, M., Trebesch, C., and Wright, M. L. J. (2019). The seniority structure of sovereign debt. *CESifo Working Paper*, 7632.
- Schumacher, J., Trebesch, C., and Enderlein, H. (2021). Sovereign defaults in court. *Journal of International Economics*, 131:Article 103388.
- Setser, B. W. (2023). The Common Framework and its discontents. *Council on Foreign Relations Follow the Money Blog*, 28 March.
- Smith, G. (2021). *Where credit is due: How Africa’s debt can be a benefit, not a burden*. London: Hurst & Co.
- Talero, B. X. (2022). Potential statutory options to encourage private sector creditor participation in the Common Framework. *World Bank Equitable Growth, Finance & Institutions Notes*, June.
- Trebesch, C. (2019). Resolving sovereign debt crises: The role of political risk. *Oxford Economic Papers*, 71(2):421–444.
- Trigeorgis, L. (1996). *Real options: Managerial flexibility and strategy in resource allocation*. Cambridge, MA: MIT Press.
- World Bank (2020). *Protecting the poorest countries: Role of the multilateral development banks in times of crisis*. Washington, DC.
- World Bank (2021). *Debt transparency in developing economies*. Washington, DC.
- World Bank (2022). *International Debt Report*. Washington, DC.

Appendices

A Additional tables

Table A.1: Comparison of main characteristics of DSSI vs. Common Framework

	DSSI	Common Framework
Timeline	May 2020 to December 2021 (incl. two extensions)	Since November 2020
Country eligibility	73 IDA countries or LDCs with no multilateral arrears	73 IDA countries or LDCs with no multilateral arrears
Debt treatment	Temporary NPV-neutral debt service suspension	Case-by-case: negotiated reprofiling, NPV reduction and/or debt write-off
Debt perimeter	Official bilateral debt; Voluntary participation by private creditors; MDBs to explore new financing	Official bilateral debt; Comparable treatment of private creditor claims; MDBs to explore new financing
Requirements and commitments by debtor	Participation request by debtor; Active IMF arrangement or request for (emergency) financing; Detailed debt data disclosure; Resources targeted towards fight against COVID-19, subject to fiscal monitoring	Participation request by debtor; Negotiation of full-fledged IMF arrangement; Detailed debt data disclosure; Resources to be used in line with IMF programme conditionality
Number of participating debtors	48	4 (as of July 2023)

Source: Own elaboration.

Table A.2: Comparison of main option value drivers for DSSI vs. Common Framework

	DSSI	Common Framework
Expected benefits	Temporary debt service savings, easing of liquidity pressures	Potentially (much) broader benefits, incl. debt service savings, overcoming of debt overhang, regaining of debt sustainability
Expected costs	(Limited) damage to financial market reputation; Stigma from IMF financing request; Administrative costs from debt data reconciliation and changes in loan terms	(Longer-lasting) damage to financial market reputation; Stigma from request for IMF arrangement with programme conditionality; Costs related to in-depth negotiations with different creditor groups
Uncertainty about benefits and costs	(Initial) doubts about exact debt perimeter, standstill terms and market reactions	Higher uncertainty due to case-by-case design, open-ended nature of negotiations, and slow progress on first cases
Opportunity costs	Foregone suspension of debt service while holding out	Potentially (much) larger, incl. missed investments in case of debt overhang

Source: Own elaboration.

Table A.3: Debtor country sample for survival analysis

Participants in first phase of DSSI (36)		Non-participants (25)	
Angola	Mali	Bangladesh	Rwanda
Burkina Faso	Mauritania	Benin	Solomon Islands
Cameroon	Mozambique	Bhutan*	Somalia
Cape Verde	Myanmar	Cambodia	St. Vincent and Gren.
Central African Republic	Nepal	Ghana	Timor-Leste
Chad	Niger	Guinea-Bissau	Uzbekistan
Comoros	Pakistan	Guyana	Vanuatu
Congo, Dem. Rep.	Papua New Guinea	Haiti**	
Congo, Rep.	Samoa	Honduras	
Cote d'Ivoire	Sao Tome and Principe	Kenya	
Djibouti	Senegal	Kosovo	
Dominica	Sierra Leone	Kyrgyz Republic	
Ethiopia	St. Lucia	Lao, PDR	
Grenada	Tajikistan	Liberia	
Guinea	Tanzania	Moldova	
Lesotho	Togo	Mongolia	
Madagascar	Yemen	Nicaragua	
Maldives	Zambia	Nigeria	

Notes: The sample excludes DSSI-eligible countries with no information on debt service or on the timing of their DSSI requests. * Bhutan is excluded from the regressions as an outlier on the debt service savings variable. ** Haiti is excluded from most regressions as an outlier on the share of bilateral debt service variable.

B Option valuation model

Real option value can be approximated using techniques from financial option models. The most popular of such models is the Black-Scholes model, as originally developed by [Black and Scholes \(1973\)](#) and [Merton \(1973\)](#), which provides a closed-form expression for the theoretical option price. The model makes a number of key assumptions, including frictionless markets without transaction costs or arbitrage possibilities but with continuous trading; a constant risk-free rate; and an asset price which follows a geometric Brownian motion, consisting of a deterministic drift component and a stochastic component (where the strength of price fluctuations is governed by parameter σ) (see [Hull, 2012](#)). Alternative, more advanced (typically numerical) option valuation models may be better-suited than Black-Scholes in case (some of) these assumptions do not hold. However, our goal here is not to produce a specific estimate of the real option value of debt relief (which would require the precise measurement of all the different model parameters), but rather to present a conceptual framework that goes beyond conventional NPV analysis and provides some insights based on simple comparative statics.

Still, one should note that, strictly speaking, the Black-Scholes model is designed to price ‘European-style’ options that can only be exercised at a predetermined expiration date, rather than ‘American’ options that can be exercised anytime before expiration—which seems to correspond closer to our case of debt treatment requests. Because of the possibility of early exercise, American options are always at least as and generally more valuable than European options. A pragmatic approach is therefore to regard Black-Scholes as a floor estimate of the true (American) option value ([Damodaran, 2005](#)).⁴¹ Moreover, classic Black-Scholes does not allow for the payment of dividends from the underlying stock (or, in real option terms, the existence of opportunity costs). This can be solved with a simple modification to the original formulation.

⁴¹[Bjerk Sund and Sensland \(2002\)](#) derive a closed-form approximation for American call options, but it is mathematically much more complex and less intuitive than Black-Scholes.

According to the (dividend-augmented) Black-Scholes model, call option value C can be calculated as ⁴²:

$$C = V e^{-qt} N(d_1) - I e^{-rt} N(d_2), \quad \text{with}$$

$$d_1 = \frac{\ln(\frac{V}{I}) + (r - q + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$$

$$d_2 = \frac{\ln(\frac{V}{I}) + (r - q - \frac{\sigma^2}{2})t}{\sigma\sqrt{t}} = d_1 - \sigma\sqrt{t}$$

where, applied to our real option case, V stands for the present value of debt treatment benefits; I is the present value of the costs associated with the debt treatment; σ is the unpredictability of the debt treatment benefits, as measured by the standard deviation of the growth rate of those benefits; t is the time left until the option of requesting the debt treatment expires; r is the continuous risk-free rate; q are the opportunity costs of holding out from the debt treatment; and $N(\cdot)$ is the cumulative density function of the standard normal distribution. This is the formula that is used to draw the illustrative option value curves in Figures 1 and 2 in the main text.

The sensitivity of option prices to changes in the underlying defining parameters are given by the so-called ‘Greeks’, in particular the first-order derivatives with respect to V (*Delta*), σ (*Vega*), t (*Theta*), and r (*Rho*), as well as with respect to I (which we can call *Chi*) and q (say *Psi*). Under the Black-Scholes model these can be calculated as in Table B.4. ⁴³

⁴²For a derivation of the Black-Scholes formula, from a binomial tree model where the number of time steps goes to infinity, see Hull (2012, pp.276–279).

⁴³See Chen et al. (2010) for detailed derivations.

Table B.4: Option Greeks

Name	Symbol and definition	Formula and sign of impact on C
Delta	$\Delta = \frac{\partial C}{\partial V}$	$e^{-qt} N(d_1) > 0$
Chi	$\chi = \frac{\partial C}{\partial I}$	$-e^{-rt} N(d_2) < 0$
Vega	$\mathcal{V} = \frac{\partial C}{\partial \sigma}$	$V e^{-qt} \sqrt{t} N'(d_1) > 0$
Theta	$\Theta = -\frac{\partial C}{\partial t}$	$q V e^{-qt} N(d_1) - V e^{-qt} \frac{\sigma}{2\sqrt{t}} N'(d_1)$ $-r I e^{-rt} N(d_2) < 0$
Rho	$P = \frac{\partial C}{\partial r}$	$t I e^{-rt} N(d_2) > 0$
Psi	$\Psi = \frac{\partial C}{\partial q}$	$-t V e^{-qt} N(d_1) < 0$

Source: Own elaboration.

Note: $N'(d)$ is the derivative of $N(d)$ with respect to d , i.e. the standard normal probability density function.

NATIONAL BANK OF BELGIUM - WORKING PAPERS SERIES

The Working Papers are available on the website of the Bank: <http://www.nbb.be>.

396. "Daily news sentiment and monthly surveys: A mixed-frequency dynamic factor model for nowcasting consumer confidence", by A. Algaba, S. Borms, K. Boudt and B. Verbeken, *Research series*, February 2021.
397. "A bigger house at the cost of an empty fridge? The effect of households' indebtedness on their consumption: Micro-evidence using Belgian HFCS data", by Ph. Du Caju, G. Périlleux, F. Rycx and I. Tojerow, *Research series*, March 2021.
398. "Low interest rates and the distribution of household debt", by M. Emiris and F. Koulischer, *Research series*, March 2021.
399. "The interplay between green policy, electricity prices, financial constraints and jobs. Firm-level evidence", by G. Bijmens, J. Hutchinson, J. Konings and A. Saint Guilhem, *Research series*, April 2021.
400. Economic importance of the Belgian maritime and inland ports – Report 2019", by I. Rubbrecht, E. Dhyne and C. Duprez, *Research series*, May 2021.
401. "The return on human (STEM) capital in Belgium", by G. Bijmens and E. Dhyne, *Research series*, July 2021.
402. "Unraveling industry, firm and host-region effects on export behaviors of international new ventures and established exporters", by I. Paeleman, S. A. Zahra and J. W. B. Lang, *Research series*, July 2021.
403. "When trust is not enough: Bank resolution, SPE, Ring-fencing and group support" by M. Dewatripont, M. Montigny and G. Nguyen, *Research series*, August 2021.
404. "Bank specialization and zombie lending", by O. De Jonghe, K. Mulier and I. Samarin, *Research series*, November 2021.
405. "Robert Triffin, Japan and the quest for Asian Monetary Union", I. Maes and I. Pasotti, *Research series*, February 2022.
406. "The impact of changes in dwelling characteristics and housing preferences on house price indices", by P. Reusens, F. Vastmans and S. Damen, *Research series*, May 2022.
407. "Economic importance of the Belgian maritime and inland ports – Report 2020", by I. Rubbrecht, *Research series*, May 2022.
408. "New facts on consumer price rigidity in the euro area", by E. Gautier, C. Conflitti, R. P. Faber, B. Fabo, L. Fadejeva, V. Jouvanceau, J. O. Menz, T. Messner, P. Petroulas, P. Roldan-Blanco, F. Rumler, S. Santoro, E. Wieland and H. Zimmer, *Research series*, June 2022.
409. "Optimal deficit-spending in a liquidity trap with long-term government debt", by Charles de Beaufort, *Research series*, July 2022.
410. "Losing prospective entitlement to unemployment benefits. Impact on educational attainment", by B. Cockx, K. Declercq and M. Dejemeppe, *Research series*, July 2022.
411. "Integration policies and their effects on labour market outcomes and immigrant inflows", by C. Piton and I. Ruyssen, *Research series*, September 2022.
412. "Foreign demand shocks to production networks: Firm responses and worker impacts", by E. Dhyne, A. K. Kikkawa, T. Komatsu, M. Mogstad and F. Tintelnot, *Research series*, September 2022.
413. "Economic research at central banks: Are central banks interested in the history of economic thought?", by I. Maes, *Research series*, September 2022.
414. "Softening the blow: Job retention schemes in the pandemic", by J. Mohimont, M. de Sola Perea and M.-D. Zachary, *Research series*, September 2022.
415. "The consumption response to labour income changes, by K. Boudt, K. Schoors, M. van den Heuvel and J. Weytjens, *Research series*, October 2022.
416. "Heterogeneous household responses to energy price shocks, by G. Peersman and J. Wauters, *Research series*, October 2022.
417. "Income inequality in general equilibrium", by B. Bernon, J. Konings and G. Magerman, *Research series*, October 2022.
418. "The long and short of financing government spending", by J. Mankart, R. Priftis and R. Oikonomou, *Research series*, October 2022.
419. "Labour supply of households facing a risk of job loss", by W. Gelade, M. Nautet and C. Piton, *Research series*, October 2022.
420. "Over-indebtedness and poverty: Patterns across household types and policy effects", by S. Kuypers and G. Verbist, *Research series*, October 2022.
421. "Evaluating heterogeneous effects of housing-sector-specific macroprudential policy tools on Belgian house price growth", by L. Coulier and S. De Schryder, *Research series*, October 2022.
422. "Bank competition and bargaining over refinancing", by M. Emiris, F. Koulischer and Ch. Spaenjers, *Research series*, October 2022.

423. "Housing inequality and how fiscal policy shapes it: Evidence from Belgian real estate", by G. Domènech-Arúmi, P. E. Gobbi and G. Magerman, *Research series*, October 2022.
424. "Income inequality and the German export surplus", by A. Rannenberg and Th. Theobald, *Research series*, October 2022.
425. "Does offshoring shape labor market imperfections? A comparative analysis of Belgian and Dutch firms", by S. Dobbelaere, C. Fuss and M. Vancauteren, *Research series*, November 2022.
426. "Sourcing of services and total factor productivity", E. Dhyne and C. Duprez, *Research series*, December 2022.
427. "Employment effect of citizenship acquisition: Evidence from the Belgian labour market", S. Bignandi and C. Piton, *Research series*, December 2022.
428. "Identifying Latent Heterogeneity in Productivity", R. Dewitte, C. Fuss and A. Theodorakopoulos, *Research series*, December 2022.
429. "Export Entry and Network Interactions - Evidence from the Belgian Production Network", E. Dhyne, Ph. Ludwig and H. Vandenbussche, *Research series*, January 2023.
430. "Measuring the share of imports in final consumption", E. Dhyne, A.K. Kikkawa, M. Mogstad and F. Tintelnot, *Research series*, January 2023.
431. "From the 1931 sterling devaluation to the breakdown of Bretton Woods: Robert Triffin's analysis of international monetary crises", I. Maes and I. Pasotti, *Research series*, January 2023.
432. "Poor and wealthy hand-to-mouth households in Belgium", L. Cherchye, T. Demuynck, B. De Rock, M. Kovaleva, G. Minne, M. De Sola Perea and F. Vermeulen, *Research series*, February 2023.
433. "Empirical DSGE model evaluation with interest rate expectations measures and preferences over safe assets", G. de Walque, Th. Lejeune and A. Rannenberg, *Research series*, February 2023.
434. "Endogenous Production Networks with Fixed Costs", E. Dhyne, A. K. Kikkawa, X. Kong, M. Mogstad and F. Tintelnot, *Research series*, March 2023.
435. "BEMGIE: Belgian Economy in a Macro General and International Equilibrium model", G. de Walque, Th. Lejeune, A. Rannenberg and R. Wouters, *Research series*, March 2023.
436. "Alexandre Lamfalussy and the origins of instability in capitalist economies", I. Maes, *Research series*, March 2023.
437. "FDI and superstar spillovers: Evidence from firm-to-firm transactions", M. Amiti, C. Duprez, J. Konings and J. Van Reenen, *Research series*, June 2023.
438. "Does pricing carbon mitigate climate change? Firm-level evidence from the European Union emissions trading scheme", J. Colmer, R. Martin, M. Muûls and U.J. Wagner, *Research series*, June 2023.
439. "Managerial and financial barriers to the green transition", R. De Haas, R. Martin, M. Muûls and H. Schweiger, *Research series*, June 2023.
440. "Review essay: The young Hayek", I. Maes, *Document series*, September 2023.
441. "Review essay: Central banking in Italy", I. Maes, *Document series*, September 2023.
442. "Debtor (non-)participation in sovereign debt relief: A real option approach", D. Cassimon, D. Essers and A. Presbitero, *Research series*, September 2023.

National Bank of Belgium
Limited liability company
Brussels RLP – Company's number: 0203.201.340
Registered office: 14 Boulevard de Berlaimont – BE-1000 Brussels
www.nbb.be

Editor
Pierre Wunsch
Governor of the National Bank of Belgium

© Illustrations: National Bank of Belgium

Layout: Analysis and Research Group
Cover: NBB CM – Prepress & Image

Published in September 2023