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Sovereign GDP-Linked Bonds: Rationale and Design

Edited by James Benford, Jonathan D. Ostry, and Robert Shiller

Foreword by Andy Haldane and Maurice Obstfeld

A VoxEU.org Book

CEPR Press

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Preface

CEPR is grateful to James Benford, Jonathan D. Ostry, and Robert Shiller for their joint editorship of this eBook. Our thanks also go to Sophie Roughton for her excellent handling of its production.

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CEPR, which takes no institutional positions on economic policy matters, is delighted to provide a platform for an exchange of views on this important topic.

Tessa Ogden
Chief Executive Officer, CEPR
March 2018

Foreword

Andy Haldane and Maurice Obstfeld
Bank of England; IMF, NBER and CEPR

While the idea of governments issuing debt instruments whose repayments are indexed to gross domestic product (GDP) is not new, the current global backdrop of high government debt suggests the case for them doing so might be especially strong now. Advanced-economy debt exceeds annual output and is at its highest since WWII; emerging-market debt is rising rapidly and is approaching levels not seen since the Latin American debt crises of the 1980s. Despite the recent improvement in global growth, concerns linger of a secular stagnation in medium-term prospects and of limited policy space to deal with the next economic downturn, when it comes.

On paper, GDP-linked bonds could create policy space. They would provide the issuing government with debt relief when growth weakens and tax receipts decline. Investors, meanwhile, gain a route out of being locked into low interest rates through exposure to the real economy. Both sides would stand to benefit if the debt-stabilising effects of issuance mean default risks become more remote.

GDP-linked bonds could also allow risk to be shared across borders more efficiently and safely. Ultimately this could reduce the need for international bail-outs of sovereigns and so reduce moral hazard.

The theoretical case for GDP-linked bonds would appear then to be strong. The question is why is it that no large government has so far issued one?

Practical questions over which countries would gain most from issuance, how much they should issue, would there be a premium to pay, and what would the contractual commercial and legal terms look like, have held back GDP-linked bonds from being considered seriously as a viable addition to the public debt manager's toolkit. There may be an element of first-mover disadvantage.

However, recent work, galvanised by the Chinese and German G20 presidencies, has made some headway into these questions. The IMF has published an analytical tool that allows countries to assess the merits of GDP-linked bonds for themselves. The private sector, meanwhile, has worked with the Bank of England to shape a model term sheet that could help to guide future issuance.

This book collects together the result of this recent work to push the debate forward.

Important questions are of course still outstanding. The insurance premium that investors might demand to cover the risk of weak growth prospects remains uncertain. However, the costs of being found to be underinsured are all too clear – debt restructurings are highly protracted and costly affairs. A simple, standardised instrument, in the form of a GDP-linked bond, could help both as prevention and, if used in an exchange, as a cure.

With a better understanding now, both of the pros and the cons of issuance, and, for the first time, a term sheet to deal with the practicalities, the groundwork has been laid for what could be one of the biggest innovations in sovereign debt in half a century.

About the authors

Andy Haldane became Executive Director of Financial Stability on 1 January 2009. The Financial Stability area plays a key role in meeting the Bank's responsibilities for maintaining the stability of the financial system as a whole. In this role, Andy has responsibility for developing Bank policy on financial stability issues and the management of the Financial Stability Area. Andy is a member of the Financial Stability Executive Board, which gives high level guidance on priority-setting, and of the Bank's Executive Management Team.

Before taking up his current role, Andy set up and headed the Systemic Risk Assessment Division within the Financial Stability area of the Bank from 2005. His previous roles include: Head of the Market Infrastructure Division; Head of the International Finance Division; and a secondment to the International Monetary Fund. Prior to that he worked in Monetary Analysis, on various issues regarding monetary policy strategy, inflation targeting and Central Bank independence.

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Maurice Obstfeld is the Economic Counsellor and Director of Research at the International Monetary Fund, on leave from the University of California, Berkeley. At Berkeley, he is the Class of 1958 Professor of Economics and formerly Chair of the Department of Economics (1998-2001). He arrived at Berkeley in 1991 as a Professor, following permanent appointments at Columbia (1979-1986) and the University of Pennsylvania (1986-1989), and a visiting appointment at Harvard (1989-90). He received his Ph.D. in economics from MIT in 1979 after attending the University of Pennsylvania (B.A., 1973) and King's College, Cambridge University (M.A., 1975). From July 2014 to August 2015, Dr. Obstfeld served as a Member of President Obama's Council of Economic Advisers. He was previously (2002-2014) an Honorary Adviser to the Bank of Japan's Institute of Monetary and Economic Studies. He is a Fellow of the Econometric Society and the American Academy of Arts and Sciences.

Among Dr. Obstfeld's honours are Tilburg University's Tjalling Koopmans Asset Award, the John von Neumann Award of the Rajk Laszlo College of Advanced Studies (Budapest), and the Kiel Institute's Bernhard Harms Prize. He has given a number distinguished lectures, including the American Economic Association's annual Richard T. Ely Lecture, the L. K. Jha Memorial Lecture of the Reserve Bank of India, and the Frank Graham Memorial Lecture at Princeton. Dr. Obstfeld has served both on the Executive Committee and as Vice President of the American Economic Association. He has consulted and taught at the IMF and numerous central banks around the world. He is also the co-author of two leading textbooks on international economics, *International Economics* (10th edition, 2014, with Paul Krugman and Marc Melitz) and *Foundations of International Macroeconomics* (1996, with Kenneth Rogoff), as well as more than 100 research articles on exchange rates, international financial crises, global capital markets, and monetary policy.

Introduction

Robert J. Shiller
Yale University

The history of financial innovation over the centuries has shown that inventiveness and experimentation of one sort or another has yielded striking benefits to human society, but the progress towards these has been remarkably slow and gradual. The invention of interest in Mesopotamia and Babylonia began with a process of experimentation over four thousand years ago. The invention of the *publicani*, precursors to modern corporations, and of dividing ownership into *partes*, like the shares of today, occurred in ancient Rome. But the modern stock market did not take shape until after the Renaissance. The concept of limited liability for shares, which makes effective portfolio diversification possible, did not achieve clarity until the nineteenth century. Tradable sovereign debt did not appear until the *ligatio pecuniae* was designed in Venice in the thirteenth century.[1]

All of these past inventions have involved the specification of seemingly small but vitally important details that have to do with managing risks, with managing imperfect and asymmetric knowledge, with the hazards of strategic manipulation, with providing useful price discovery, with achieving liquidity, with managing various forms of moral hazard, with survival after changes in governments, wars and crises.

It has been a long story of the innovation, that underlies our modern civilisation, our prosperity, our freedom to achieve, and ability to lead fulfilling lives.

But the story is not over yet. Not even half over. For there are major problems still today in financial markets, as revealed most recently by the global financial crisis of 2008-9. The crisis was indeed a tragedy, especially in the hard-hit places, like Greece, as described in the chapter by Mark Walker in this volume.

1 The histories of all of these innovations, and more, are collected in Goetzmann and Rouwenhorst (2005).

Moreover, there are innovations outside of finance that have created new opportunities to reduce the severity of such tragedies. Notably, there has been the invention, within the last century, of the concept of gross national product (GNP) or of gross domestic product (GDP). No country had a solid measure of the market value of the overall output of the economy until these concepts were defined, during the Great Depression that began with a stock market crash in 1929. The basics of GNP and GDP accounting were established in a series of works by a group of inventors, including Simon Kuznets and Richard Stone, both of whom won the Nobel Prize in Economics for this work years later, in 1971 and 1984 respectively.[2] Their work is deserving of praise, for the presence of GDP data has changed our ways of thinking about the economy. In the future, GDP may have a more profound role as it is used for the settlement of fundamentally important contracts.

There is also an epochal improvement in information technology, in communications. These innovations have the hope of making GDP calculations more rapid, less subject to revision, and more verifiable by third parties.

This volume concerns itself with the improvement of sovereign debt, though many of the principles should be ultimately considered for corporate and personal debt as well. The forms of sovereign debt that have developed over millennia are still not perfect, still leave room for substantial improvement, improvement that can result in tangible benefits to our lives.

The key idea is that if we acknowledge that, historically, uncertainty about GDP is as important as it has been, then there should be risk management of that uncertainty.

The absence of GDP-linked debt around the world is a sort of a puzzle. Why should governments tie their debt to *fiat* money as has been the convention? Chapters in this volume address this puzzle. But the slowness to adopt GDP-linked debt should not be considered anomalous from the standpoint of world history, which has shown great conservatism in financial institutions. Nor should it be considered discouraging.

2 The histories of all of these innovations, and more, are collected in Goetzmann and Rouwenhorst (2005).

This tendency towards conservatism and slowness to adopt new financial forms reminds one of how governments once tied the currency to precious metals, even though the time-varying scarcity of those metals and lack of responsiveness to economic conditions created severe economic problems, problems that modern central banks now alleviate. The gold standard, or the bimetallic standard, seemed so set in history as to be impossible to change. And yet change did ultimately occur, and the change was ubiquitous. *Fiat* money requires some trust in government. So do GDP-linked bonds, but not more so.

There is an art to investment banking, and oftentimes complexity is necessary to appeal to the varied interest of the issuers as well as the ultimate holders of financial instruments. Complex details need to be worked out in communication with many people, a communication that the publication of this volume has hopes to launch.

The exact specification of the contract needs to be devised in accordance with the judgments of people who know the market for such contracts, weighing the advantages of complex formulations against simpler but perhaps less appealing ones. The GDP-linked debt has to be issued into a world with existing outstanding nominal and inflation-indexed debt, with laws regulating the debt, such as national debt limits, and with public expectations and rules of thumb regarding the concept of debt, and even public hopes that the debt live up to religious principles, such as the Islamic Shari'ah compliant sukuk. Public discussion of the debt will require a theory of its pricing, that peers through any complexity, such as the capital asset pricing model applied to GDP-linked debt in this volume. The design of the contracts has also to consider the circumstances of the issuance of the GDP-linked bonds, such as the state of default on existing debt, that are likely to be the instigator of first issuance of such debt.

A number of possible formulations of GDP-linked debt are suggested in the chapters of this volume, some of them rather more complex than others. For an example of a complex formulation, consider the Argentine GDP warrant issued in 2002, which is described in in Yannis Manuelides and Peter Crossan's chapter. Complexity of this level is surely a barrier to widespread acceptance of such contracts, and makes them less natural as a model for future contracts.

The kind of index-linked bond described in the London Term Sheet in this volume is close to a conventional bond, in that it has a fixed maturity date and a balloon payment at the end. The complexities described in the Term-Sheet are all about inevitable details and questions, such as how the coupon payments should be calculated for a GDP-linked bond that is issued on a specific date within the quarter, when the GDP data are issued only quarterly. The term sheet is focused on a conceptually simple concept for a GDP-linked bond, as it should be. It includes, as a special case, the even simpler concept – advocated recently by me and my Canadian colleague Mark Kamstra – of a perpetual GDP-linked bond, if one sets the time to maturity to infinity.[3] Perpetual GDP-linked bonds are an analogue of shares in corporations, but with GDP replacing corporate earnings as a source of dividends. However, it seems there are obstacles to perpetual bonds and these obstacles might slow the acceptance of GDP-linkage. The term-sheet here gets the job done with finite maturity, shows how a GDP-linkage can be done in a direct and simple way, and should readily be seen as appealing.

The London Term Sheet highlighted in this volume describes a bond which is simple and attractive, and the chapters in this volume that spell out other considerations and details of implementation, have the potential to reduce the human impact of risks of economic crisis, both real crises caused by changes in technology and environment, and events better described as financial crises.

The time has come for sovereign GDP-linked bonds. With this volume they are ready to go.

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Robert J. Shiller is Sterling Professor of Economics, Yale University, and Professor of Finance and Fellow at the International Center for Finance, Yale School of Management. He received his B.A. from the University of Michigan in 1967 and his Ph.D. in economics from the Massachusetts Institute of Technology in 1972. He has written on financial markets, financial innovation, behavioural economics, macroeconomics, real estate, statistical methods, and on public attitudes, opinions, and moral judgments regarding markets.

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He has been research associate, National Bureau of Economic Research since 1980, and has been co-organizer of NBER workshops: on behavioural finance with Richard Thaler 1991-2015, and on macroeconomics and individual decision making (behavioral macroeconomics) with George Akerlof 1994-2007.

In 2013 he was awarded the Nobel Prize in Economic Sciences, jointly with Eugene Fama and Lars Peter Hansen.

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Part I: Rationale

1 Overcoming the obstacles to adoption of GDP-linked debt

Eduardo Borensztein, Maurice Obstfeld, and Jonathan D. Ostry
Borensztein Consulting; IMF, NBER and CEPR; IMF

Elevated sovereign debt levels have become a cause for concern for countries across the world. From 2007 to 2016, gross debt levels shot up in advanced economies – from 24 to 89% of GDP in Ireland, from 35 to 99% of GDP in Spain, and from 68 to 128% of GDP in Portugal, for example. The increase was generally more moderate in emerging economies, from 36 to 47% of GDP on average, but the upward trend continues. The main driver of this increase was the global financial crisis, which affected debt/GDP ratios through a combination of recession, weak recovery, and counter-cyclical fiscal policies.

Debt management policies can strengthen the sustainability of these high debt levels and help sovereigns to avoid crises or defaults. By structuring the public balance sheet with an eye toward risk mitigation, countries could achieve a debt structure that is more resilient to economic downturns and more robust to disappointments over long-term growth prospects. More constrained fiscal space has therefore rekindled interest among policymakers in GDP-linked bonds as a debt-management instrument that enhances sustainability and avoids pro-cyclical fiscal policies (Bank of England Staff 2016). GDP-linked bonds tie the value of debt service to the evolution of GDP and thus keep it better aligned with the overall health of the economy. As public sector revenues are closely related to economic performance, linking debt service to economic growth acts as an automatic stabiliser for debt sustainability. GDP-linked debt can improve the debt structure of a wide range of countries, both advanced economies and emerging and developing countries, as the linking of fiscal revenues to economic growth is quite general.

Sovereign debt defaults can be costly both in economic and institutional terms. While some international investors may suffer sizeable losses, the biggest costs usually fall on the defaulting country itself. Defaults affect the financial soundness of banks, pension funds, and other institutions, and they degrade creditor rights and contract enforcement in the local legal system. While most efforts to reform the international financial architecture over the past 15 years have aimed at facilitating defaults, for example through a sovereign debt restructuring framework (SDRM), the design of a sovereign debt structure that is less prone in the first place to defaults and their associated costs would be a more straightforward policy initiative.

GDP-linked debt is an attractive instrument for this purpose because it can ensure that debt stays in step with the growth of the economy in the long run and can create fiscal space for countercyclical policies during recessions. A recent study of Spain has estimated that the probability that debt hits a level of 140% of GDP would decline from 10% now to essentially zero if all the debt were indexed to GDP growth (Blanchard *et al*. 2016). In practice, governments would find it difficult to access financing well before such high debt levels were reached. Research on sovereign debt has found that there is an effective limit, or ceiling, on how high debt can go before the risk of default becomes too high, and financial markets restrict access to further finance (see Ostry *et al* 2010). When debt is indexed to GDP, however, the probability of default is smaller for any debt level, and the debt limit becomes significantly higher (Kim and Ostry 2017). Thus, GDP-linked debt would give governments more room to use fiscal policy, which would be especially valuable at a time like the present when fiscal space is scarce.

While the analytical case for GDP-linked debt is well established, it should be recognised that past experience with GDP-linked bond issuance has not been without glitches. The challenges in designing and implementing a GDP-linked instrument arise from several factors, notably the link to an economic indicator that the debtor government produces and revises, as well as the hybrid debt/equity nature of the security. Experience, however, offers useful lessons for overcoming possible design defects and developing a sound market for these securities.

Lessons from experience

The first lesson is to ensure that the payout structure of the instrument reflects the state of the economy and is free from complexities or delays that can make payments stray from their link to the economic situation. To date, GDP-linked debt has been issued primarily in the context of debt restructuring operations, from the Brady bond exchanges that began in 1989 to the more recent cases of Greece and Ukraine. Given the context, the bonds have typically had a payout structure that would somehow compensate bondholders for their losses when the sovereign went into default. This feature, however, gave rise to structures that were not ideal from the point of view of debt risk management. For example, some specifications provided for large payments if GDP crossed certain arbitrary thresholds or were a function of the distance to GDP from those thresholds. In addition, some payout formulas were sensitive to the exchange rate, failed to take inflation into account, or were affected by revisions of population or national account statistics. All these mechanisms resulted in payments that were disconnected from the business cycle and the state of public finances, detracting from the value of these GDP-linked instruments for risk management (see Borensztein 2016).

The second lesson is that the specification of the payout formula can strengthen the integrity of the instruments. GDP statistics are supplied by the sovereign, and there is no realistic alternative to this arrangement. This fact is often held up as an obstacle to wide market acceptance of the instruments. However, the misgivings seem to have been exaggerated, as under-reporting of GDP growth is not a politically attractive idea for a policymaker whose success will be judged on the strength of economic performance. Furthermore, the experience with inflation indexed debt has been unproblematic for a very broad group of countries, despite the fact that, in this case, the incentives are (perversely) aligned in favour of underreporting inflation. Nevertheless, it is important to avoid structures that may create suspicions. The danger is greatest when there are discontinuities in the payment schedule, such as when a small increase in the GDP growth rate triggers a large payout. When the reported growth rate comes out just below that benchmark, it can generate suspicions in markets, even if statistics are being reported accurately.

The third lesson is that there is ample room to improve the drafting of security documentation, such that proper provisions are made for several contingencies that affect GDP-linked instruments. In particular, the documentation needs to spell out clearly the treatment of data revisions, of changes in national accounts methodology, and the priority ranking relative to other sovereign bonds. Typically, first estimates of quarterly GDP growth are provisional and are revised within a few weeks. There may be further, unscheduled revisions later on. The documentation needs to specify which data will be considered definitive for determining coupon payments. In addition, the methodology for calculating GDP and the base year for estimates are revised from time to time. This revision happens less frequently, probably every ten years or so. Documentation providing transparent formulas for the calculations in cases of methodological change will preclude any resulting ambiguities or unintended effects on coupon payments. Finally, it would also be important to state the seniority ranking of GDP securities relative to other sovereign debts. For example, do GDP-linked instruments rank *pari passu* relative to other bonds? In this regard, the face value of GDP-linked securities is sometimes ambiguous as the coupon-paying units can be detached from the original bonds. Although New York courts have gone part of the way towards answering these questions in connection with the Argentina litigation, it would be preferable for the documentation to dispel any ambiguities *ab initio* and head off any future litigation over these points.

Going forward

The development of a robust market for GDP-linked instruments will require the building of confidence, familiarity, and a wide participation to provide liquidity, in addition to an attractive array of risks and returns. While market development is still not widespread, markets have come a long way since the Brady bonds of the late 1980s and early 1990s. Argentina's 'warrant' has an active market, where buy-sell spreads are not wide for an emerging market instrument, suggesting a reasonable level of liquidity. Still, there are many areas where there is room for improvement. Standardisation of the bond documentation could help bring more clarity and transparency, and save sovereign issuers from falling into the pitfalls that bedevilled many of their predecessors.

In this regard, the term sheet drafted by the working group spearheaded by the Bank of England appears to be quite helpful.

Market development would also be helped by the presence of a significant organic demand for GDP-linked instruments. There is, in fact, a large institutional investor group for which GDP-linked debt is a natural hedge for their risk exposure. This group includes pension funds that offer defined-benefit plans with benefits linked to the wage rate. Real wages, at least in the long run, are related to the productivity of labour, which is in fact the biggest component of GDP growth, and hence a GDP-linked security would be an investment option that matches the evolution of pension fund liabilities well in the long run. A second risk that GDP-linked debt matches well is the 'valorisation' of pensions. Valorisation is the growth factor that is applied to workers' base earnings in the calculation of pension benefits. Valorisation formulas are usually calculated from wage growth but sometimes, for example in the cases of Italy and Turkey, are directly related to GDP growth (World Bank Pensions Database). This linkage means that, in the case of these two countries, pension liabilities are *de facto* indexed to GDP. An asset whose return is also indexed to GDP growth would be a valuable investment vehicle for those pension funds. While these valorisation formulas apply to public pensions, social security systems are typically autonomous entities that need to manage their portfolios to meet their pension liabilities in the future. In addition, private-sector pensions sometimes mimic benefits provided by public pensions.

There are several areas where further research could be helpful. In particular, there is the question of whether coupons (or 'dividends') should be indexed to the *growth* rate of GDP, or whether instead, the principal of the bond should be indexed to the *level* of GDP. The former case, which could be termed a 'growth-linked' instrument, has the advantage of providing a strong tie to the cyclical state of the economy, and thus to fiscal revenues and financing needs. The latter case is close to Shiller's (1993) proposal for 'macro markets'. So-called 'Shiller bonds' are less sensitive to the cycle but would track better the long-term evolution of GDP, including the case of a protracted decline in GDP. The choice between these two designs deserves more analytical consideration. Most of the existing instruments have in fact utilised combinations of indexing to the level and the growth rate of output, often with complicated formulas that also present jumps or discontinuities in the dividends.

Finally, it should be noted that the main source of reluctance regarding the use of GDP-linked debt, or insurance instruments more generally, may not stem from markets but from policymakers. Politicians tend to have relatively short horizons, and would not find debt instruments attractive that offer insurance benefits in the medium to long run but are costlier in the short run, as they include an insurance premium driven by the domestic economy's correlation with the global business cycle. In addition, if the instruments are not well understood, they may be perceived as a bad choice if the economy does well for some time. The value of insurance may come to be appreciated only years later, when the country hits a slowdown or a recession, but by then the politician may be out of office. While this problem is not ever likely to go away completely, multilateral institutions might be able to help by providing studies on the desirability of instruments for managing country risk, and how to support their market development, in analogy to work done earlier in the millennium promoting emerging markets' domestic-currency sovereign debt markets. Moreover, multilateral institutions could provide technical support on statistical issues, where useful, to enhance the quality and credibility of the underlying macroeconomics. They could also issue benchmark instruments themselves, as these would add value by expanding markets as well as persuading donors to subsidise the cost of insurance for low-income countries. Such undertakings could be temporary, until financial markets fully develop.

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2 Sovereign GDP-linked bonds: Pros and cons

James Benford and Fernando Eguren-Martin
Bank of England

The case for issuing GDP-linked bonds today

While the idea of issuing GDP-linked bonds is not new, the current global backdrop suggests the case for it is particularly strong now.

Public debt levels are high globally. For advanced economies, public debt exceeds annual output and is at a post-WWII high. For emerging markets, where output tends to be more volatile and, therefore, debts harder to service, public debt is around half of annual output and at its highest since the 1980s. Weak nominal growth has made it difficult to reduce these elevated debt levels.

Replacing conventional debt with bonds linked to a country's output could help to de-risk balance sheets. Payments on debt would then adjust automatically with the sovereign's capacity to repay. In an economic downturn, when tax receipts are likely to be weak, coupon and principle payments on outstanding debt would fall. This way, GDP-linked bonds have the potential to reduce the incidence of (domestically and internationally) costly sovereign solvency crises and debt restructurings.

Quantifying the debt stabilisation benefits

One way to measure the debt stabilisation benefits of different debt instruments is to contrast how a country's public debt-to-GDP ratio evolves under different financing structures.

Benford *et al*. (2016) compare the evolution of the debt ratio for a country with its debt either all in the form of conventional or all GDP-linked bonds. As case studies, they look at an advanced and an emerging economy whose gross government debt as a share of GDP is halfway between the (unweighted) average and the highest in their respective peer groups. This translates to a government debt ratio of about 100% for an advanced economy and 65% for an emerging one.

The approach starts with the basic debt dynamics equation for conventional debt (1). The debt-to-GDP ratio, d_t, grows in line with the difference between the interest rate on the debt, i_t, and the rate of nominal GDP growth, g_t, less the primary balance as a share of GDP, pb_t. In the base case, these variables evolve as in the IMF's October 2015 WEO. Shocks to i_t, g_t, and pb_t around this path are calibrated to match those for the representative advanced and emerging economy experienced over the past decade and a half. They are drawn from an empirical joint normal distribution estimated over the 1999 to 2015 period.

$$\Delta d_t=(i_t-g_t)\, d_{t-1}-pb_t \qquad (1)$$

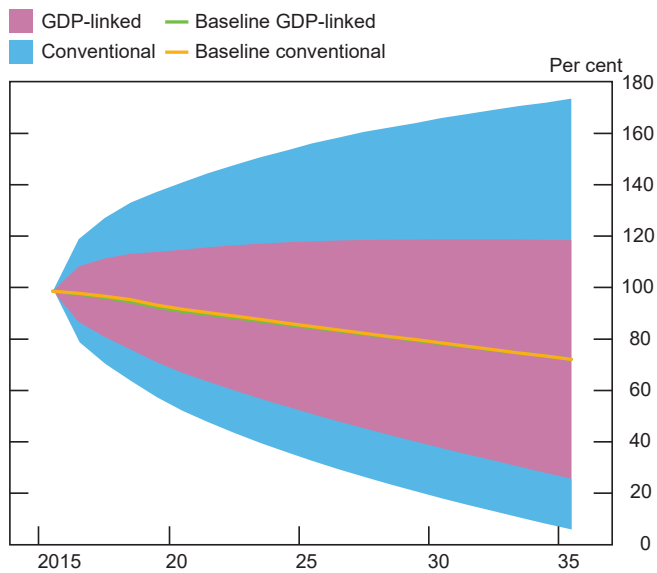
For GDP-linked bonds, the effective interest rate varies with GDP growth (2). The *ex post* return on the instrument is determined by the growth rate g_t, plus a GDP risk premium, θgdp, and a constant k. The constant k is chosen such that, in the base case and for zero GDP risk premium, the projected debt ratio after 20 years is the same for GDP-linked bonds as it is for conventional debt. The assumption of a zero risk premium is relaxed later. In the calculations, both the principal and coupons of GDP-linked debt are indexed to the level of GDP.

$$i_t^{gdp} = g_t+k+\theta_{gdp} \qquad (2)$$

Results show that issuing GDP-linked bonds narrows the range of stressed outturns for the government's debt to GDP ratio. For the representative advanced economy, the upper tail of the debt distribution narrows by around 55 percentage points (Figure 1). That is, an outturn in the 99% tail for the debt to GDP ratio puts the ratio at 120% after 20 years in the case where the country issues only GDP-linked bonds, compared with 175% for conventional debt.

The representative emerging market faces an additional source of risk, stemming from issuance of debt in foreign currency. The debt burden from this foreign currency debt will be sensitive to exchange rate shocks, increasing when the domestic currency depreciates. While issuing conventional debt in local currency only offers a significant reduction in upper tail risk over mixed local and foreign currency issuance (reducing the debt ratio by around 20 percentage points), local currency GDP-linked bonds further reduce the upper tail by a similar amount (a 20-percentage points reduction) (Figure 2).

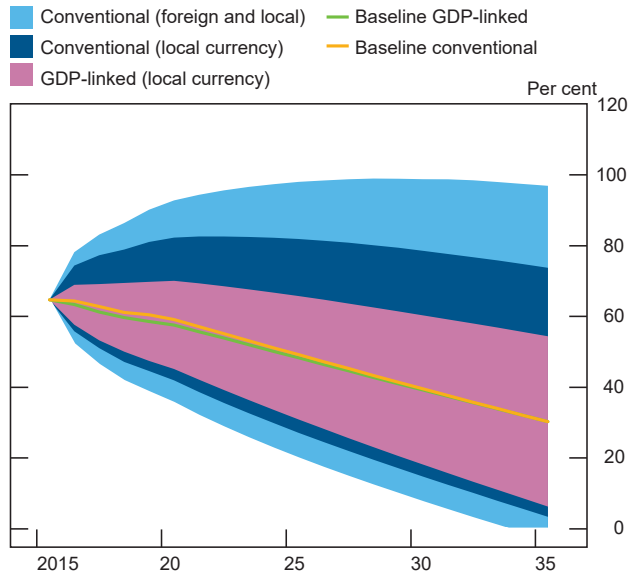
Figure 1. Gross government debt under either conventional or GDP-linked bond: for an indebted advanced economy sovereign.



Notes: Chart shows debt to GDB ratio paths corresponding to the 1st, 50th and 99th percentiles of the joint normal distribution of shocks. The orange line shows the 50th percentile path for conventional debt. The green line shows the 50th percentile path for GDP-linked debt. The paths are the same in 2035 by construction: the risk premium on GDP-linked debt is assumed to be zero.

Source: Author calculations

Figure 2. Gross government debt under either conventional or GDP-linked bond: for an indebted emerging market economy sovereign.



Notes: Chart shows debt to GDB ratio paths corresponding to the 1st, 50th and 99th percentiles of the joint normal distribution of shocks. The orange line shows the 50th percentile path for conventional debt. The green line shows the 50th percentile path for GDP-linked debt. The paths are the same in 2035 by construction: the risk premium on GDP-linked debt is assumed to be zero. Foreign currency debt accounts for 25% of the total.

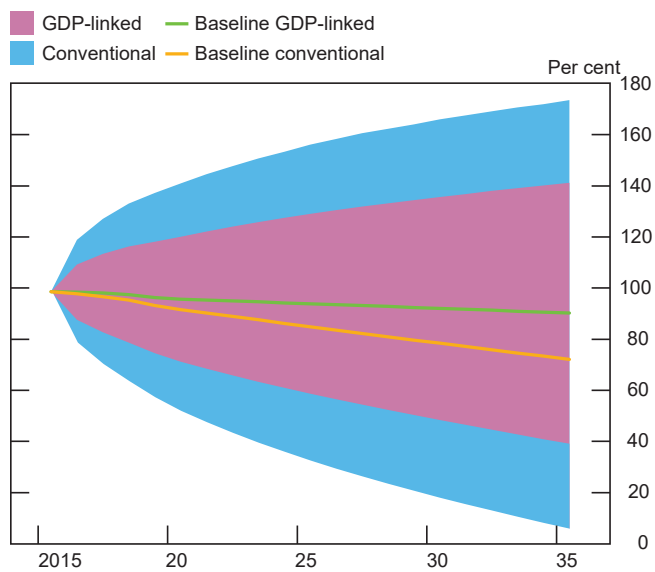
Source: Author calculations

This approach to modelling debt-to-GDP ratios is relatively simple and relies on economic variables evolving in the future as they have done in the past.

However, given a starting point of high debt-to-GDP and low interest rates, it is possible that these experiments understate the benefit of issuing GDP-linked bonds. Over the past decade, there has been substantial room for central banks to cut interest rates when the economy has slowed. This has helped to reduce the burden of servicing debt as bonds are re-financed. However, with many central banks now closer to the effective lower bound on interest rates, this cushion might be more limited in the future. That would point to a higher risk of conventional debt rising to a large share of output and so larger benefits from issuing GDP-linked bonds. Further, with the starting level of debt high, some countries are closer to the point where further increases in the debt to GPP ratio might trigger market concerns about a country's ability to repay. By driving up the interest rate demanded by investors, such concerns can be self-fulfilling.

On the other hand, these estimates could also overstate the benefits of GDP-linked bonds. The analysis does not consider how the country's borrowing behaviour may change with the introduction of GDP-linked bonds. Governments could, conceivably, take advantage of the additional space by increasing borrowing. In the case of emerging markets, the benefits of moving from foreign- to local-currency conventional debt could be larger than estimated here, and so the relative benefits of GDP-linked bonds smaller, if exchange-rate shocks get amplified by, say, negative balance sheet effects that trigger contingent fiscal liabilities. Finally, and most importantly, the estimates do not allow for the possibility that investors will demand a higher average return on GDP-linked bonds than on conventional debt to compensate them for bearing GDP-risk.

Figure 3. Gross government debt-to-GDP for indebted advanced economy, with 100bps premium on GDP-linked bond



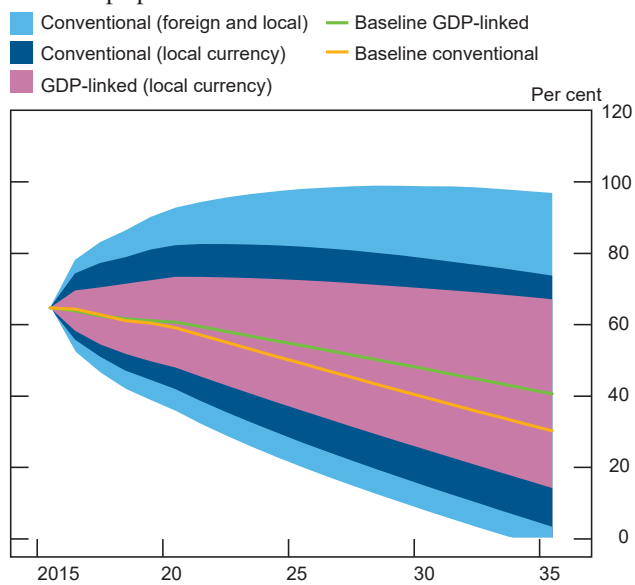
Notes: Chart shows debt to GDB ratio paths corresponding to the 1st, 50th and 99th percentiles of the joint normal distribution of shocks. The orange line shows the 50th percentile path for conventional debt. The green line shows the 50th percentile path for GDP-linked debt.

Source: Author calculations

When one allows for a premium on GDP-linked bonds, there is still a debt stabilisation benefit, but this comes at the cost of a higher average debt burden. Figures 3 and 4 repeat the simulations for the case where investors demand a 100bps premium for holding GDP-linked bonds relative to conventional debt. GDP-linked bonds still reduce the upper tail on the debt-to-GDP ratio, though the effect is smaller.

For the advanced economy, the upper tail is reduced by just under a quarter, compared to a third previously. For the emerging market economy, the reduction is around an eighth, compared to a quarter previously. In both cases, the cost of insuring against bad GDP outcomes leaves the baseline projections for the debt-to-GDP ratio higher than before.

Figure 4. Gross government debt-to-GDP for indebted emerging market economy, with 100bps premium on GDP-linked bond.



Notes: Chart shows debt to GDB ratio paths corresponding to the 1st, 50th and 99th percentiles of the joint normal distribution of shocks. The orange line shows the 50th percentile path for conventional debt. The green line shows the 50th percentile path for GDP-linked debt.

Source: Author calculations

What might investors demand as a GDP-risk premium?

It is difficult to predict the size of the premium that investors might demand to hold GDP-linked instruments. In principle, the fact that payoffs are smaller in 'bad times' (that is, when GDP growth is low) adds to the inherent uncertainty surrounding the future evolution of GDP and should make investors require a positive excess return. This logic is particularly strong for domestic investors, whose income is more closely tied to the evolution of GDP of the issuing country. However, and to the extent that this risk could in principle be easier to diversify for foreign investors, these might require a

smaller premium.Work underway at the Bank of England aims to estimate the potential size of this GDP risk premium at a range of maturities by analysing how existing asset prices react to GDP growth shocks. Using data for the US, and relying on bond and equity prices, the estimates of the GDP risk premium at long maturities (from eight to ten years) average around 100 basis points. These estimates are of a similar magnitude to those found using alternative approaches, and do not look prohibitively high in principle.

Conclusion

While this chapter has weighed up some of the pros and cons of GDP-linked bonds, there is more work to be done on gauging operational viability and possible ways forward. A critical factor in issuance is the likely size of the GDP risk premium. If there is no intersection between what issuers are willing to pay and what investors expect to receive, then there will be no market for these bonds, however large the macroeconomic and fiscal benefits. It would be important to tailor the instrument to buy-and-hold investors, who are less concerned with liquidity and novelty considerations that might deter asset managers who may need to liquidate positions at short notice. Standardisation of the instrument's commercial and legal terms would be important for reducing the first-mover problem. Progress has already been made here with the drafting of a model term sheet, discussed in Chapter 7.

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3 On the role of GDP-linked debt in expanding fiscal space

Jonathan D. Ostry and Jun I. Kim
IMF [1]

A key issue confronting the global economy today concerns the degree to which countries have room for fiscal manoeuvre – fiscal space – and, relatedly, the extent to which policy adjustments are needed to entrench debt sustainability. By fiscal space, we mean the scope for further increases in public debt without undermining sustainability; when and whether such space should be used is a separate question. Financial markets have a tendency to bring fiscal concerns to the front page, often with little warning, and a more general reassessment of sovereign risk across a number of countries (advanced, emerging, developing) – given the legacy of the global financial crisis and looming demographic pressures – remains salient.

This risk, together with fears about secular stagnation and a prolonged deficiency of aggregate demand in an environment where monetary policy has hit diminishing returns, have put a premium on fiscal expansion – including for infrastructure – to stimulate economic growth. But the aftermath of the global financial crisis has left many advanced and emerging countries with high sovereign debt ratios. This has led some policymakers to argue that their fiscal space is limited, and thus that it would be difficult to take advantage of the opportunity afforded by low real interest rates to undertake fiscal expansion.

1 Views expressed in this chapter, which draws on Kim and Ostry (2017), are those of the authors, and should not be attributed to the IMF.

One way of thinking about fiscal sustainability is simply to ask whether the 'intertemporal budget constraint' of the government is likely to be satisfied. However, the notion that governments eventually repay their debts, so that these do not grow without bound, requires only that adjustments to bring debt dynamics back on track occur at some point in the (possibly distant) future. Given the sovereign's right to tax (and not spend), credible changes in these variables can always make the problem of fiscal insolvency disappear.

This brings us to the approach followed in this chapter, which is to draw implications from how fiscal policy has responded to increases in public debt in the past for the sustainability of public debt at the present time. Under the approach pioneered by Bohn (2008) and Mendoza and Ostry (2008), the salient feature of the fiscal track record is whether the primary fiscal balance responds positively to increases in the level of debt, controlling for other determinants of the primary balance. But this approach is clearly too crude along (at least) two dimensions, not least in its implication that fiscal space is either infinite (the policy response is strong enough at any debt level) or zero.

First, it cannot literally be true that, as debt rises, primary balances rise over the entire possible range of debt (since, at some point, this would imply primary balances that are larger than a country's GDP itself). And second is the role of uncertainty – and specifically the potential for shocks to push a sovereign above its debt limit (based on a 'normal' pattern of adjustment), at which point sustainability can only be restored by an extraordinary fiscal effort. This is a critical dimension of the problem of fiscal space, since markets will factor in the chance that a sovereign will be on the wrong side of the debt limit in the lending rates they charge, and those rates in turn will affect the probability that the debt limit is breached.

It is a stylised fact, documented in some earlier work by us (Ostry *et al*. 2010), that, while fiscal effort is increasing in the debt ratio at moderate levels of debt, the relation breaks down at higher levels, as fiscal effort peters out (reflecting the political infeasibility of further tax increases or spending cuts). This phenomenon gives rise to an endogenous debt limit, above which level debt dynamics become explosive. Naturally, creditors will price-in the risk of default before the country gets to its debt limit, given the likelihood that negative shocks will push the sovereign into an unsustainable position.

The analysis is complicated by the feedback between the endogenous interest rate and the risk premium as default risk emerges.

Figure 1 provides a heuristic treatment. To understand how growth uncertainty affects the debt limit and fiscal space, it is useful to begin with the case where growth is certain – i.e. the GDP growth rate (g) is constant at some rate, g^*. To start, the sovereign is assumed to have available to it only nominal bonds. It enjoys market access (i.e. it can borrow at a finite interest rate), and so the change in its debt ratio from one period to the next will be governed by the difference between the debt service obligation and the primary balance. Once the debt ratio rises above its debt limit, the sovereign loses market access because of its inability to pay. The probability of default is unity in such a case and the interest rate is no longer finite (the sovereign is shut out of the bond market). This simple thought experiment shows that, in the absence of growth uncertainty, the debt limit is determined where the primary balance and debt service obligation just offset each other, as shown by the intersection of the black primary balance schedule and the red (linear) debt service schedule in Figure 1.

Can GDP-linked debt increase debt limits and fiscal space?

Concerns about limits to fiscal space raise the issue of how to make what is scarce more plentiful. The obvious way is to have a fiscal contraction and pay down the debt. But this runs counter to the goal of using fiscal policy to boost demand or upgrade infrastructure and the public capital stock. Another way is to promise to pay down the debt tomorrow through forward commitments. But markets might take such commitments *cum grano salis*. Is there a way to increase fiscal space that does not require contractionary fiscal policy either today or tomorrow? One way involves reducing the risk that the sovereign might default *for a given path of primary fiscal balances*. Lower default risk would generate a payoff in terms of reduced real debt service costs, buttressing fiscal space.

GDP-linked bonds (GLBs) have long been seen as offering potential benefits for both issuers and investors (Shiller 1993). By linking payments on sovereign debt to the issuing country's GDP, GLBs can help stabilise debt ratios and reduce vulnerability to external shocks and financial crises. Using *ad hoc* simulation methodologies, Borensztein and Mauro (2004) and Blanchard *et al*. (2016) show the debt-stabilising

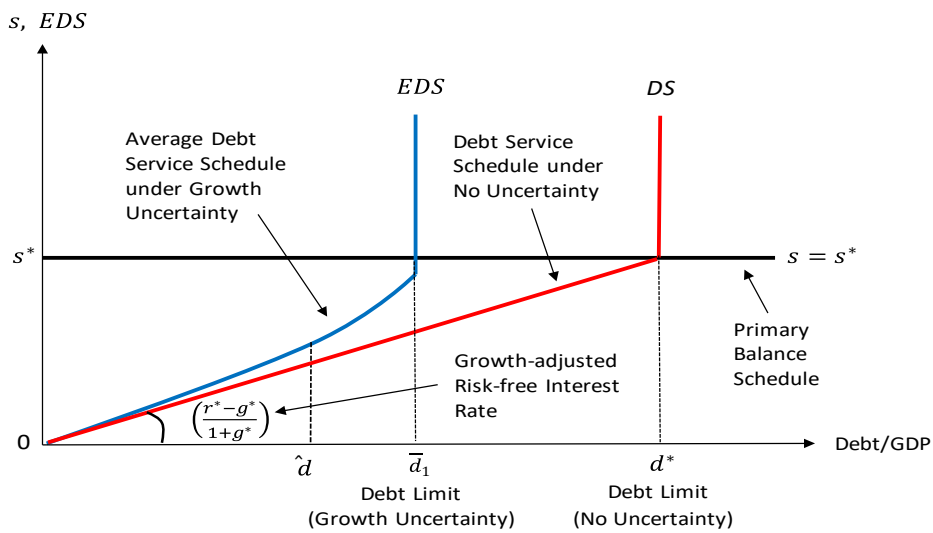
effects of GLBs; using similar methods, Barr *et al*. (2014) and Bank of England (2016) assess that GLBs can increase debt limits and reduce default risk. For investors, GLBs may further enhance return and diversification opportunities across a broad range of countries.

The mechanism through which GLBs help to increase fiscal space arises because the evolution of sovereign debt ratios is affected by stochastic variation in GDP. In bad states with lower-than-expected growth, an assessment of sovereign creditworthiness takes a hit because the higher-than-expected debt ratio raises default risk. If the debt contract were instead written to give the sovereign a break on its debt service during such bad times (in exchange for an increased interest rate during good states), default risk would decline; this would allow the debt contract to be written with a lower average interest rate. An alternative way to understand the mechanism is to recognise that the bond yield is a *convex* function of the debt ratio because, as debt rises toward the debt limit, investors demand an increasingly higher yield to compensate for greater default risk. The *average* bond yield on nominal debt thus will be increasing in the extent of growth uncertainty (from Jensen's inequality). A GDP-linked debt contract which reduces the variability in the debt ratio can be struck therefore at a lower average interest rate while maintaining the lender's same expected profit.

We can use the diagrammatic apparatus in Figure 1 to illustrate the uncertainty case and how it compares to the certainty case discussed earlier. Suppose that the growth rate varies randomly over some finite range, with the average equal to g^* as before. The blue line portrays the expected debt service (EDS) schedule which must lie above the red line (because of the convexity of the growth-adjusted interest rate with respect to the growth rate). Moreover, it bends upwards at higher debt levels as default risk emerges, causing the bond yield to rise above the risk-free rate, before becoming vertical once debt exceeds the debt limit. The debt limit in the uncertainty case, $\overline{d}_1$, is reached earlier than under certainty, and thus lies to the left of d^*. Growth uncertainty thus lowers the debt limit of nominal debt and reduces fiscal space. As uncertainty increases, the blue line in Figure 1 will rotate counter-clockwise, and bend upward earlier and more steeply, resulting in an even lower debt limit.

In this setting, consider GLBs whose payout at maturity is tied to the growth outcome with the expected value equal to one dollar – for instance, $\rho'=(1+g')/(1+g^*)$ where ρ' and g' are payout and the growth rate at maturity, respectively. Such GLBs completely insulate the issuer from the impact of growth uncertainty and, therefore, act as a perfect risk sharing device: giving the issuer a reduced obligation when its capacity to generate resources for debt service suffers, in exchange for a higher obligation when its capacity to pay is greater. This risk-sharing property of the GLB returns us to the world of perfect certainty, moving the debt service schedule back to the red line in Figure 1, and restoring fiscal space to the level that prevailed when there was no uncertainty.

Figure 1. Debt limit under uncertainty: Nominal and GDP-linked bonds



Potential gains in fiscal space

How large are the potential gains in fiscal space flowing from GLBs? Assuming investor risk neutrality, our simulation results suggest gains in fiscal space on the order of 10-60% of GDP for a representative advanced economy. Simulated gains in fiscal space are larger for counter-cyclical fiscal policy because, holding constant the extent of growth uncertainty, more countercyclicality in policy amplifies stochastic variation in the debt ratios by more for nominal bonds than for GLBs.

Efficient risk sharing (between sovereign and investors) is at the heart of the favourable effects of GLBs on fiscal space. The scope for risk sharing is largest under investor risk neutrality. To examine how investor risk aversion affects our conclusions, we simulate the maximum premium that an issuing country would be willing to pay to transfer debt service risk to investors. We find that the maximum premiums are on the order of 150-260 basis points, being larger the greater the underlying growth uncertainty. The implied Sharpe ratios are greater than one, and appear large relative to empirical norms of Sharpe ratios for bond or equity returns (which are typically well below unity), suggesting that GLBs could be attractive to investors unless investors are exceptionally risk averse or severely constrained in diversification opportunities.

Policy implications and challenges

GLBs may be attractive both to emerging market countries where growth volatility is high, and to advanced economies with elevated debt ratios and limited room for manoeuvre to undertake counter-cyclical monetary policy. Our work suggests that there is scope for significant gains in fiscal space when GLBs account for only a negligible share of total debt, as at present. One should expect reduced scope for risk sharing between sovereign and investors if investors demand a premium for return volatility in GLBs. Our simulations suggest, however, that the risk-sharing benefit of GLBs is plausible, unless investors are exceptionally risk averse or the opportunity of risk diversification is significantly constrained.

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4 Debt limits and the structure of public debt

Alex Pienkowski
IMF[1]

Background

In an era of high debt, low and uncertain growth and compressed global interest rates, the potential benefits from issuing debt instruments that better buffer against macroeconomic shocks are higher than ever. Average public debt in advanced economies has grown from a pre-crisis level of around 70% of GDP to nearly 110% in 2016. At such levels, relatively small macroeconomic shocks, such as a typical recession, can cause debt vulnerabilities to increase substantially. Therefore, insuring against GDP and exchange rate volatility has the potential to substantially reduce risks to debt sustainability. Of course, such insurance is rarely free. In today's low interest rate environment, however, sovereign issuers have greater capacity to afford such protection. And with investors 'searching for yield', they may be more willing to share macroeconomic risks with sovereigns; especially if this also implies a lower risk of default.

This chapter explores how the structure of sovereign debt can alter the payment capacity of a government. Three broad types of debt instrument are modelled – foreign currency denominated debt; local currency denominated debt; and debt indexed to GDP. Each offers varying degrees of protection to the sovereign's balance sheet from

1 With special thanks to S. Ali Abbas for his guidance and comments on this chapter. Thanks also to Sam LaRussa for his research assistance support.. The views expressed here are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

potentially destabilising shocks. For example, local currency debt shields a sovereign's balance sheet from the direct effects of potentially volatile exchange rate movements. Correspondingly, 'GDP-linked bonds' adjust in value in the face of shocks to output, helping to stabilise the debt-to-GDP ratio.

These instruments are incorporated into a model of sovereign default to assess the impact they have on a government's debt limit. If debt goes above this limit, then the sovereign will default on its payment obligations; so, the higher this threshold, the lower the probability of default. The interest cost of issuing these instruments compensates the creditor for the extra risk that they take on – so there's no free lunch for the sovereign.

The foundations of this model are based on the paper by Ghosh *et al*. (2011); and the extension by Barr *et al*. (2014). Full details of the model and its calibration can be found in Pienkowski (2017). The model is calibrated using historical data from four country groups: All Countries (ACs), Advanced Economies (AEs), Emerging Markets (EMs) and Low-Income Countries (LICs).

Results

Table 1 (column 1), shows the 'baseline' debt limit, derived using this model, for a representative country from each of the four groups. This debt limit – the maximum sustainable debt level before a default occurs – varies with the fundamentals of each country group. Not surprisingly, AEs have the highest debt limit: they find it easier to raise taxes and sustain a primary surplus for long periods of time; and they are less exposed to exchange rate and growth shocks. These factors help AEs sustain higher levels of debt before they experience a debt crisis. In contrast, LICs are less able to raise revenues to repay debt and are subject to much larger shocks (although they do have a higher trend growth rate, which helps raise the debt limit). The fact that LICs and EMs have foreign currency denominated debt also exposes them to destabilising exchange rate shocks, which lowers the debt limit relative to AEs.

Table 1. Debt limits with various instrument designs (percent of GDP

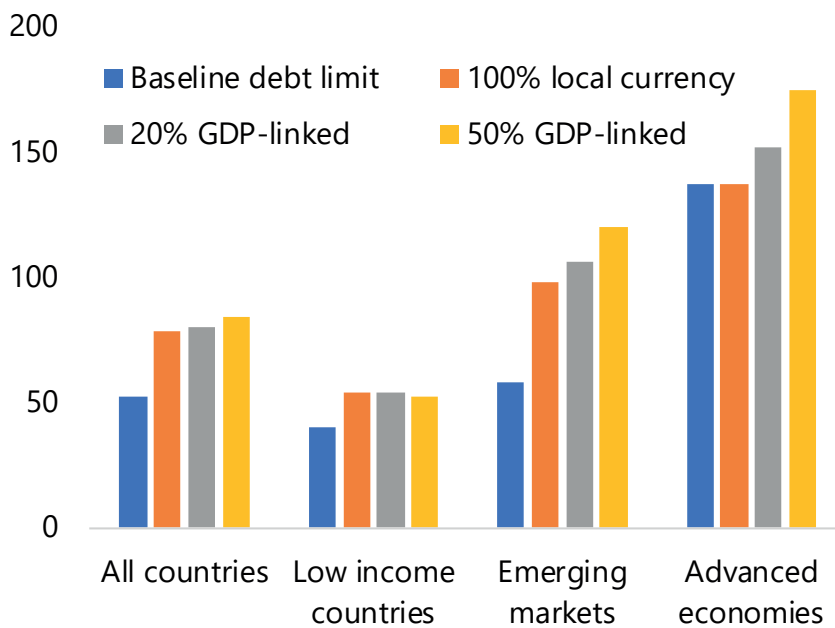
Country Group	Baseline debt limit	Debt limit - 100% local currency	Debt limit - 100% Local currency; 20% GDP-linked	Debt limit - 100% local currency; 50% GDP-linked	Debt limit - 100% local currency; 100% GDP-linked
All countries	52	78	80	84	84
Advanced economies	137	137	152	175	238
Emerging markets	58	98	106	120	140
Low income countries	40	54	54	52	50

Now that these baselines are derived, the impact from increasing the share of debt in local currency or linked to GDP can be estimated. Moving towards full local currency denominated debt raises the debt limits of all country groups (AEs are assumed to already have all debt in local currency). This is shown in the second column of Table 1. The increase is especially pronounced for EMs, where the debt limit increases by 40 percentage points of GDP. This implies that exchange rate shocks are a significant risk to EM solvency. By eliminating this risk (and after taking into account the higher interest rate on local currency debt), the *credit* spread demanded by investors declines, and therefore the debt limit of the country increases. LICs also benefit, with the debt limit increasing by 14 percentage points of GDP. However, the absolute and relative impact on the debt limit is less than for EMs. LICs are vulnerable to exchange rate shocks, but the risk of a growth or primary balance shock is also important. Therefore, while the risk of default declines with greater local currency debt issuance, the impact on the debt limit is less (i.e. growth and primary balance shocks remain a major risk).

Next, the impact of GDP-linked bonds on the debt limit is explored (Figure 1). Such instruments protect sovereign solvency from shocks to growth: if growth declines by 10%, the debt service (interest and principal payments) will fall by the same amount, leaving the debt-to-GDP ratio unchanged. Of course, it is unlikely that any sovereign would issue all their debt in GDP-linked bonds. However, even issuing relatively modest amounts – say 20% of the total debt stock – can have a significant impact on the debt limit. For AEs, the debt limit would rise by around 15 percentage points of GDP,

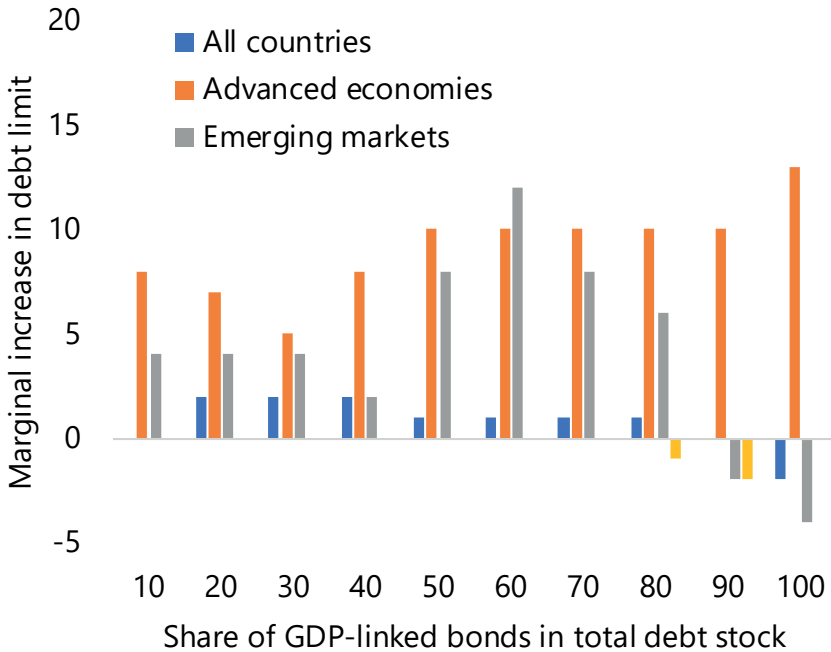
which would be enough to accommodate the median fiscal costs of a systemic banking crisis.[2] An eight percentage point increase in the debt limit for EMs is also substantial, enough to accommodate additional borrowing through a typical recession (IMF 2016). For LICs, however, there is no change in the debt limit (relative to the case where 100% of debt is local currency denominated). Here, the higher interest rate costs associated with GDP-linked bonds offset the benefits from smaller shock on debt. If half of debt is GDP-linked, AEs experience an increase in the debt limit of around 40 percentage points, enough to accommodate all but the worst tail-events. EMs also experience a sizeable increase, around 20 percentage points of GDP.

Figure 1. Debt limits (% of GDP)



2 Amaglobeli *et al*. (2015) estimate that the direct fiscal cost of a systemic banking crisis (recapitalisation and asset purchases) has a median of 6% of GDP; while the median increase in public debt associated with these events is around 14% of GDP.

Figure 2. Marginal change in debt limit



The results also show that the marginal impact on the debt limit from raising the share of GDP-linked bonds can be diminishing, or even negative. This is illustrated by the marginal impact of moving to full GDP-linked bond issuance (Figure 2). EMs have a maximum debt limit when GDP-linked bonds make up around 80% of the debt stock. Beyond this, the cost of issuing these instruments outweighs the benefits, and the debt limit begins to fall. For AEs, the debt level continues to increase with the share of GDP-linked bonds, and hence reaches a maximum when all debt is GDP-linked.

This does not, however, imply that the share of GDP-linked bonds that maximises the debt limit is necessarily 'optimal'. A sovereign may have risk tolerance preferences whereby they opt for a lower debt limit to reduce debt service costs. This is also consistent with 'myopic' preferences, whereby policymakers don't fully internalise the costs of debt crises. Furthermore, a high share of GDP-linked bonds could have other unintended consequences such as i) a reduction in the supply of 'safe' conventional assets, which are important for financial market transactions; ii) excessive risk being transferred to the private sector, which could cause business cycles to become more volatile, and; iii) an increased risk of moral hazard or incentives to manipulate data by the sovereign. These issues are explored in detail in IMF (2017).

Policy implications

The results of this model suggest that there is no one-size-fits-all debt structure that all countries should target. For LICs, with the lowest 'baseline' debt limit, this simple framework suggests that focus may be best directed at reducing exchange rate risk through local currency debt issuance (and building institutions that can raise the maximum sustainable primary balance). For these economies, there are well known 'original sin' constraints, so in practice it may be necessary to pursue intermediate steps. For example, they could first issue local currency inflation-linked bonds, which can reduce the risk of governments 'inflating away' their debt obligations while also providing some protection from exchange rates. For EMs, once they manage to sufficiently reduce exchange rate risk, the benefits from GDP-linked bonds are apparent. But AEs experience by far the largest benefit, with debt limits rising by 15 percentage points when GDP-linked bonds make up one-fifth of the debt stock.

The analysis also provides insight on the marginal properties of GDP-linked bond issuance. When considering all economies together, there appears to be a quadratic relationship between the share of GDP-linked bonds and the debt level, where the debt limit is maximised at 80% of the total stock. However, from a cost-benefit approach, sovereigns may choose to target lower levels, given that the 'marginal benefit' (in terms of the change in the debt limit) is declining. While not identifying the 'welfare optimal level', this framework allows these issues to be explored.

The results presented here are sensitive to the parameter assumptions. Perhaps the largest uncertainty surrounds the risk premium demanded by investors to hold local currency and GDP-linked bonds. In the absence of large-scale market issuance, further research in this area is important. Another useful extension would be to better capture the various policy frameworks in different countries. For example, 'reserve currency issuers' that typically experience 'safe-haven inflows' during times of crisis arguably have a policy toolkit that can mimic many of the features of GDP-linked bonds. Conversely, countries in a currency union may have significantly less scope to control nominal GDP through monetary and fiscal policy, and hence the debt-to-GDP ratio. Hence, the impact of GDP-linked bonds on their debt limit may be significantly different.

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Part II: Design

5 Could performance-linked lending have helped in the euro crisis? Could it still?

Patrick Honohan
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From 2010, the overindebtedness crisis in the euro area has been dealt with through official financing on traditional terms. No attempt was made to innovate with financing instruments that could have reduced debt overhang and facilitated a faster growth recovery. This chapter argues that (i) evidence from Ireland suggests that state-contingent financing could have produced better results for both debtor and creditor; and (ii) the deep decline in Greek GDP makes it possible to design state-contingent instruments that would reduce debt overhang without generating the same political resistance as conventional forms of debt relief.

The accumulation of official claims on Greece and Ireland

With a sudden mushrooming of the scale of actual and prospective government indebtedness to levels that looked potentially unpayable, first Greece and then Ireland lost access to the financial markets during 2010. Rapidly constructed European lending facilities, combined with IMF resources, took the initial strain in both cases on a very large scale, with the result that official claims quickly formed a substantial fraction of each government's indebtedness.

Market participants' doubts about debt sustainability – in Greece's case because of the limited medium-term capacity for expanding exports; in Ireland's case because of uncertainties about the ultimate scale of banking loan losses – were shared by IMF staff.

Nevertheless, the IMF participated in both lending operations, citing a "systemic exception" to its normal criterion that large-scale lending should only be made to countries whose debt was sustainable with high probability. The result was a debt overhang which arguably slowed the recovery of both economies by chilling investment and consumption decisions.

Although interest rates were subsequently lowered in both cases and maturities greatly extended, the Greek economy shrank without evident recovery even seven years later, and the full recoverability of the official claims on Greece remain in doubt, even after a deep restructuring of its market debt. Ireland fared better, thanks to its more flexible economic structure and dynamic export sector, and also because the banking losses crystallised at lower-than-feared levels. Nevertheless, the Irish economy saw essentially no growth until late in 2012.

The story is not confined to these two countries. For a variety of reasons, the national governments of several other euro area countries followed suit, becoming heavily indebted after the global financial crisis broke out in 2008. In all, ten European countries, six of them in the euro area, lost – or nearly lost – access to private financial markets and had to have recourse to official lending. Borrowings from the IMF and other official sources were on traditional terms and at first carried interest rates set at a sizeable premium over wholesale market interest rates for low risk borrowers.

Each of these countries, with the exception of Greece, has eventually managed to get its finances under sufficient control to have ready access to the financial markets and to have repaid, or be in the process of repaying, the official loans that were advanced.

Bank-related contingent financing for Ireland

Uncertainty surrounding banking losses was an important part of Ireland's loss of market access in 2010. Discouraged by a series of increasingly disappointing evaluations of segments of the Irish banking system's loan portfolio, and shocked by the consequential burden on the Irish Government's finances as it injected capital into the banks, market and official lenders had become unduly sceptical of the capacity of the Irish economy, and, in particular, of its banking system, to recover. They foresaw even larger losses in the banks, dragging the Government's finances down into an unsustainable spiral.

The Troika negotiators insisted on a sum of €35 billion of the Programme financing (equivalent to more than 20% of that year's GDP) to be earmarked, if necessary, for an additional injection of capital (this was to be in addition to the almost €50 billion which the Government had already injected or committed). Secondary market prices of Irish Government bonds wilted under the prospect of such a fiscal burden, seemingly pushing the Government's access to market financing further into the distance.

An obvious solution to this Irish overhang would have been for official European funds to be injected directly into the capital of the banks, or for the official lenders to provide some form of loan-loss insurance. That way the banking risk would have been transferred to an entity more capable of bearing it. By removing the debt overhang from the Irish State, financial engineering of that type could have accelerated the recovery of market confidence in Ireland and boosted economic growth more quickly. It would have been worth it for the Irish Government to pay an insurance premium, or to forego some ownership claims on the banks. Furthermore, such a transaction had the potential to yield a high benefit to the lenders.

Indeed, shortly after the Central Bank's detailed stress test of March 2011 arrived at a much lower capital need than the earmarked €35 billion, a consortium of private equity firms did invest about €1 billion into the equity of the leading Irish bank. This investment, speculative at the time, yielded a 200% profit when the private equity investors began to cash out, less than three years later. Such a rate of return had not been dreamed of by the European lenders, but it shows that they could have obtained something like it had they paid more attention to the suggestions of Irish officials during the Troika negotiations. It could have been win-win for both sides of the official financing transactions.

Another contingent alternative, albeit less focused on the specific banking issue, which was suggested at the time, would have been to link debt servicing to the recovery of the Irish economy. This too could have generated spectacular returns for the lenders considering the astonishing 26% growth rate of the Irish economy in 2015. However, this extreme example reminds us of the importance of choosing a stable and credible reference index for contingent debt. The 2015 growth spike had much to do with the taxation manoeuvrings of MNCs in Ireland.

(Given the well-known distortions in the Irish GDP figures, the Irish side would have made sure that any such debt contract would not have been indexed on GDP, but on more stable measures of aggregate economic capacity.)

Greek debt overhang

There is no need to belabour the proposition that Greek debt is not sustainable; a proposition which is accepted by virtually all close observers (cf Zettelmeyer *et al*. 2017). And this is not simply a question of making conjectural calculations for decades into the future, though the results of such calculations, such as are routinely made by IMF staff, do fail to provide comfort to those supposing that the debt will or can be repaid in full. It is true that the interest rates and maturities for much of the European intergovernmental lending have been greatly eased. But even for the years immediately ahead, there is a stream of debt servicing payments due to the other creditors: private creditors, the IMF and the ECB, totalling over €30 billion in the next seven years 2018-2024, or about 3% per annum of Greek GDP (Bulow and Geanakoplos 2017).

Even if successive negotiations over the coming years can push back the need for Greece to run sizeable surpluses, the danger that these negotiations might fail represents a sword of Damocles hanging over the Greek economy, threatening the economic viability of any projects. Suppose the actual and prospective burden of debt servicing is really holding back the recovery of the Greek economy and the resumption of a strong growth path. If so, growth potential could be unlocked by adjusting the debt servicing schedule so that it applies only to the extent that the economy's payment capacity grows, making it possible eventually to achieve a higher flow of payments to the creditors than now seems likely.

It would now be far from impossible to choose a macroeconomic aggregate acceptable to both borrower and lender Governments, for the purpose of indexing loan servicing. Since the major problems with Greek statistical reporting that were uncovered after 2009 (and despite the disgraceful legal cases taken against the reforming head of the Greek statistical service), there have been very significant improvements in the quality of statistical information-sharing in Europe, including on Greek macroeconomic aggregates. Given this improved statistical infrastructure, the problem of identifying an acceptable and credible index is lower within Europe than elsewhere and much lower

than would be the case for private creditors who might have limited ability to challenge manipulated data.

Rather than using GDP, one ingenious proposal for Greece suggests aggregate government spending as the index to be used for debt servicing (Bulow and Geanakoplos 2017). Apart from being simpler and potentially less manipulable than GDP, this has the attraction for the creditors of adding directly to fiscal discipline.

Political cost to other countries

One well-aired obstacle to constructing debt relief that would restore Greek debt sustainability is the political cost for decision-makers in the main creditor countries in publicly acknowledging that the debt, as currently specified, will not be repaid. But a move to state-contingent debt need not make any such acknowledgment and can indeed be represented as strengthening the recoverability of the initial outlay. The missed profit opportunity for official providers of bank recapitalisation funds in Ireland provides some concrete evidence for the proposition that shifting to state-contingent financing need not amount *de facto* to a reduction in the net present value of their claims relative to standard loan contracts.

As time has passed, a further problem has emerged, namely the reluctance of *debtor* country politicians, who have brought their finances under control at considerable domestic cost, to allow Greece to get relief which they themselves did not secure. They fear being seen by their electorates, in the event of a Greek debt restructuring, as having been too compliant with the Troika and having failed to hold out for an available relief for their own countries some time ago.

The answer to this would be to exploit the exceptional decline in Greek output and Government spending in the instrument design. The Greek economy has been so weak that a contract can be designed that would only be of interest to Greece – a separating equilibrium. The idea would be to calibrate the index-linked debt servicing schedule so that it provides substantial relief only when the index lies far below the pre-crisis peak, and carries a higher servicing charge than the current schedule whenever the Greek economy surpasses the previous peak. Such a schedule could ensure that the state-contingent contract would not have been chosen by any of the other countries, even if it had been available when they borrowed.

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6 Sovereign GDP-linked bonds: Design choices

Mark Joy
Bank of England

Taking a GDP-linked bond from the drawing board to the market place entails making a number of practical design choices. Some concern the indexation method and payment structure. Others address concerns over data quality. A further set relate to giving the investors clarity over their legal rights if there are payment defaults. This chapter gives an overview of some key design choices.[1]

As with any new security, an important issue is addressing the trade-off between market liquidity and structures that appeal to specific investor groups. Different instruments could be designed to secure high prices from different investors with different preferences. However, there are likely to be gains from standardisation and from having a product that has sufficient appeal and depth of liquidity to underpin a well-functioning market.

Reference variable

GDP fulfils several important criteria as a reference variable to index repayments: it is regularly published, widely understood, comparable across countries, and forecasts of it are readily available from both the official and private sectors.

This is probably why many analysts have focused on it when considering the indexation of sovereign debt. However, when the first wave of interest in indexing debt to GDP surfaced, following the debt crises of the 1980s, indexing to exports or commodities was

1 A fuller discussion of these design choices, including investor feedback on them, can be found in Joy (2017).

also proposed. At the time, a majority of academics emphasised that the moral hazard costs of indexing to GDP (i.e. the temptation to manipulate GDP data) outweighed the insurance benefits. Indexing to commodity prices found favour, at least in part, because their decline contributed to the Latin American debt crisis, an event fresh in peoples' minds.

An alternative would be to index to wages. Uruguay, for example, issued a $1 billion bond with principal and coupon payments indexed to nominal wages, in 2014. Indexing to wages is attractive since it is a natural hedge for pension funds with liabilities indexed to nominal earnings. Against this, wages might be too stable (i.e. exhibit downward rigidity) and therefore poorly correlated with the government's repayment capacity.[2] They also tend to be measured differently both across countries (eg. at different frequencies) and within them (with most national statistical offices having multiple rival measures of earnings and labour income).

Denomination in local versus foreign currency

GDP-linked bonds denominated in local currency provide the issuer with insurance against exchange rate shocks that could otherwise reduce or cancel out their debt-stabilising benefits. Local currency debt eliminates currency mismatches. Governments with deep local currency bond markets may find it easiest to issue local currency GDP-linked bonds.

However, there may be instances – e.g. when new instruments are issued through debt restructurings or when the domestic currency is not accepted as a Euroclear or Clearstream settlement currency – where investors prefer to receive GDP-linked bonds that settle in a foreign currency. Contractually, this could be achieved by keeping the same basic commercial and legal structure as a standard GDP-linked bond, with the coupon and principal indexed to GDP in domestic currency, but with payment made in a foreign currency. Latin American sovereigns have issued such obligations before (Tovar 2005).

2 Empirical work suggests that, depending on the country, wages can be either positively or negatively correlated with GDP, or even uncorrelated.

Level versus growth rate

The two canonical models of GDP-linked bonds are Shiller's (1993) version, which indexes both the coupon and the principal to the *level* of nominal GDP (similar to how inflation-linked bonds have their coupon and principal indexed to the price level), and Borensztein and Mauro's (2004) variant linking the coupon to the *growth rate* (with the principal remaining fixed). We refer to these two different structures as 'principal-indexed' and 'floating rate', respectively.

Indexing the principal to the *level* of GDP stabilises the debt-to-GDP ratio. Indexing the coupon to GDP growth results in more variable interest payments. It requires a payment floor if growth drops below zero but offers more interest relief to the issuer when growth falls. Because principal is not indexed in this variant, it may also satisfy investors desiring principal protection.

Floating rate instruments can stabilise the debt-to-GDP ratio in the same way as principal-indexed bonds can, provided certain conditions are satisfied: the government needs to use the interest savings to buy back bonds, and the growth rate that the coupon payments are linked to needs to remain at or above zero. In this way, coupon-indexed GDP-linked bonds act like an option. The government can choose to use its interest savings to either pay down debt, or opt for fiscal expansion, in which case the debt ratio rises. With principal-indexed bonds, debt stabilisation is automatic.

Maturity

Shiller suggests a GDP-linked bond could be perpetual in tenor. Recent work on contractual terms for a GDP-linked bond (discussed in Chapter 7) envisages one with a long-term maturity, i.e. a lifespan of 10 to 20 years, enough to span more than one business cycle. For the issuer, the longer the maturity is, the higher the probability that its cumulative GDP-linked debt service payments will even out over time. Also, the longer the maturity, the better the hedge the GDP-linked bond provides against lower trend growth. For the investor, longer maturities mean pricing is better able to reflect trend growth rather than short-term fluctuations.

Publication delay and data revisions

For the issuer, one of the most important features of GDP-indexed bonds is that when GDP falls so do debt repayments. This is what gives them their recession-proofing properties. For recession-proofing to be completely timely, all cash flows would have to be adjusted for GDP at the time they are paid. However, in practice, GDP can be measured only with a lag because it takes time to compile and publish the data. In many countries, a first ('flash') estimate of GDP is published two months after the end of each quarter. A second estimate often follows a month later, and a third three months after that. GDP can continue to be revised, even years later.

Publication delay

One way to deal with this delay is to have interest and principal payments based on data measured with a lag, as is done with inflation-linked bonds. The commonly-used Canadian model for inflation-linked bonds incorporates an indexation lag of three months.[3] An indexation lag for GDP-linked bonds of six months (i.e. when the second or third estimate of GDP is available) still leaves the problem of subsequent data revisions.

Revisions

Ideally the investor wants to limit the uncertainty over future payments to the variability in GDP which results from buying the instrument. Data revisions thus add an additional layer of (unwanted) uncertainty.

There are two main types of GDP data revision. One is the routine adjustment of published GDP data that follows previously released estimates, as less detailed early source data or less detailed estimates are replaced with more comprehensive data. Routine adjustments tend to be small. But they continue for a long time, with the data only really being fully settled after five to ten years have passed.

3 Earlier issues of inflation-linked debt used longer lags, for example eight months.

Then there are non-routine revisions to GDP data that occur less frequently. These tend to be larger, mostly upwards, and difficult to predict in terms of magnitude. Often, they occur in order to incorporate census-based data that comes available every five years. They can also incorporate 'rebasings' of GDP, where the weights assigned to different sectors of the economy are revised, giving a more accurate picture of the level of economic activity. The IMF recommends this should happen every five years at least. Nigeria took 23 years, before rebasing in 2014, and as a result had to revise its estimate for the level of GDP the year before upwards by 89%. The impact of such rebasings on measured GDP growth over a given period tends to be much smaller. Advanced countries typically rebase every year using a method that 'chain-links' sector weights, again reducing the recorded impact on measured GDP growth.

Below are two viable indexation methods, with different approaches for dealing with GDP revisions.

i. Indexing to a notional, chain-linked series that is constructed by cumulating together lagged estimates of recorded GDP-growth. This approach constructs a series in a pre-defined way that is then not subject to revisions. It effectively strips out the effect of revisions that shift only the level of recorded GDP, and so reduces their impact on the pay-out on the bond. The advantage of this approach is that investors do not need to worry about the possibility of back-revisions to recorded GDP growth when pricing the bond. As a consequence, all bonds will effectively also be linked to the same GDP index. A lag of six months should work for most countries. The disadvantage is that payments are no longer tied to the latest available measure of GDP growth.

ii. Indexing each payment on the bond to the latest available data for measured GDP growth. This would ensure each payment is made based on the latest available estimate for recorded GDP-growth since the bond was issued. The drawback with this option is that it limits the degree to which uncertainty over future payments on the bond diminishes as the bond approaches maturity. For example, for a ten-year bond that was issued five years ago, the investor, when considering the pay-off on the indexed principal on a maturing bond, will need to consider the scope

for revisions to estimates of GDP growth over the past five years as well as the evolution of growth over the remaining five.

Indexation lag length

For both the issuer and the investor there is a trade-off over the optimal length of the indexation lag. If the lag is too long, then payments may turn out to be indexed to previously high levels of GDP, when in fact the economy has already turned downwards. As a result, the issuer may end up with an obligation to pay out more than it can afford to in bad times. For the investor, this may increase the credit risk of the instrument. Meanwhile, the shorter the lag, the more likely that the early estimates of GDP that bond payments are linked to will have to be revised when better data comes along. Payments may, as a result, either serially under- or over-estimate what they would be if final GDP data is used instead (i.e. they may be biased). They may also be difficult to predict, if early GDP data are a noisy estimate of the final data. Taking both noisiness and predictability into account, work elsewhere (Joy 2017) finds that for many countries a six-month lag strikes the best balance between timeliness of the payment date in relation to economic conditions while ensuring that there is a sufficient period of time for an accurate picture on GDP-growth to emerge.

Methodological changes to the measurement of GDP

Methodological changes to the measurement of GDP can affect its future path. At the start of the 1990s, there was a debate about the impact that 'hedonic pricing' might have on future measured GDP growth. The latest issues of UK inflation-linked bonds offer no protection against improvements in the construction of the retail price index (RPI) that might leave investors worse off in future. Prior to 2002, they did. If any change was considered, by a committee of experts, to be 'materially detrimental' to the interests of bondholders, then they would be switched to a substitute index that stripped out the effect of the change. Over time, however, it was found that investors did not require such protections, so they were discontinued.

Data unavailability

There could be occasions when the issuer is unable to publish GDP data, for reasons outside its control, such as a technical failure at its statistical office. In these instances, the GDP-linked bond can allow for a grace period that gives the issuer time to get its publication of GDP data back on track.

Data misreporting

A common concern about GDP-linked bonds is that governments issuing them might have an incentive to misreport GDP to reduce interest payments. While this is a risk, it is one that inflation-linked bonds also face, and yet these are issued in many countries.

Market discipline may force potential issuers of GDP-linked bonds to take steps to safeguard accurate reporting. Countries with less credible track records would likely pay a higher yield on their GDP-linked debt, but some investors may want to be protected contractually. One way to do this would be to incorporate into the GDP-linked bond's term sheet a set of events that would each constitute an unacceptable loss of data credibility, and if any of these 'put events' occurred, would give the investor the option to be repaid immediately in full.

Provisions to ensure pricing close to par at issue

Because many countries have long-run nominal GDP growth rates that are high relative to government bond yields, a debt instrument whose redemption values are indexed to the level of nominal GDP would provide an attractive expected return to investors through the higher redemption value alone, even with very low (or zero) coupons. This raises a question of whether some investors would prefer more of the expected return to come from the coupon rather than the principal, to smooth cash flows. One technical device to shift the balance of return towards the coupon is a 'principal factor', a simple scalar, which adjusts the redemption amount downwards at maturity by an amount set at issue.

Principal protection

Some bond investors cannot invest in securities that do not offer principal protection. This raises a question of whether principal protection could be offered to widen the investor base and, if it is offered, to what extent this might impact the risk-sharing properties of the instrument. Putting a floor on the redemption value of the instrument could compromise its debt-stabilising properties. Inflation-linked bonds do not universally offer principal protection (a 'deflation floor'). In the US, Germany, France, Italy and Sweden, they do. But in the UK, Canada, Australia and most emerging markets, they do not.

If a floor was needed only for technical reasons, an option could be to design one that is unlikely to be economically binding. A simple way to achieve this would be to set the instrument's maturity at a tenor that would make the probability of the redemption value of the bond falling below par at close to zero (the longer the maturity, the less likely the floor would be hit.).

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7 A Term Sheet for GDP-linked bonds

Yannis Manuelides and Peter Crossan
Allen & Overy[1]

In early 2015, an *ad hoc* group of economists, market participants and lawyers decided to expand the debate on the use of GDP-linked bonds by writing a term sheet for such securities. 'The London Term Sheet' (LTS)[2] serves as a strawman for a focussed debate on their market design and bring into the discussion potential issuers, investors, and other stakeholders.

The difference between GDP-linked bonds and warrants, highlighted elsewhere in this book, is worth repeating here. Warrants are issued in the context of debt restructurings and provide only an upside, never a downside. Their intent is to compensate investors who saw part of their principal disappear in a restructuring by promising a share of the 'better days to come'. What constitutes a 'better day' (and the number of 'sunshine hours') accruing to investors remains controversial and subject to negotiation. The complex and bespoke drafting that surrounds the pricing of warrants makes them illiquid and difficult to price. In some cases, they have delivered more than the issuer had anticipated or (with the benefit of hindsight) found politically acceptable. In other

1 The authors are finance lawyers with Allen & Overy LLP. They are part of the Ad Hoc London Term Sheet Working Group and gratefully acknowledge the contribution and friendship of the other group members, David Beers, James Benford, Starla Griffin, Mark Joy and Christian Kopf. Contributions and discussions with S. Ali Abbas, Matthew Hartley, Leland Goss, Hung Tran and Allen & Overy LLP are also acknowledged with appreciation. Some of the topics covered in this chapter are discussed more fully in Manuelides (2017). Views expressed are those of the authors.

2 Included as an Annex to this book.

cases, their upside features have been so limited as to make them practically irrelevant. This is not altogether surprising, as warrants are issued at a time when the issuer is emerging from a major economic shock, its prospects are uncertain and the commercial bargain with investors both on the size of their loss and of their share in the possible recovery is still in question. Finally, bargaining over the characteristics of the warrants typically ignores the quality and consistency of the GDP data produced by the issuer's authorities.

By contrast, GDP-linked bonds in the LTS design have a principal amount that fluctuates with GDP movements according to an identical formula across the universe of this new asset class.[3] They carry a coupon that also fluctuates in accordance with the same formula. Although GDP-linked bonds can be issued in the context of a restructuring, they are more likely to be issued as part of a long-term treasury management programme that considers the financing needs of the issuer in the context of medium- and long-term economic cycles. To achieve market confidence and investor loyalty the issuing sovereign must comply with the best reporting standards on its GDP, a long-term commitment which requires stability and continuity, the very opposite state to that in which a sovereign finds itself as it emerges from a major restructuring where it had to ask its creditors to forgive part of its debt obligations.

Identity of issuer

Preparing a term sheet for a new market instrument without knowing the identity of the issuer or the requirements of the investment audience allows for a genuinely open debate on the design issues. Nonetheless, in the LTS some assumptions had to be made about the issuer of the GDP-linked bonds, the fictitious sovereign the Republic of Arcadia. Arcadia is an emerging economy still reliant on commodities but with a growing manufacturing and services sector. It is not a member of a currency union and its national

3 Market feedback from certain fixed rate investors, driven in part by their own requirements, was to include an option for a principal 'floor' at par and the LTS allows this option.

currency, the Arkadin, is readily convertible in the international foreign currency markets. Arcadia's institutions are reliable and its statistical authority subscribes to the IMF's Special Data Dissemination Standard (SDDS).[4] Investors can monitor compliance with SDDS through the IMF's annual observance reports and any assessments by IMF staff on data quality as published in Arcadia's Article IV report.

Arcadia was chosen so that the LTS could include features that are unlikely to be found in the issue documentation of GDP-linked bonds by developed countries. The most notable of these features is the provision of fallback options in case Arcadia's data are either not provided or become unreliable. In such cases the terms of the bonds provide for both a deemed uplift of the relevant GDP for the calculation of debt service and for bondholders to put the bonds back to the issuer.

GDP-linked bonds are also appropriate for developed economies and indeed the benefit for such economies has been highlighted in a number of publications by academics and official sector policymakers.[5] In addition, developed countries who take the lead in issuing GDP-linked bonds will help (a) remove any likely first-mover stigma and (b) establish the norms for the granular reporting of GDP and the detailed link between GDP and pricing required by investors.

Put events, governing law and disputes forum

The identity of the issuer will be a major factor in determining the law governing the GDP-linked bonds and the choice of forum where disputes will be adjudicated. Developed countries are very likely to be already issuing bonds subject to domestic law and jurisdiction and this is unlikely to change when they issue GDP-linked bonds. Developing countries issuing fixed rate bonds in domestic currency are also likely to do so under domestic law and jurisdiction. Investors are very likely, however, to require an external, insulating law and corresponding forum if they have concerns over

4 See in this regard the standards for data dissemination promulgated by the IMF. Over 97% of IMF's member subscribe to one of the three standards, enhanced General Data Dissemination System (e-GDDS) for countries "with less developed statistical systems", the Special Data Dissemination Standard (SDDS) for countries with or wishing "access to the international capital markets" and the SDDS Plus to address "data gaps identified during the global financial crisis".

5 See (a) Blanchard *et al.* (2016), (b) Communiqué of G20 Finance Ministers and Central Bank Governors Meeting Chengdu, China, July 24, 2016 and (c) Deutsche Bundesbank press release 1 December 2016.

issuers with no established track record in generating and reporting economic data of an appropriate quality.

An external law and forum (which the LTS proposes to be English law and courts) is likely to be required, principally to give greater legal certainty to certain, optional, provisions in the LTS, protecting investors in case GDP data are not available, or do not meet certain minimum quality thresholds, or Arcadia is not co-operating with the IMF. The protection comes through the ability of any investor to force an early redemption of the GDP-linked bonds if certain 'Put Events' occur and indeed to do so on the basis of a deemed increase of GDP by 10% if the data are not available. The LTS proposals for such events are (a) failure by Arcadia to publish GDP data in a timely manner; (b) non-publication of the IMF's annual Article IV report on Arcadia over a specified period; (c) ceasing to subscribe to the IMF's SDDS; (d) the IMF's Executive Board determining that Arcadia has failed to provide certain information required under the IMF's Articles of Agreement; or (e) Arcadia ceasing to be a member of the IMF.

The legal ontology of GDP-linked bonds

Where exactly GDP-linked bonds sit in the universe of other payment obligations of an issuing sovereign is a question which deserves to be considered, if only because of concerns that this new class of instruments could somehow be senior to other payment obligations and in particular to those of fixed-rate bonds[6].

6 See in particular the IMF Directors' Report and page 37 of the IMF's report on 'State-Contingent Debt Instruments for Sovereigns'.

Table 1. Key legal parameters of the LTS are summarised in the following table:[7]

Issue	Proposal	Comment
Ranking	Equal ranking with all other unsubordinated and unsecured borrowed money of Arcadia.	There is no legal preference of GDP-linked bonds by Arcadia over all its other debt obligations (e.g. bills, bonds, warrants, loans, financial guarantees). The provision is the usual one in the market for all fixed rate bonds and results in equal ranking with them.
Negative pledge	The debt to which this prohibition extends is only Arcadia's capital market obligations to third parties.	This prohibition against encumbering Arcadia's assets to secure Arcadia's other capital market obligations to third parties is the usual one in the market for fixed rate bonds and ensures that all bonds can all be priced on the same unsecured basis.
Cross default	Cross-default rights are granted to GDP-linked bondholders, but only in respect of payment defaults over a minimum amount and only in respect of other GDP-linked instruments.	Investors in GDP-linked bonds do not acquire acceleration rights if fixed rate bond (or other debt) payments are not made, unless the non-payment is in respect of other GDP-linked instruments. This is one of the two provisions through which GDP-linked bonds are differentiated as a class from fixed-rate bonds.
CACs	Collective action clauses (CACs) in the terms of ICMA's model clauses permitting aggregation across all series are included, but aggregation is only in respect of other GDP-linked instruments.	This is the counterpart provision to the cross-default provision that contractually delineates the class of GDP-linked bonds from that of fixed rate bonds. The misunderstandings of certain market participants in respect of the contractual restriction on aggregating GDP-linked bonds with fixed-rate bonds are discussed below.

7 Manuelides (2017) contains a detailed discussion of these topics, including on the operation of collective action clauses as proposed in the LTS.

Should GDP-linked bonds have their own CAC?

Aggregated CACs provisions have provided for the first time a glimmer of hope that sovereign restructurings will be conducted through a simple contractual mechanism – replicating mechanisms successfully used in the corporate world – to bring about restructurings with a super-majority of all creditors. The fear that somehow a new class of debt will arise which will escape the universal coverage of CACs and will permit holdout creditors to subvert restructurings has given rise to the comments cited earlier. Indeed, the critics of the approach taken by the LTS quite correctly point out that the ICMA proposed CACs give the issuer the flexibility to sub-aggregate. Sub-aggregation allows the sovereign issuer to pool together as many of the bond issues as it deems appropriate in a single class and then invite that class to approve with supermajority the restructuring proposal made to the members of that class. Critics of the LTS approach point out that (a) this feature allows the issuing sovereign to treat GDP-linked bonds as a separate class, and (b) therefore there is no need to hard-wire a separate class into the terms of the GDP-linked bonds as this will undermine the universalist project of aggregated CACs and will raise concerns about preferences.

The mechanisms used in the corporate world are either statutory or are supervised and approved by the competent courts. In both instances an overall integrity of process is ensured, which in turn generates legitimacy, acceptability and hence practical success. The success of these mechanisms, therefore, ultimately depends on the underlying integrity of process.

Aggregated CACs, for all their virtues, suffer from the absence of provisions that completely safeguard the integrity of process. In particular, the sub-aggregation rights of the issuing sovereign permit it to do a sort of gerrymandering of the creditors, apportioning them in classes as it sees fit. There is no safeguard in the CACs against such a gerrymandering ability. This ability, moreover, has to be considered in the context of the whole restructuring process that aggregated CACs permit. The restructuring is, in essence, unilateral, as it can be run as a liability management exercise of the issuer's bonds. There is no contractual obligation to engage with the creditors 'as a whole' and although some form of engagement will be required to ensure success of the LME, this can be entirely on the terms of the issuer and can indeed rely on gerrymandering.

Although the CACs have disenfranchisement provisions, these are not strong enough to prevent a determined issuer from gaming these provisions, manipulating pricing through its statements and permitting friendly investors to acquire stakes in particular series of bonds.[8]

So, although aggregated CACs are a necessary condition for the success of sovereign restructurings, they are far from sufficient. For the mechanism to work, integrity of process must be present. There is no doubt that most sovereigns, especially when their restructuring is accompanied by an IMF programme or advice, are unlikely to game the process or seriously undermine its integrity. Unfortunately however, there is nothing in the current mechanism that guarantees this integrity. In particular, there is nothing in the process that guarantees that the issuer will not pool the various bonds in a gerrymandering fashion.

So, although it is correct to say that the issuer does have the ability to sub-aggregate all GDP-linked bonds into a separate pool and create a separate class of GDP-linked bonds which will vote on its own, thereby achieving exactly what is proposed in the LTS, there is no guarantee that this will be the case. The LTS makes this possible and in so doing further promotes the goal of orderly restructuring by providing a further guarantee of integrity of process.

Completing the project

The LTS is only the first step in the journey to develop standardised documentation for GDP-linked bonds. Next steps are likely to include (a) further engagement with sovereign issuers on the potential benefits of issuing GDP-linked bonds under the LTS design; (b) work on contract design of Shari'ah compliant GDP-linked structures; (c) completion of the debate on CACs; d) beginning discussions on the regulatory treatment of GDP-linked bonds; (e) assessment of the LTS by the credit rating agencies (see Chapter 12); and (f) work with market information providers to provide the data necessary for the orderly and fairly-priced trading of GDP-linked bonds.

8 For a discussion of how this can be done, see "Venezuelan debt: 'Qué Pasa?'" by Lee Buchheit and Mitu Gulati in Financial Times.

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Allen & Overy LLP is an international legal practice with approximately 5,200 people, including some 530 partners, working in 44 offices in 31 countries worldwide.

8 GDP-linked securities: Designing instruments for a new asset class

Christian Kopf
Union Investment Group[1]

Introduction

A basic economic function of our financial system is to enable households to shift their consumption spending across time in accordance with their needs. Financial intermediaries such as asset managers contribute to this goal by channelling households' temporary money surpluses to businesses and governments with deficits, expecting a return of this money along with a share of its earnings at a later stage. Depending on the choice of instruments in this process, financial intermediation can achieve varying degrees of functional efficiency in pooling risks and in insuring economic agents against contingencies (Tobin 1984).

Surplus funds made available to businesses in the form of outside equity face the risk of dilution, since management may spend them on perks that benefit themselves while failing to raise the enterprise value. One way of dealing with the agency conflict between the owners and the holders of funds that is inherent in equity financing (Jensen and Meckling 1976) consists in making funds available to businesses in the form of debt contracts. Loans or bonds can guarantee creditors a fixed return on their capital, independently of the spending and investment decisions and the business success of the entities with which they have entrusted their money. Fixed-rate bonds are also the dominant form of government financing.

1 I am grateful to the fellow members of the London-based Ad Hoc Working Group on GDP-linked Bonds, namely David Beers, James Benford, Peter Crossan, Starla Griffin, Mark Joy and Yannis Manuelidis, and to seminar participants at Banco Central de Reserva del Perú, Bank of England, Banque de France, Bretton Woods Committee, Bundesbank, Club de Paris, ECB, EMTA/ICMA/IIF and Secretaría de Hacienda y Crédito Público de México, for helpful comments and corrections.

Fixed-rate bonds, however, suffer from a major problem that impacts businesses and governments alike: the fact that the future remains uncertain. A borrower's ability to repay fixed-rate debt with the contractual interest depends on its ability to grow its revenues, and this growth may not materialise. Recessions may lower a government's tax receipts such that the servicing of sovereign debt becomes unaffordable, and poor business decisions may depress a company's earnings to a degree that they fall below its scheduled interest expenditures. Apart from these repayment problems, payment defaults on bonds can also be caused by the workings of the financial system itself: the, often unfounded, expectation that a debtor may be unable to repay her obligations can unleash a self-reinforcing rise in market yields and a sudden stop in the rollover of maturing debt contracts (Calvo 1998). This applies to corporate and government bonds issued in a currency that the sovereign does not control.

One could argue that such payment defaults are comparable to the loss that an equity investor suffers when the value of her stocks plummets during a recession, or to the hit the holder of domestic-currency denominated fixed-rate government bonds takes when inflation erodes the real value of her financial claims. However, violating the contract terms of a financial instrument via a discrete payment default is fundamentally different from those forms of continuous erosion of purchasing power: the loss in value is sudden, creditors do now know how much they will lose, and they do not know who amongst their group will bear the brunt of the loss. This is why "outright default on government debt is clumsy and costly" (Sims 2012). A government default, or the threat thereof, often brings to a halt all but the most basic forms of financial intermediation in the affected national economy and thereby imposes immense costs on society. Severe frictions in debt restructuring tend to prolong this pain.

The question then arises of whether we can devise financial instruments that avoid the agency cost of outside equity and the resulting volatility of stock markets, as well as the inherent default risk and lack of upside participation of fixed-rate government and corporate bonds. GDP-linked securities, as first proposed by Robert Shiller (1993), can fulfil these requirements better than any other type of financial asset known to us so far.

Designing GDP-linked securities

In order to achieve their potential for investors and issuers, GDP-linked securities need to exhibit a number of design features. The essential ones were incorporated into the London Term Sheet for GDP-linked bonds[2], which was drafted by a group of market participants, lawyers and economists, with input provided by leading institutional investors, public debt managers, trade bodies, academics and international financial institutions (ICMA 2017). This section highlights the key design choices made in the London Term Sheet; legal and commercial dilemmata in defining those instruments are discussed in detail in chapters 6 and 7.

GDP-linked securities should provide investors with a store of value, which can best be achieved by a security with a pre-set maturity date and a well-defined bullet payout at redemption that does not depend on market pricing. To align issuers' payment obligations with their ability to pay, sovereign GDP-linked securities should be denominated in domestic currency and should make payments that are indexed to the level of domestic GDP at current prices, since a sovereign's tax receipts are also denominated in domestic currency and fluctuate with changes in the level of a country's nominal economic output.

In order to provide issuers with automatic debt relief during an economic downturn and investors with increased payments in an economic upturn, GDP-linked securities should have a symmetrical indexation of payments to nominal GDP. This can be complemented with a payment floor on the principal at a sufficiently low level to make the instrument eligible to regulated investors that require a form of principal protection.

Like other forms of state-contingent debt, such as inflation-linked bonds or floating-rate notes that are indexed to Libor, GDP-linked securities are subject to manipulation of the index that defines contractual payments. This risk can be mitigated by including a fallback calculation mechanism for GDP statistics, an early repayment option if the issuer fails to meet certain data reporting standards, and a penalty early redemption amount if reliable GDP statistics are unavailable in a timely manner.

2 Included as an Annex at the end of this book.

These covenants, of course, are only valuable to investors if the issuer cannot abolish them by decree or by an act of parliament. For this reason, GDP-linked securities should be issued under English law, or under another appropriate jurisdiction that governs the issuer's international debt. The issuer, in turn, then requires protection against holdout creditors in the unlikely event of a debt restructuring. This should be provided by including the new model collective action clauses published by the International Capital Markets Association in 2014, including a single-limb provision for the cross-series modification of payment terms with elevated voting thresholds and the disenfranchisement of sovereign holdings in bondholder votes.

When it comes to sovereign debt restructurings, an issuer would typically seek a haircut on its foreign currency debt, because the foreign currency required to service those obligations might not be readily available or affordable. However, issuers may not want to simultaneously default on or restructure local currency-denominated sovereign bonds, since those obligations can be serviced in most *fiat* money systems with the help of the central bank and since the issuer derives utility from preserving the integrity of some form of domestic financial intermediation. This is why, in most sovereign debt crises, issuers have defaulted on foreign currency obligations while remaining current on local currency bonds. Consequently, it appears necessary to preserve the issuer's option to differentiate between domestic currency obligations that are issued under foreign law, such as GDP-linked securities, and foreign currency obligations. This can be achieved by introducing a specific cross-default clause that allows the issuer to cease payments on other borrowed money without risking an involuntary acceleration of GDP-linked securities.

Four advantages of GDP-linked securities for investors

From an investor perspective, GDP-linked securities offer several advantages over other financial instruments that are readily available in the market today. First, GDP-linked securities allow investors to better diversify their financial wealth and reduce risk than holdings of company stocks. Even a well-diversified equity portfolio offers an investor no more than a claim on the earnings of the corporate sector, which is only a fraction of national income. GDP-linked securities, on the other hand, offer investors a claim on the income of an entire economy, and thereby provide them with insurance against

earnings recessions, corporate tax changes or shifts in the labour and capital share of national income. International investors often seek to invest in the growth of dynamic countries; this cannot be achieved with equities, but it can be achieved through GDP-linked securities. GDP-linked securities are also a superior asset for pension funds, which need to match a stream of liabilities that are implicitly or explicitly linked to nominal wage growth, or even GDP growth, as in Italy, Turkey or Uruguay.

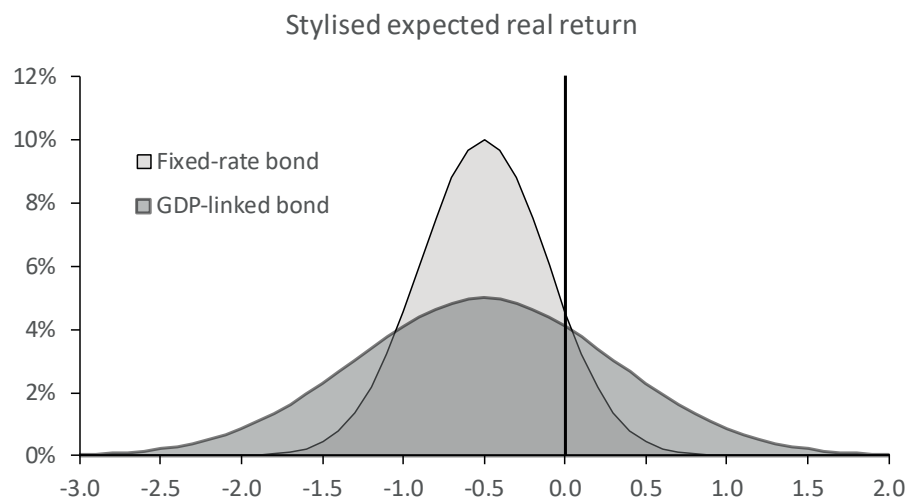
Second, GDP-linked securities offer a better store of value than fixed-rate government bonds in the current environment of very low bond yields. The 2008 global financial crisis led to two sea changes in government bond markets of advanced economies: a rapid rise in public debt relative to GDP and an even more rapid decline in government bond yields, as central banks undertook large-scale asset purchases. As a result, debt-servicing costs actually declined relative to GDP. In this setting, holders of long-term fixed-rate bonds issued by the governments of advanced economies will likely receive negative inflation-adjusted returns, while holders of GDP-linked securities face a somewhat reduced risk of a loss of purchasing power due to the greater variability of payouts under this instrument.

This is illustrated in Figure 1, which compares the payout of a fixed-rate government bond and a GDP-linked bond that both yield 1.5%. If inflation runs at 2%, holders of both instruments should expect an average annual real return of -0.5%. If we also assume that inflation follows a normal distribution, and that the volatility of nominal GDP is twice as high as the volatility of consumer prices, then holders of the fixed-rate bond will face a loss of purchasing power with a probability of 88%, while holders of inflation-linked securities will only suffer a negative real return with a probability of 72%. The probability of a loss of purchasing power on GDP-linked securities declines further if we assume that those instruments carry a positive GDP-risk premium.

Third, GDP-linked securities provide international investors with an embedded protection against currency devaluation. GDP-linked securities do involve a certain transfer of risk from the issuer to the investor, but this risk transfer is not one-sided. Foreign holders of domestic currency fixed-rate bonds can face severe losses when the currency depreciates. Foreign holders of domestic currency GDP-linked securities, on the other hand, possess a natural hedge, since nominal GDP in domestic currency and the exchange rate are inversely correlated.

Currency depreciation boosts nominal GDP both via its positive impulse on net exports and via the increase in import prices (Cabrillac *et al.* 2017).

Figure 1.



Finally, GDP-linked government securities, especially when issued under the provisions of the London Term Sheet, offer investors an elevated level of protection against payment default. This is due to the macroeconomic effect of GDP-linked securities in stabilising public debt service ratios throughout the economic cycle, as well as the legal terms of the proposed instruments. In determining the appropriate GDP-risk premium, investors will weigh the decline in default risk against the increased volatility, novelty and relative illiquidity of GDP-linked securities. The result may well be a small or even negative yield premium over fixed-rate bonds of the same issuer.

Increasing economic resilience through better forms of financial intermediation

Economists often take a Panglossian view of the world and argue that there is no viable alternative to the current structure of financial intermediation, since any change to it would produce winners and loser and the former would not be willing to compensate the latter. Financial innovation, however, is not a zero-sum game.

The development of domestic currency bond markets in emerging economies over the past 20 years has greatly reduced the occurrence of financial crises, which benefits issuers and investors alike, as well as society. This move from foreign currency debt to domestic currency debt has now largely been completed, and the time has come to take the next step, from fixed-rate bonds to GDP-linked securities.

Putting GDP-linked bonds to work could greatly enhance the financial resilience of emerging economies, but it is advanced economies that would reap the largest benefits from the introduction of these instruments. In most of these countries, the rise in sovereign indebtedness over the past decade has instilled a fear in private sector agents that debt-servicing costs could eventually get out of hand and cause another fiscal and banking crisis. These fears and the related decline in 'animal spirits' (Keynes) may be the main reason for the anaemic economic recovery on both sides of the Atlantic. Governments of advanced economies today are in a unique position to take advantage of repressed market yields to shift a portion of their liabilities into GDP-linked securities at a very affordable cost and thereby insure themselves against a rise in debt servicing costs. Apart from providing the public sector with greater fiscal space to face a future economic downturn, the resulting increase in financial resilience could encourage greater economic risk-taking by the private sector and thereby help advanced economies to escape economic stagnation.

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9 The case for GDP-linked sukuk

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In this chapter, we consider an emerging topic for Islamic finance: how sukuk structures can incorporate the risk-sharing properties of conventional GDP-linked bonds. This is pertinent since a) there is an overlap with Shari'ah compliant transaction models emphasising risk- and reward-sharing as a general principle, and b) a significant proportion of high-debt countries are home to majority-Muslim populations, or have governments that may otherwise be open to alternative forms of financing.

Islamic finance and sukuk

Islamic finance refers to activity deemed consistent with Islamic commercial jurisprudence. This jurisprudence, in turn, is informed by the high-level principles of Islamic law ('Shari'ah')[1]. These include: the Aristotelian notion that money has no intrinsic value and should serve only as a medium of exchange; an emphasis on real economy activity and consequent risk- and reward-sharing; a prohibition on involvement in what are considered socially detrimental activities; and a prohibition on interest.[2]

In Islamic finance, sukuk are instruments (excluding equities) which entitle the holder to a share of the beneficial ownership of a Shari'ah compliant underlying asset or activity. Sukuk can therefore be viewed as a securitisation 'wrapper', since the underlying structure will be based on one or more transaction types, which in turn originate from various nominate commercial contracts used in early Islamic history.

1 The terms 'Islamic' and 'Shari'ah compliant' are often used interchangeably in the sector.

2 So for example, trading in debt at other than par value is prohibited, as is making equity investments in prohibited sectors such as alcohol, gambling and tobacco. This also entails avoiding equity investments in firms that are themselves excessively leveraged.

Sukuk can take a variety of forms. At one end of the spectrum sukuk will resemble equities without the voting rights (variable payments; sometimes perpetual in tenor; no safeguard of principal). At the other end, sukuk will be more akin to fixed-income instruments (*de facto* fixed periodic payments; fixed tenors; fixed redemption payments upon maturity). Table 1 summarises the main sukuk types currently in usage.[3] As these classes are based on broad nominate contract types, the economic/risk profile of individual issuances will vary depending on their specific contractual features.

Table 1. Overview of commonly used sukuk structures

Equity-like instruments	Variable-profile instruments	Fixed-income instruments
• Musharakah (pure partnership) • Mudarabah (silent partnership, one party provides capital, the other provides effort/ expertise) *Equity-like instruments normally based on some form of partnership arrangement. Risk/ reward sharing ratio agreed ex ante. Impermissible in these contracts for one party to provide guaranteed fixed payment to the other (either periodic return or maturity payment). Mudarabah sukuk can resemble wakalah in terms of cashflows but contractual relationship between parties differs.*	• Wakalah (agency-based) • Hybrid sukuk *Wakalah represents agency arrangement in which sukuk holders delegate responsibility to issuer to carry out Shari'ah-compliant revenue generating activity. Precise nature of activity can vary, and can encapsulate other transaction types within it (ijarah, murabaha, salaam, etc.). Aggregate return may be fixed or variable. Hybrid sukuk may vary in form at different points in life cycle (e.g. istisna' + ijarah sukuk may be used by issuer to raise funds to first build an asset before leasing it out).*	• Murabaha (sale at mark-up) • Salaam (forward commodity sale) • Istisna' (manufacturing sale) • Ijarah (lease-based) *Fixed-income instruments normally either sale- or lease-based. Sale-based contracts represent a debt, therefore cannot be bought/sold in secondary market at other than par value. Lease-based contracts (ijarah) have no secondary market restrictions, as revenue streams based on tangible underlying asset. Ijarah sukuk also typically have redemption payment, representing return of beneficial interest in underlying asset back to sukuk issuer.*

Current sukuk market structure

Figure 1 provides a breakdown of sukuk outstanding by value, showing how the market for these instruments has grown over recent years. The most common sukuk types are

3 This is not an exhaustive list.

ijarah (lease-based) and murabaha (sale-based). Wakalah sukuk, salaam sukuk and hybrid structures are included in the 'other' category.

There are no faith-based restrictions on who can purchase sukuk. Some investors do so in observance of religious principles, but sukuk are also frequently held by conventional investors to diversify their portfolios. In terms of market supply, most sovereign sukuk is issued by governments of countries with majority Muslim populations, though notable exceptions include the UK, Luxembourg, South Africa and Singapore.

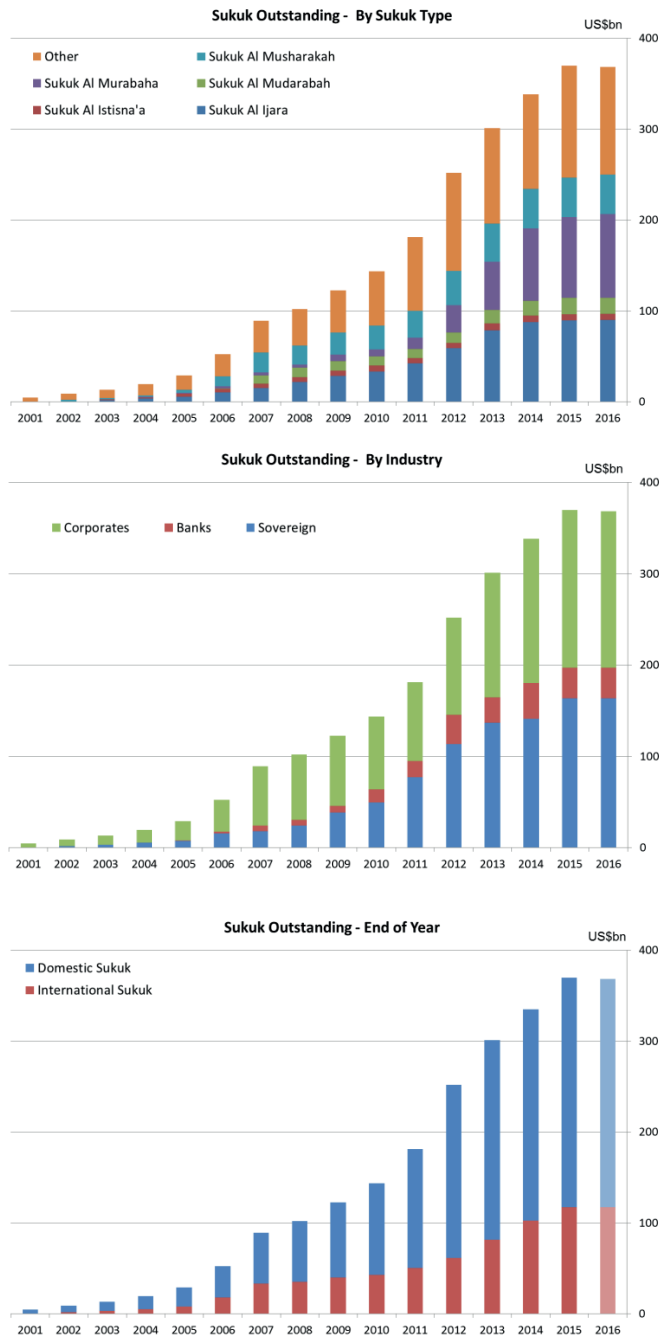
What types of sukuk might be GDP-linked?

No GDP-linked sukuk have yet been issued. Academic research on such instruments is also limited, but at least two structures have been suggested in the literature. The first is a hybrid form called 'forward ijarah', which appears similar to istisna'+ ijarah described in Table 1 (referred to as **hybrid ijarah** here). The second structure is musharakah. However, a pure form musharakah structure may not be suitable for a GDP sukuk, because it relies on symmetry of roles/responsibilities between the contracting parties that do not normally exist in a sukuk holder/sukuk issuer relationship for sovereign instruments. Instead, the **mudarabah** (silent partnership) model may be more appropriate. We therefore focus on hybrid ijarah and mudarabah models as GDP-linked sukuk vehicles.

Option A: The hybrid ijarah structure

The main difference between hybrid ijarah and a plain vanilla ijarah is that, for the latter, common market practice is that the return is *de facto* fixed rate, since it is underpinned by regular lease payments (and the target investor base prefers a fixed coupon). However, it would be possible to calibrate the periodic return on a hybrid ijarah to track GDP. The key advantage of a hybrid ijarah is that it can be used to create a tangible underlying asset, which is especially useful for emerging market economies with a limited current fixed asset base. Box 1 illustrates a possible GDP-linked hybrid ijarah sukuk structure.

Figure 1. Breakdown of the sukuk market by issuances outstanding



Key considerations for hybrid ijarah

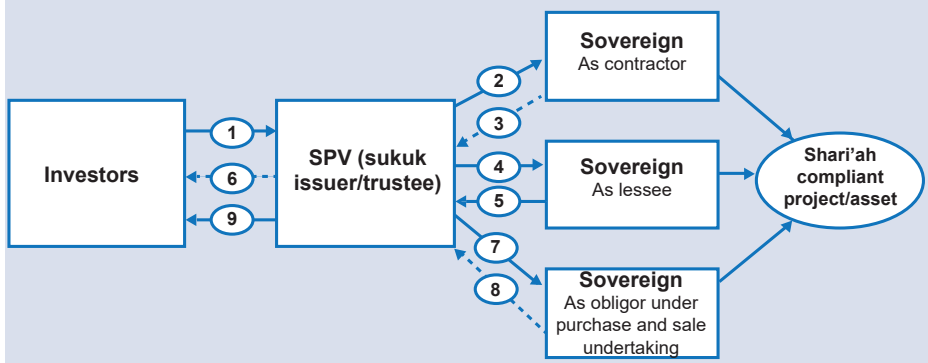
- **Secondary market liquidity/tradeability**. During the istisn'a/manufacturing phase of the contract, it is characterised as a debt obligation, so in most jurisdictions cannot be bought or sold at other than par value. Secondary market liquidity during this initial phase is therefore constrained, which may make it less attractive for investors – one of the reasons why this structure is less common than other structures (see Figure 1). However, this constraint only applies for a finite period. It falls away during the leasing phase of the contract, and may in any case be less material for potential investors in GDP-linked instruments who have longer-term investment horizons.
- **Efficient allocation of funds**. As is common for construction projects, in the manufacturing phase payments are made to the sovereign as contractor on a staged basis, upon the completion of specified project milestones. This means that in the interim, the unpaid portion of sukuk issuance proceeds needs to be invested in a Shari'ah compliant manner to avoid negative carry.
- **Views on Shari'ah compliance of the contract**. A detailed analysis of Shari'ah compliance falls outside the scope of this discussion, but scholarly opinion can vary on the permissibility of forward ijarah contracts.[4] It may be possible to address this through careful contractual wording on the leasing phase of the arrangement. Alternatively, Shari'ah advisors to the issuance may place greater emphasis in their assessment on broader principles of social benefit ('maslaha') which are consistent with the motivation behind GDP-linked instruments.[5]

4 Concerns centre chiefly on the permissibility of selling an asset that does not yet exist.

5 It is worth noting that the general prohibition on selling an asset which does not yet exist/is not in current prohibition does not apply to e.g. salaam transactions, which are the forward sale of agricultural produce not yet grown. This is an example of broader 'maslaha' considerations superceding specific prohibitions.

Box 1. GDP sukuk based on a hybrid ijarah structure

An *istisna'* + *ijarah* hybrid sukuk is a contract of two parts/stages. In the first stage, the sovereign will use the funds raised via the SPV (which consolidates the interests of investors) to manufacture some sort of fixed asset (e.g. hospitals, schools, power stations, roads). In the second stage, they will lease the asset back from the sukuk holders for a fixed period, before buying the asset outright at maturity for a predetermined sum. The basis upon which the periodic lease payments are made by the sovereign to the investors is flexible, and can be benchmarked/periodically adjusted as appropriate.



1. Investors pay for sukuk issued by SPV, representing an interest in the underlying asset or transaction. The sukuk also represents a right against the SPV for periodic payments (coupons) and a dissolution/redemption amount.
2. The SPV declares a trust over the proceeds (and any assets acquired using the proceeds), thereby acting as trustee on behalf of investors.
3. The sovereign undertakes to deliver at a future date the asset, which it then constructs.
4. The SPV as trustee pays consideration to sovereign for the asset. This can be paid in instalments over the construction period, and in aggregate will sum to the principal amount. The SPV will also agree to forward-lease the assets to the sovereign for a period corresponding to the tenor of the sukuk
5. The sovereign as lessee makes periodic lease payments on the asset to the SPV. Commercial ijarah sukuk commonly pay a fixed return, but it is feasible/permissible under Shari'ah to agree a variable return based on GDP.
6. The SPV makes periodic payments to investors.
7. The SPV sells the asset to the sovereign at maturity/dissolution.
8. The sovereign pays the redemption/dissolution amount to the SPV.
9. The SPV pays the redemption/dissolution amount to investors.

Option B: the mudarabah structure

This model may be an appropriate alternative to the pure partnership musharakah model, because it entails the sukuk holder providing working capital to the sovereign ('mudarib') to run their 'business', i.e. the country. It is perhaps the closest analogue to an investor taking an equity interest in a sovereign – and consequently accepting a variable return on their investment as determined by acceptable GDP indicators. Box 2 illustrates how a mudarabah structure could be used for a GDP sukuk.

Key considerations for mudarabah

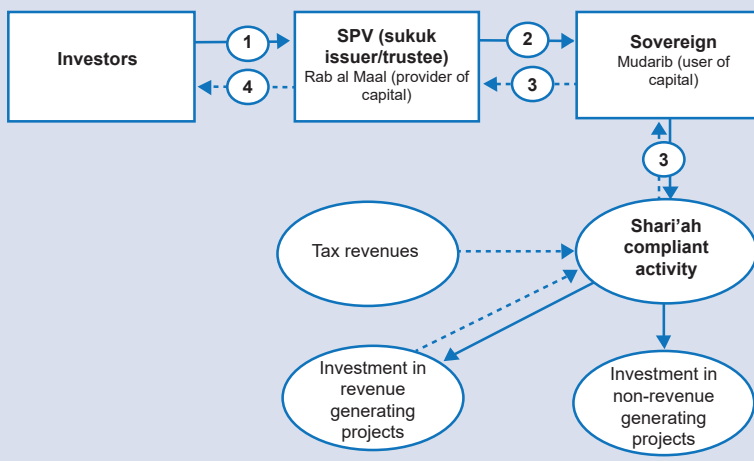
Because a mudarabah sukuk represents a share of the beneficial interest in an economy as a whole (i.e. the 'enterprise' value), a prescriptive list of tangible underlying assets may not be required for the hypothetical 'portfolio' of government activity being invested in. This question would benefit from further examination, but initial analysis raises two main points:

- **The proportion of intangibles in the portfolio**. It would be permissible for tax receivables from Shari'ah compliant activity to be included in the portfolio,[6] and doing so would demonstrate a clear connection with GDP, since tax revenues can be assumed to broadly correlate with economic growth. However, this constitutes debt in Shari'ah terms, so if the proportion of such receivables in the portfolio breaches certain thresholds, it will restrict secondary market tradeability in the sukuk.
- **Usage of sukuk issuance proceeds for permissible activity**. At a macro level, a sovereign would have considerable freedom to use the funds raised from a mudarabah sukuk issuance as they deem fit. There may however be some restrictions. For example, such proceeds could not be used to develop the conventional interest-bearing financial sector of the economy. Investment in nuclear power might also be deemed impermissible (though this would need to be confirmed by the relevant Shari'ah advisors to the specific issuance). It may however be permissible to use sukuk issuance proceeds to pay down the existing conventional debt obligations of the sovereign, as this fits within the broader objective to reduce reliance on interest-based financing.

6 Though segregating Shari'ah compliant from non-Shari'ah compliant tax revenues (e.g. levies upon tobacco or alcohol industries) may be challenging for the relevant tax authority.

Box 2. GDP sukuk based on a mudarabah structure

A *mudarabah* arrangement is a silent or modified partnership model in which one party provides capital, the other party provides labour/expertise, and the return on the enterprise is split according to a predetermined ratio. Within a sukuk structure, the sukuk holders' interests would be consolidated through the use of an SPV, which in contractual terms is designated as the provider of capital ('rab al maal'), and the sovereign is designated as the user of capital ('mudarib'). Mudarabah agreements can be unrestricted or restricted, based on the extent to which the sovereign's use of the funds is pre-specified/limited (i.e. against any non-Shari'ah compliant activity).



1. Investors pay for sukuk issued by SPV, which declares a trust in favour of the investors over the proceeds of the issuance.
2. The SPV as trustee passes the proceeds of the issuance of the sukuk to the sovereign as mudarib, according to the terms of the mudarabah agreement.
3. The Sovereign as mudarib agrees to contribute its effort and expertise, using the capital provided through the SPV by investors to generate a return based on general government projects and tax receivables from Shari'ah compliant sources, to be divided between the Sovereign and investors via the SPV according to a predetermined Profit Distribution Ratio.
4. The periodic profit rate payments and any dissolution amount due to redemption/default are paid to the investors.

Across both GDP sukuk models, there are number of additional factors which warrant further consideration:

a. **Pricing.** It is unclear at this stage whether GDP-linked sukuk would incur a premium above conventional traditional sovereign debt of the same tenor, or conventional equivalent GDP-linked bonds. Market engagement would therefore be necessary to form a view. In the UK, previous experience with the 2014 UK sovereign ijarah-based sukuk shows that that issuance was priced at par with the equivalent conventional five-year debt issuance – 2.036% – and heavily oversubscribed. While there may be a general GDP premium to this class of instruments, the position of a relatively highly rated sovereign such as the UK as an issuer may skew this effect. Diaw *et al*. (2014) break down the return on a hypothetical hybrid ijarah GDP sukuk as follows:
GDP sukuk return = risk free rate[7] *+ default premium + growth risk premium + novelty premium*
They note that while the growth risk premium will likely persist over time, the novelty premium will likely decrease if/as these instruments become more commonly used. In this pricing model, it may be appropriate to recognise how risk-sharing should reduce probability of default by explicitly subtracting a portion of counterparty credit risk from the default premium. As discussions on GDP sukuk progress, it would be useful to test these assumptions on pricing against actual investor demand, and on the extent to which pricing might differ between the two GDP sukuk models, and between GDP sukuk and their conventional equivalents.

b. **Currency of instrument**. Sukuk issuances targeted at international investors are typically USD-denominated. By contrast, issuance in the London Term Sheet design for GDP-linked bonds (see Chapter 7) would be local currency-denominated to avoid FX risk for the issuer.[8] Further discussion on choice of issuing currency would be beneficial.

7 The authors suggest using the prevalent mudarabah deposit rate to represent opportunity cost. In practice, this often tracks the conventional benchmark risk free rate, so it may be appropriate to simply use the latter, especially if the target issuer base is also engaging in conventional interest based activity anyway.

8 Though this is less of an issue for sovereigns with dollar-pegged currencies, as is common in e.g. the Gulf.

c. **Governing law**. The majority of sukuk issuances aimed at international investors are governed by English law – this is flexible and allows for netting of obligations in the event of default.[9] Though there has been some discussion of using the domestic law of the issuing sovereign for GDP-linked bonds, this could make a sukuk less attractive to international investors, especially if local law is unclear or weak on certain issues. Two issues in the past have been the appropriate use of arbitration mechanisms, and treatment/permissibility of netting off exposures in the event of a default.[10]

Sovereigns interested in raising Shari'ah compliant or non-interest based financing may opt for one or both of the sukuk models described in this chapter, depending on their specific circumstances. Factors which will feed into their choice will include the nature and extent of their need for, and pre-existing stock of, suitable fixed assets, and size of their tax base.

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About the author

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9 A small proportion, estimated at less than 5%, of international issuances references New York State law.

10 Though technically not a sovereign, these were material issues for Dubai during its 2009 debt crisis.

10 GDP-linked or similar instruments in sovereign debt restructurings

Mark A. Walker
Millstein & Co.

Introduction

As interest grows in exploring the potential stabilising effects of governments issuing GDP-linked bonds, it is also natural to explore the use of variable payment instruments as a technique to aid in the restructuring of sovereign debt. For example, a sovereign experiencing difficulty in servicing its debt might seek to exchange conventional debt for variable payment instruments, such as bonds with payments linked to GDP or Gross Financing Needs (GFN).[1] The following discussion seeks to identify and comment briefly on the complex issues likely to arise in such an exercise.

Private sector precedents

In addition to adjusting the interest rate, maturity, amortisation schedule and principal amount to be repaid, private sector restructurings frequently include an equity element in the form of a debt-for-equity exchange, or the delivery to creditors of warrants to buy stock off the debtor or an affiliated party. This equity element offsets the impairment of creditors' claims with the potential to realise gain if the fortunes of the debtor improve. Importantly, in the case of a debt-for-equity exchange, the creditor may or may not suffer immediate impairment (depending on the price of the stock at the time of the exchange).

1 In the case of a country that is heavily dependent on the export of a single commodity, one might envisage a variable payment instrument linked to the price of that commodity. Such an instrument would pose a number of the issues discussed here, as well as some new ones, but is beyond the scope of this chapter.

The creditor exchanges its position as a debtor with a fixed claim subject to credit risk to that of a shareholder with no fixed claim and with both downside risk and upside potential depending on the performance of the enterprise and its stock.

Sovereign precedents

Although sovereign governments do not issue equity, they have agreed, on several occasions[2], to offset impaired creditors' claims by issuing a combination of new debt and so-called value recovery instruments that provide for payments in amounts based on a formula that is a function of GDP growth, an increase in oil prices or the like.[3] In the case of GDP-linked instruments, it has been customary to base payments on performance that exceeds a specified target – one tied to an IMF programme, for example. In contrast to this model, the current proposals for GDP-linked bonds would vary payments with changes in nominal GDP. To date, there has been no sovereign debt restructuring in which the creditor assumes downside risk (beyond the initial impairment of claims reflected in the terms of the restructured debt itself) because of debt service payments tied to GDP or GFN.[4]

GDP linkers

The official sector and some quarters of the private sector have recently shown interest in exploring the issuance by governments of GDP-linked bonds to raise new finance. In the design that has attracted the most attention, the principal amount of these bonds (and thus the interest payable) would adjust upward or downward periodically and automatically as a function of nominal GDP. (Design of the formula itself raises many interesting issues, some of which are discussed briefly below.)

2 Beginning with Mexico's Brady deal in 1990.

3 It has been observed that these warrants have been difficult to price and often were assigned negligible value by the market when issued, notwithstanding that some have paid generously over time. The author submits that this is a function of the design of the warrants (in particular the linkage formula) and not a difference between warrants and indexed debt securities *per se*.

4 Sovereign debtors have occasionally allowed their creditors to exchange debt for newly-issued shares of private sector, or to use debt as currency in a privatisation, or to settle tax liabilities. Often, these transactions have allowed for a sharing of the discount reflected in the market price of the debt exchanged. Although the restructuring may create the framework, actual transactions have been one-off, voluntary deals and not an integral element of the restructuring itself.

The perceived benefit of these instruments is that, by allowing payments to fluctuate in line with a proxy for a debtor's capacity to pay, the risk of inability to pay – and therefore of restructuring – would decrease. Conversely, bondholders would be compensated for their risk of a reduction in payments by the potential increase in payments should the debtor's fortunes improve. Although both private sector issuers and governments have issued inflation-linked debt in sizeable amounts, no sovereign has issued debt linked to GDP. Inflation-linked instruments appeal to buyers looking to preserve purchasing power (and, in the case of many issuers that do not allow the principal amount to decline below face value, to protect principal as well). These debt securities have demonstrated appeal to a large segment of the market.

GDP or similar linked instruments in sovereign debt restructurings

As noted above, bonds linked to GDP or GFN have not been used as currency in previous sovereign debt restructurings. What concerns might a creditor have as it considers the possibility of exchanging conventional bonds – albeit bonds trading at distressed prices or perhaps even in default – for instruments linked to GDP or GFN? And under what circumstances would this approach offer advantages over current sovereign debt restructuring practice?

To answer these questions one must, on the one hand, assess the degree to which the use of indexed instruments as exit securities will offer effective protection against a future restructuring and, on the other hand, address the attractiveness of the instrument to creditors whose debt is to be restructured and to the market generally.

Countries restructure their debt when they lose market access and their debt-to-GDP or GFN-to-GDP ratio is unsustainably high. Ideally, GDP will grow faster than debt or GFN, debt will become sustainable and the debtor country will regain market access. This rebalancing may begin immediately, but in many cases, countries need to increase their public indebtedness to finance ambitious adjustment programmes and, as a result, their debt dynamics deteriorate before they begin to improve. In such a case, a GDP- or GFN-indexed instrument issued as the exit instrument in a restructuring, particularly one with a symmetrical adjustment formula, will not operate in the same fashion as a similar instrument issued by a healthy sovereign borrower.

If a borrower's debt or GFN to GDP ratio is well below the threshold of sustainability, an instrument that guards against an unsafe increase in either ratio can perform a salutary function even if it maintains the ratio in good times.

On the other hand, a country whose debt or GFN to GDP ratio is already excessive will be ill-served by an instrument that preserves that unhealthy ratio in periods of high growth and does not allow the debtor to grow out of its excessive debt.[5] This is the last thing an over-indebted country needs. But if the adjustment formula is symmetrical, moving to a formula that allows debt or GFN to grow more slowly than GDP will provide less protection on the downside when GDP declines.

How will creditors view a restructuring proposal in which they are offered indexed securities in exchange for their existing debt? At the time of restructuring, the creditor group will almost certainly include distress buyers whose sole motivation is to turn a quick profit by trading out of the post-restructured debt as soon as possible. For these creditors the incremental value of their exit instruments over their cost, and the presence of sufficient liquidity in the market to enable them to sell their newly indexed bonds at an attractive price is all that matters. They will have scant interest in the performance of the new instrument, except to the extent that it affects their ability to exit on favourable terms. Other members of the creditor group at the time of the restructuring may be unable to hold GDP or GFN indexed bonds for legal or policy reasons. These creditors too will be looking for an early exit and will have similar interests and concerns to those of the distress buyers.

Other holders, although not hold-to-maturity investors, may like the option of staying with the credit for the medium term, in order to realise greater upside. For these creditors, liquidity and the risk of future value impairment will be of paramount importance. A medium-term horizon of, say, three to seven years may be insufficient to provide much assurance of value retention for a country that has just exited from a restructuring,

5 Based on a list of the sovereign debt restructurings referenced in the IMF Working Paper 'Sovereign Debt Restructurings 1950–2010: Literature Survey, Data, and Stylized Facts' and data from World Bank's International Debt Statistics, external debt as a % of GDP ratchets down 10-20% on average during the 5-10-year period post-restructuring. This is due to the fact that GDP grows at faster rate of 6-7% per annum than external debt stock which grows at 0-2% per annum during the 5-10-year period post-restructuring.

and countries that have just completed a restructuring frequently lack market access for some period of years. As a result, this group of holders may look for a higher yield than buyers investing for the long term.

It is also the case that exchange debt issued in a restructuring typically begins to amortise well before final maturity. A country that is fortunate enough to experience high rates of growth in the early post-restructuring period, but whose debt remains unsustainably high and has increased materially along with GDP, would be ill served by having to repay this debt at a premium to its value at issuance. In private sector restructurings where creditors receive equity, a tripling of equity value does not imply that the issuer must pay three times as much. But a GDP-linked debt instrument is different from equity. Here, if the value increases (because of an increase in GDP for example) the sovereign must pay more. And if the payment formula is not well-designed, the upside can be wholly out of proportion to the downside.[6]

Of course, a sovereign debtor could issue a combination of indexed and conventional debt in its restructuring, and in any event its debt portfolio may include significant amounts of non-restructured conventional debt. In the first instance, a mechanism will be needed to allocate the indexed debt and the conventional debt among restructuring creditors. (A discussion of how this might be done is beyond the scope of this paper, but examples abound of sovereign debtors offering holders a menu of options, sometimes with a requirement of minimum issuance of items on the menu.)

In either case, the taker of indexed debt in a restructuring will want to know how its new instruments will be treated *vis-à-vis* conventional debt in a subsequent restructuring, particularly if the events giving rise to the new restructuring have caused a decline in the principal of the indexed debt.[7] An argument could be made to accord a measure of seniority to the indexed debt.[8] Thus, one might require conventional bonds to be restructured first, before touching the new linkers.

6 Rao (2017). And note that a symmetrical formula does not ensure symmetry of upside and downside risk.

7 One can imagine a scheme in which indexed bonds would revert to their original pre-restructuring terms and status in the event of a subsequent restructuring and then be restructured along with other debt starting from their original terms.

8 To a private sector practitioner this result would seem counter-intuitive, as equity-like instruments are almost by definition junior to debt.

Put differently, one might imagine requiring an NPV reduction of outstanding conventional bonds at some prescribed level before the linkers would be asked to suffer further impairment. Issues relating to seniority become extremely complex and raise delicate questions of intercreditor treatment, which are all the more difficult to resolve as outstanding conventional bonds do not, of course, included provisions specifically designed to deal with these issues. Just as we thought that *pari passu* issues had gone away post Argentina, and the market has agreed on a revision of the wording of standard *pari passu* clauses, preferential treatment of linkers in a restructuring context might well reopen this can of worms as there is no market-accepted standard by which to determine comparable treatment of conventional debt and indexed bonds. This issue does not arise with warrants, which typically are not restructured.

To avoid a number of the issues highlighted above, one possibility is to issue new linked debt that does not increase or reduce principal but rather adjusts interest payments and the timing of principal repayments only.[9] Thus, principal payments could be accelerated in good times and deferred in bad times, resulting in faster or slower payback, and interest payments could be deferred and capitalised in part (but not forgiven). This approach – with no adjustment in principal – has been explored by the official sector in the case of the Greek debt held by it, where the IMF has argued forcefully that Greece's official debt needs to be restructured and the official creditors are subject to legal and political constraints that preclude reducing principal. One risk of this approach is that constant deferrals of amounts due as a result of prolonged underperformance will either extend maturities for a very long time or result in a large amount of deferred payments that will need to be refinanced.

Conclusion

A mechanism that automatically adjusts debt service payments due by a sovereign as a function of its capacity to pay should be as useful in the context of new debt issued in a restructuring as it is in the issuance of debt outside the restructuring context.

9 Sovereign debt instruments that would automatically adjust payments without modifying principal have been christened sovereign cocos. Consiglio and Zenios (2015).

That said, such a mechanism needs to be carefully calibrated. For a debtor with a debt-to-GDP or GFN-to-GDP ratio above the level of sustainability following a restructuring, it is not obvious that a symmetrical mechanism will provide adequate downside protection without depriving the debtor of the critical possibility of growing out of its debt problem. Alternatives would include a larger haircut or an asymmetric adjustment mechanism, each of which introduces its own problems. To create such a mechanism and persuade bondholders that it will operate as intended will be a challenge. Additionally, inter-creditor issues and the treatment of indexed debt in a future restructuring introduce new issues that might counterbalance the hoped-for advantages of reducing the likelihood of a future restructuring. For these reasons, the design of the linkage formula, the amortisation schedule and the composition of the country's debt post-restructuring take on heightened importance in the context of a debt restructuring.

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Mark Walker is a Managing Director and head of sovereign advisory at Millstein & Co. Mr. Walker was a Managing Director and head of sovereign advisory at Rothschild London from August 2012 to October 2014 and a senior advisor at Lazard Paris from June 2011 to July 2012. Mr. Walker led the Rothschild team that advised Cyprus during its financial crisis in 2013 and co-led the Lazard team that advised Greece in 2011 and

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Part III: Market Development

11 Estimating GDP-linked bonds' volatility risk premiums

Joel Bowman and Kevin Lane
Reserve Bank of Australia [1]

Introduction

In principle, GDP-linked bonds may be attractive to both issuers and investors. For potential investors, GDP-linked bonds would provide an opportunity to gain direct exposure to economic growth, though they are likely to demand higher returns to compensate them for the associated risk. For the government, the issuance of such securities has the potential to improve its debt sustainability. In particular, GDP-linked bonds could reduce a government's debt-servicing burden during an economic downturn, which could in turn reduce the probability of a sovereign default (see, for example, Benford *et al*. 2016 and Cabrillac *et al*. 2017). The overall effect of issuing GDP-linked bonds on the probability of default will depend not just on this stabilising effect but also on the level of borrowing costs associated with these securities. Previous studies have found that the benefits of GDP-linked bonds would outweigh the costs so long as the volatility premium is less than 200-350 basis points (Barr *et al*. 2014 and Blanchard *et al.* 2016).

The borrowing costs associated with GDP-linked bonds will depend to a large degree on the compensation that investors require for bearing the risk associated with GDP growth. To see this, it is instructive to decompose the premium paid on GDP-linked bonds into sub-premiums (Blanchard *et al*. 2016 and IMF 2017):

1 This chapter is based on a *Reserve Bank of Australia Bulletin* article (Bowman and Naylor 2016). Views expressed in this chapter are those of the authors and not necessarily those of the Reserve Bank. Use of any results from this chapter should clearly attribute the work to the authors and not to the Reserve Bank of Australia.

- A *liquidity premium*, required to compensate investors for the degree of difficulty in converting the asset into cash at fair market value.
- A *novelty premium* and *model uncertainty premium*, the additional return investors would demand on new, complex investment products.
- A *default premium*, required to compensate investors for the risk that the debtor will not make the required repayments (this could theoretically be lower than that of traditional debt, if GDP-linked bonds were to make debt more sustainable).
- A *volatility risk premium (or growth risk) premium*, which would compensate investors for taking on some of a country's economic growth risk.

The liquidity, novelty and model uncertainty premiums could be high initially but may decline over time as the market for GDP-linked bonds develops and investors gain experience pricing these securities. As noted by the IMF (2017), this development process could be advanced by the 'test issuance' of GDP-linked bonds by governments of major countries. For these larger countries, concerns around data integrity and adverse selection would be less problematic. The default risk of GDP-linked bonds would be closely linked to the size of the premiums on existing debt, but would also depend on the extent to which investors perceive the issuance of GDP-linked bonds to have changed the sustainability of the issuer's debt. The default risk premium will therefore depend on the level of other premiums, including the volatility risk premium. Therefore, estimates of the volatility risk premium will be crucial in assessing the feasibility of GDP-linked bonds.

The volatility risk premium would compensate investors for bearing the risk associated with uncertainty in GDP growth. To estimate the volatility risk premium, this chapter employs the capital asset pricing model (CAPM). The basis of the CAPM is that investors are not concerned with the riskiness of an asset *per se*, but the effect of the asset on the overall riskiness of their portfolio. With this model, the required rate of return of an asset depends on the historical relationship between its returns and that of a market portfolio. Therefore, the choice of the market portfolio and the sampling period can influence the estimates.

Methodology: Estimating the volatility risk premium

This chapter employs the CAPM to estimate a range of estimates for the volatility risk premium, with a view to gauging the sensitivity of these estimates to the assumptions used. The premise underlying the CAPM is that the required return for a risky asset depends on the level of risk it contributes to the overall portfolio. This contribution is the degree of systematic 'risk', as measured by 'beta': the sensitivity of the asset's returns to that of the market portfolio, and hence the level of risk that cannot be avoided by holding a diversified portfolio of assets. An asset will have a higher beta – and a higher degree of systematic risk – if its returns are highly correlated with, and more volatile than, the market portfolio.

The CAPM is not the only method that may be used to estimate the risk premiums on GDP-linked bonds. Nonetheless, the CAPM is widely used by analysts in pricing risky securities, so CAPM-implied risk premiums will play some role in determining the feasibility of issuing GDP-linked bonds. However, the results from CAPM may depend on the assumptions used, highlighting the need to take into account the results from a range of approaches.

In particular, it is not clear what benchmark should be employed as a proxy for the market portfolio. In theory, the market portfolio should include all types of assets held by investors, but such a portfolio is unobservable (Roll 1977). Common market portfolios used include US and world equity prices, though previous studies have also used US GDP growth and world GDP growth (Borensztein and Mauro 2004). GDP may contain information on the returns of investable assets not captured by equities. In addition, the GDP benchmark is relevant to the extent that investors' returns are closely correlated with GDP, which will be the case if they already hold GDP-linked bonds issued by the US or other nations.

Beyond using four different benchmarks, this chapter tests the sensitivity of CAPM with two extensions. First, it presents the results using downside CAPM, a variation of CAPM in which only the below-average results factor into the return required by the bondholder. Second, the CAPM is estimated over a range of rolling 15-year sample periods to display the sensitivity of the results to the time at which they are estimated. For each of these variations, we take the G20 member nations as our sample, since

the governments of these major nations would be best placed to participate in a 'test issuance' to help reduce liquidity, novelty and model risk premiums.

Results

The volatility risk premium is estimated to be relatively modest for each of the G20 countries when using established equity benchmarks, such as the world (MSCI Equity Price Index) or US equity prices (S&P 500) (Table 1 and Figure 1). The median volatility risk premium is around 30 basis points across the G20 countries when using world equities or US equities as the benchmark portfolio. The estimates of the risk premium are substantially higher when world GDP is used as the benchmark portfolio. This is largely because GDP-linked bonds are estimated to have a higher beta with respect to world GDP growth (Figure 2). Relative to the other benchmarks, world GDP growth is less volatile and more closely correlated with GDP growth of other nations. There is also much greater variation in the level of the premium across countries for this benchmark. Overall, these results show that the choice of the market portfolio can have a large effect on the estimate of the volatility risk premium.

Table 1. Estimates of Volatility Risk Premiums (basis points)

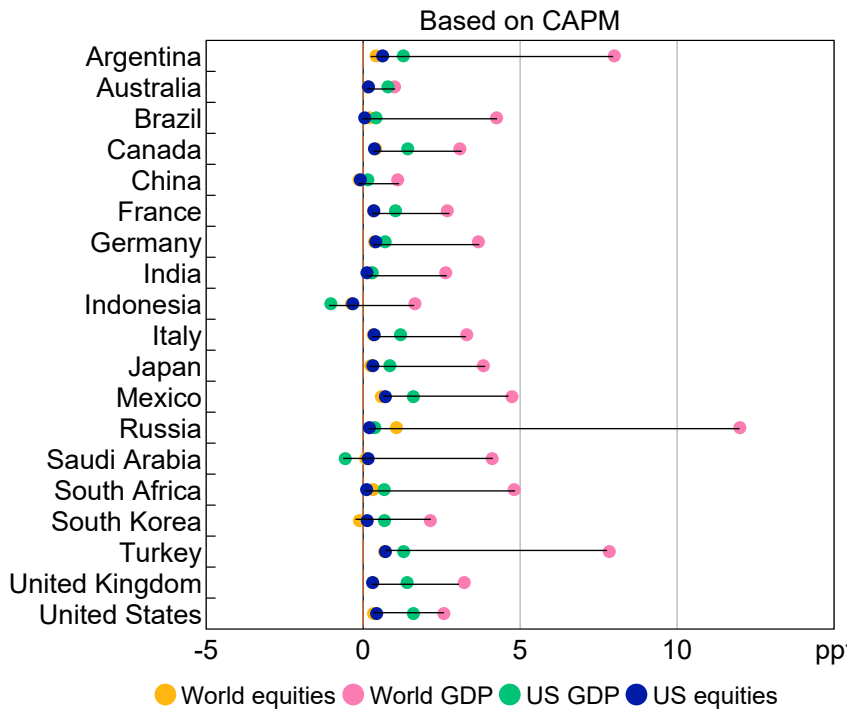
Median across G20 countries[(a)]

	World Equities	US Equities	World GDP	US GDP
Baseline	30	32	330	79
+ Downside CAPM	10	21	165	66
+ Rolling CAPM (max)	18	19	140	81

(a) The estimates use annual data from 1989 to 2016, except Russia, which begins in 1993 due to data availability. We assume a real risk-free rate of zero, expected market rate of return on equities of 6.5%, US GDP growth of 1.6% and World GDP growth of 3.8%. The real risk-free rate is broadly consistent with US 10-year Treasury inflation-index bond yields, the equity returns is equal to the long-run average return on US equities (Siegal 2014) and US and World GDP equal to the long run projections in the IMF October 2017 World Economic Outlook.

Sources: Bloomberg; IMF; RBA

Figure 1. Growth premium estimates - different market portfolios*



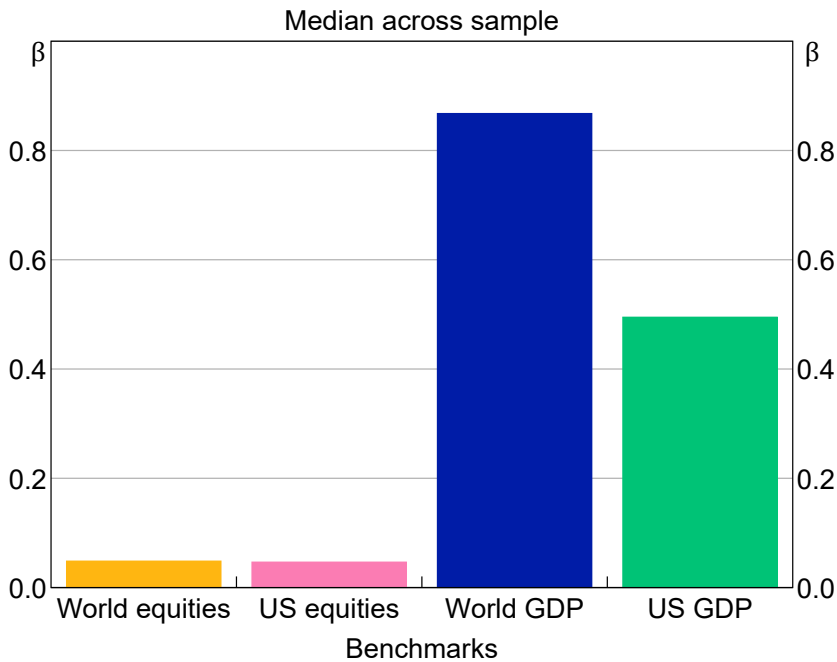
*The graph range represents the minimum and maximum estimates of the growth risk premium using world GDP, US GDP, world equities and US equities as the benchmark portfolio

**Restricted sample beginning in 1993; estimates for all other countries use the full sample from 1989 to 2016

One of the criticisms of the CAPM is that it assumes the distribution of returns is symmetrical. In practice, however, many financial assets are subject to much more downside risk than upside risk (Bakshi *et al.* 2003). Indeed, the distribution of most countries' GDP is negatively skewed. In addition, investors may care more about below-average returns than above-average returns, a phenomenon known as 'loss aversion'. To address this concern, we estimate volatility risk premiums using the D-CAPM model, which focuses on the variation of below-average returns. The D-CAPM has been found to reflect prices of emerging market debt securities more accurately, compared with the CAPM (Estrada 2007), which suggests it may also be a useful framework for gauging how GDP-linked bonds could be priced. We find that the volatility risk premium is generally higher under the D-CAPM than under the

CAPM. This difference reflects that for most countries its correlation with the various benchmarks tends to increase during periods of below-average growth.

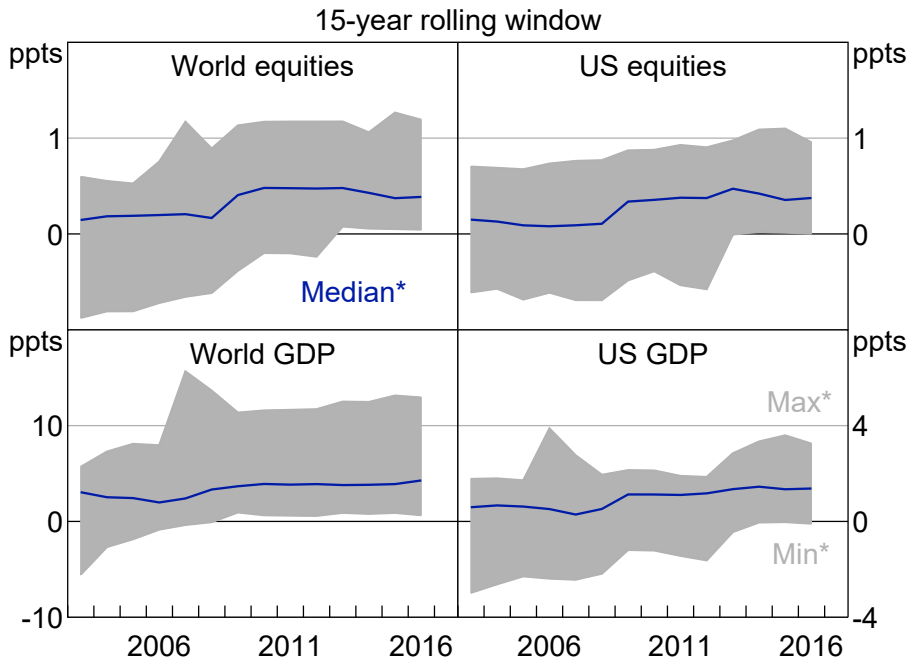
Figure 2. Beta estimates for different market portfolios



Sources: Bloomberg; IMF RBA

Finally, a large body of work finds that risk premiums in financial markets vary considerably over time (see, for example, Engle *et al.* 1987). This raises additional uncertainty about the time frame that investors would use to price GDP-linked bonds. To examine this, we estimate the CAPM over 15-year rolling windows, generating a wide range of growth risk premiums. We find that the median difference between the baseline and maximum volatility risk premium is around 20 basis points when using equities, and much higher for US and world GDP. The risk premiums have tended to increase over the sample, with a notable step-up around the period of the financial crisis of the late 2000s (Figure 3).

Figure 3. Rolling growth premium estimates



**Across* the sample countries

Sources: Bloomberg; IMF; RBA

Conclusion

In principle, GDP-linked bonds have features that appeal to both issuers and investors. Estimating the potential volatility risk premium is critical to assessing the practicality of GDP-linked bonds. We find that the estimated volatility risk premium is relatively modest when using established benchmarks such as world and US equities. However, the results appear particularly sensitive to changes to the market portfolio. Given this, further investigation into GDP-linked bonds could draw on liaison with private market participants, particularly potential investors, to better understand how GDP-linked bonds are likely to be priced in practice.

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12 Credit ratings and the new market for GDP-linked bonds

David T. Beers
Bank of England [1]

Introduction

This chapter focuses on what might appear to be a straightforward matter – ratings of GDP-linked sovereign bonds by the major credit rating agencies (CRAs). CRAs already rate most market debt of sovereign governments. S&P assigns ratings to 131 sovereigns (Cullinan 2017), and the coverage of its two main competitors, Moody's and Fitch, is similarly comprehensive. If GDP-linked bonds are issued, it is a fair assumption that investors will expect CRAs to rate them.[2]

Even so, it is unclear whether the leading CRAs will rate these new instruments and, if they do, how exactly. CRAs have not addressed this topic, but a survey of their current methodologies suggests outcomes that, at first blush, look problematical. CRAs could decide not to rate GDP-linked bonds. Alternatively, some could rate them *lower* than existing sovereign bonds. In doing so, CRAs would be saying that GDP-linked bonds' equity-like characteristics set them near to or outside the perimeter of rateable obligations.

1 David Beers is a special adviser at the Bank of England and a member of the Ad Hoc Working Group on the London Term Sheet for GDP-Linked Bonds. From 2000 through 2011, he was head of sovereign and international public finance ratings at S&P Global Ratings. The views expressed in this chapter are the author's and are not necessarily those of the Bank of England.

2 Topics discussed in this chapter presume that readers are familiar with the role of ratings as assessments of credit risk. For additional background, see SEC (2017). Fitch, Moody's and S&P Global (here collectively termed the 'Big 3') are not the only CRAs that rate sovereign debt, but they have the largest coverage, and numerous independent studies have shown that their ratings have the biggest market impact (Kiff 2010). All references to GDP-linked bonds refer to the London Term Sheet design described in Chapter 7 of this volume.

Does it matter that these instruments fit uneasily into existing CRA criteria? It could, if ratings influence GDP-linked bond investors in the way they do for investors in existing sovereign bonds. It is less of an issue if GDP-linked bonds find support from investors not constrained by ratings-related rules. In any case, the best outcome would be for CRAs to take the radical step of devising *new ratings* that address GDP-linked bonds' distinctive risk characteristics. Financial market dynamics have prompted CRAs to expand their suite of ratings before, and CRAs can do so again to support this new asset class.

GDP-linked bonds and the fuzzy perimeter of rateable obligations

Why might CRAs treat GDP-linked bonds differently than the existing stock of sovereign market debt? The answer depends on where they see these new instruments fitting within the spectrum of debt and equity obligations.

CRAs have similar comfort zones about the types of obligations where they think ratings can add useful information. Ratings predominate at the fixed-income end of the debt-equity spectrum, because that is where credit risk – the risk of default, or loss given default – can most readily be assessed. By contrast, at the other end of the spectrum, equities are unrated since they entail no obligation to repay investors. Instruments in between – preferred stock and catastrophe bonds, for example – often are rated, but they are 'notched' below the issuer's senior debt rating, indicating greater risk, since debt service payments are conditional on one or more events.[3]

Within this continuum, GDP-linked bonds would constitute a new asset class. True, like conventional sovereign bonds, the new instruments are senior and unsecured, but they are different because debt service varies with the level of nominal GDP (NGDP).

3 An issuer's senior unsecured debt rating, also known as its 'issuer credit rating', is the highest rating assigned to different classes of its debt issues. Because GDP-linked bonds are local currency denominated, comparisons with Big 3 CRA ratings refer to their long-term local currency sovereign ratings.

Their design reduces the risk of contractual default by *internalising* some of the credit risk investors take holding conventional sovereign bonds. However, from both a CRA and a broader market perspective, the risk-sharing features of GDP-linked bonds place them towards the right of the debt-equity spectrum. Compared with the relatively 'safe' outstanding stock of sovereign debt, they are more like a distant relation than a close sibling (Eisenbach 2017).[4]

What do the rating agencies say?

CRA rating methodologies do not address GDP-linked bonds, since none have been issued. However, CRA criteria for rating other types of indexed bonds and, more generally, of bonds with conditional promises, give a sense of how CRAs could view these new instruments. In a discussion of indexed debt, for example, S&P states, "…a rating will only be assigned if principal is 'protected'… Under our criteria, protected principal means that the par amount of principal is protected at all times during the life of the instrument, i.e. repaid at least at par value" (Feinland Katz 2014). Here, S&P evidently rules out rating GDP-linked bonds because they contain no promise to maintain original par values. Fitch takes the same view, requiring 100% principal protection for its rated issues (Stringer 2017).

Moody's ratings methodology likewise stresses stable principal values. However, it focuses more narrowly on whether bond principal paid at redemption is (at least) equal to its par value at issuance (Remeza 2016). This may be because Moody's ratings, unlike its competitors', address both the probability of default on contractual debt service and the *expected losses* in the event of default (Emery 2017). Moody's ability to assess the range of potential NGDP losses on redemption principal thus appears to best position it to rate GDP-linked bonds.[5]

4 A related point is that CRAs do not rate obligations solely on their contractual terms, and they would not simply rely on London Term Sheet provisions when rating GDP-linked bonds. CRAs often look beyond contractual issues, for example, when considering which events constitute a sovereign default. These include consensual debt restructurings that result in NPV losses, not just failures to pay debt service when due (Beers 2017).

5 This reflects the supposition that Moody's would view a scenario where the indexed principal value of a GDP-linked bond at redemption falls below par value at issuance as an effective default.

There are also situations, often involving obligations in the middle of the debt-equity spectrum, where one CRA methodology supersedes another. A pertinent example is S&P's and Fitch's treatment of catastrophe or 'cat' bonds, as it suggests an alternative path for them to rate GDP-linked bonds. Like GDP-linked bonds, cat bonds contain a conditional payment promise – principal and interest depend on whether a specified catastrophe event occurs.[6] If one does, regular debt service ceases and the insurer pays insurance claims instead.

S&P and Fitch view such events as effective defaults. Reflecting this risk, the two CRAs typically assign speculative-grade (BB+ or lower) ratings to cat bonds, well below the insurer's senior debt rating (Josefs 2017, Mohrenweiser 2017). If S&P and Fitch follow this precedent, their GDP-linked bond ratings could also be markedly lower than comparable ratings on conventional sovereign bonds.[7]

How Moody's GDP-linked bond ratings might differ from its current sovereign ratings is less clear. Historical data tracking NGDP declines at 10-year intervals – used here to illustrate the hypothetical performance of 10-year GDP-linked bonds – are not well aligned with the range of expected losses embedded in its rating scale (Emery 2017).[8] On the one hand, there are few instances of NGDP losses for advanced economy (AE) sovereigns (Figure 1), and those that occurred were relatively mild and of short duration.[9] These factors might warrant little differentiation between GDP-linked bond ratings and Moody's conventional debt ratings.

However, the data for emerging market (EM) sovereigns highlight a possible ratings conundrum. Over the shorter timeframe that data is available, there are no instances where NGDP is lower at the end of each 10-year interval than at the start (Figure 2).

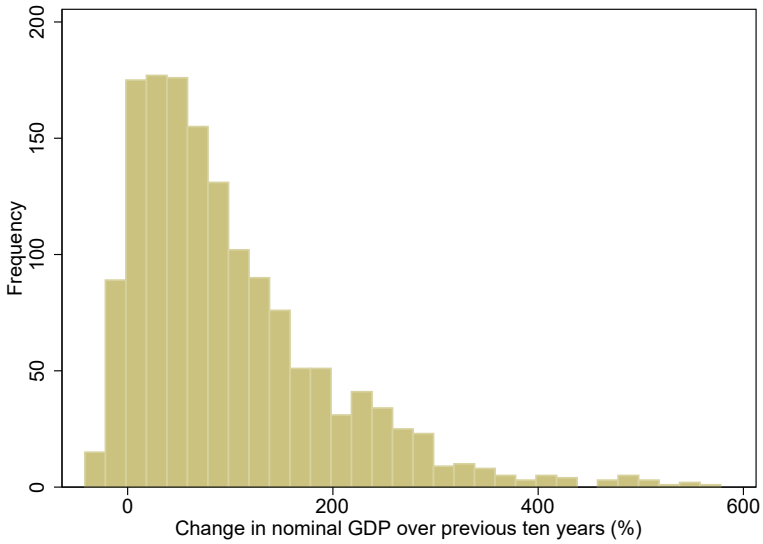
6 A cat bond differs structurally from a GDP-linked bond because the issuer is a bankruptcy-remote, special purpose vehicle that provides coverage to the insurer sponsor that can result in investor losses, with no upside, if a specified catastrophe event occurs.

7 This assumes that, like cat bond loss events, S&P and Fitch would view *each instance* where the accrued value of GDP-linked bond principal falls with NGDP as an effective default.

8 Expected losses in Moody's scale generally apply to its speculative-grade ratings, ranging between 1%-5% for B-rated bonds and 65%+ for C-rated bonds.

9 Had these governments issued GDP-linked bonds, in most cases (apart from WWII) the value of 10-year bonds would have been above par when they matured.

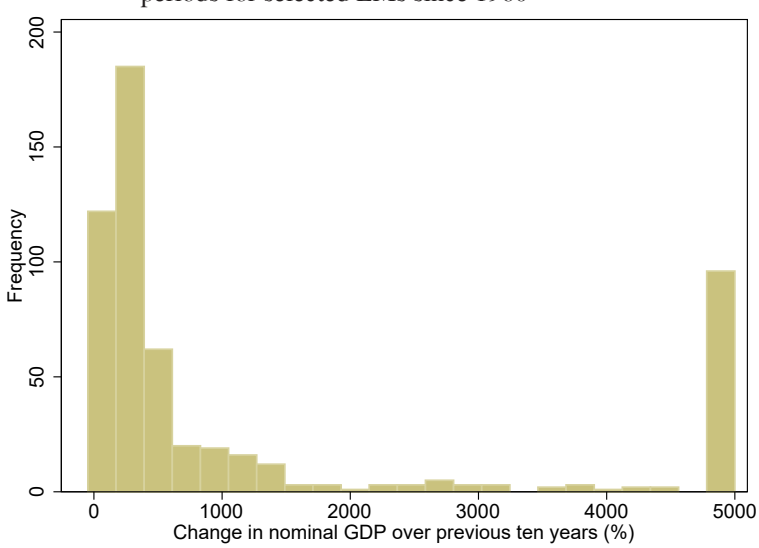
Figure 1. Histogram of percentage changes in the level of NGDP over 10-year periods for selected AEs since 1870



Notes: NGDP in local currency for Australia, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, UK, and US.

Source: Author calculations and Schularick (2012)

Figure 2. Histogram of percentage changes in the level of NGDP over 10-year periods for selected EMs since 1960



Notes: NGDP in local currency for Argentina, Brazil, Chile, China, Hungary, India, Indonesia, Israel, South Korea, Mexico, Russia, Saudi Arabia, South Africa, and Turkey. The right-hand bar shows all cases of changes larger than 4500%.

Source: Author calculations, IMF (2017) and World Bank (2017). AE and EM chart data available from the author on request (david.beers@bankofengland.co.uk).

At the same time, however, nearly a third of sampled EM sovereigns have a history of defaults on their conventional local currency debt (Beers 2017). So, if Moody's gives weight to the record, some of its GDP-linked bond ratings could be higher than its current sovereign bond ratings – a quite different outcome, potentially, compared with its competitors.[10]

Ultimately, whether or not CRAs rate GDP-linked bonds is a call they must make. Our analysis suggests that Moody's could be the CRA most likely to rate GDP-linked bonds. Whether S&P and Fitch also rate them is less certain but if they do, they likely would rate the new instruments more conservatively. Against this, though, is the evidence that folding GDP-linked bonds into current ratings frameworks is challenging. Still other possibilities are for CRAs opting not to rate them, at least initially, to see how the market develops, or taking the more radical step of rating GDP-linked bonds on a new scale.

Ratings, investment policies and bond indices

To understand the import of differing CRA responses to GDP-linked bonds, we need to consider how ratings currently influence market behaviour. Globally, Big 3 CRA ratings are embedded in the investment policies of many fixed-income investors. The same holds for portfolio managers (FSB 2014, SEC 2016). Ratings here serve as shorthand for investors' credit risk preferences and for constraints on managers' discretion over credit risks in their portfolios. Importantly, these policies can require sales of bonds when one or more Big 3 rating falls below Baa3/BBB-, which often depress bond prices (Cantor 2007, Merritt 2013). CRA ratings also feature in many indices that fixed-income investors use to benchmark their investment performance. Bonds included in the Bloomberg Barclays Global Aggregate Index, for instance, usually require Baa3/BBB- ratings or higher by one or more of the Big 3 (Bloomberg 2017).

10 Of course, the NGDP history of a number of sovereigns reflects high inflation that, under new policy regimes, has moderated more recently. So, looking ahead, it is possible that the NGDP behaviour of more EM sovereigns will converge with the track record of AE sovereigns. It is also possible that the frequency of NGDP declines and sovereign defaults on conventional local currency debt could converge. From a ratings perspective, however, it is less clear how frequently GDP-linked bond issuers might experience both events.

As a result, rating changes can trigger additions to or deletions from indices that also affect markets.

Such practices, if extended to GDP-linked bonds, could have significant impact. Low or no ratings, for example, might slow the market's development by limiting the investor pool and raising issuance costs. Yet this supposition begs two important questions: will the investor base for GDP-linked bonds differ from the investor base for conventional sovereign bonds? And, if it differs, would that matter?

GDP-linked bonds, ratings and market innovation

My view is yes, the investor base will differ, and yes, this matters. As already noted, GDP-linked sovereign bonds would be a new asset class, distinguished from fixed-income debt by their equity-like features. This difference will inevitably challenge the risk tolerance of many existing sovereign investors. It is safe to assume, for example, that banks will limit their exposure (as dealers) to GDP-linked bonds, or simply not buy them, for prudential and/or regulatory reasons. At the same time, non-bank investors obliged to hold bonds with principal floors, and/or bound by ratings-specific rules, could be unable to buy the new instruments. On the other hand, investors with few or no such constraints potentially could buy them. An important implication is that CRA ratings will have far less influence on these investors than they do on current sovereign bondholders.[11]

That said, CRAs can play a useful role in the development of the GDP-linked bond market. Investors will expect service providers to develop analytical tools for this new asset class that, in turn, create opportunities for the Big 3, smaller CRAs, and investment advisory firms. In particular, CRAs can introduce rating scales focussed on GDP-linked bonds' distinctive risk characteristics. They have expanded the ratings playbook before – examples include short- and long-term bond ratings, foreign and local currency bond ratings, money market fund ratings, and national scale bond and stock ratings (Emery 2017).

11 In this regard, international regulators seeking to reduce reliance on CRA ratings in markets and to promote greater competition within the ratings industry should view GDP-linked bond issuance favourably. For context, see FSB (2014) and SEC (2016).

There is a compelling case for CRAs to assess GDP-linked bonds differently because, as we have seen, the existing ratings framework cannot address both their downside risks and upside potential.

Historically, innovation in sovereign debt markets has been a slow process. Governments are, arguably, the most conservative of issuers. Their gradual adoption of inflation-linked bonds bears witness to this. The UK pioneered issuance by AE sovereigns in 1981, while the US, the premier issuer of 'risk free' debt, did not follow until 1997 (Benford 2016). Embracing GDP-linked bonds may be a bigger challenge for sovereign debt managers. But rising public debt burdens should incentivise many of them to consider new forms of borrowing that appeal to a wide range of investors. This includes ones with limited exposure to conventional sovereign bonds. Outreach by the GDP-linked bonds working group suggests there is potential demand for the new instruments from pension funds, sovereign wealth funds, insurance companies, equity funds and hedge funds (Benford 2016, Ad Hoc Working Group 2017).

New indices will need to be developed and some investment policies updated to take account of GDP-linked bonds. Index providers should respond quickly, but revisions to investment mandates may take longer, given the many players involved. Even so, the rapid growth of emerging market debt and equity flows in recent decades, which drove changes in investment guidelines and spawned multiple indices, shows what is possible if GDP-linked bonds gain traction.

In the final analysis, GDP-linked bonds will become a reality if governments and investors both see value in issuing them. Assuming they do, credit ratings need not impede the market's development. Indeed, with updated criteria and bespoke rating scales, in this new asset class CRAs may yet emerge as a facilitator, not an obstacle.

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13 Applying lessons from past innovations to build consensus on the London Term Sheet

Starla Griffin
Slaney Advisors

This chapter considers market reactions to GDP-linked instruments as envisioned in the London Term Sheet (LTS). It draws on lessons from past innovations in sovereign debt markets and, in particular, highlights that issuance of these new instruments rests on a strong stakeholder consensus on both their design and benefits. The development of the LTS – standardised documentation suitable for both advanced economy (AE) and emerging market (EM) sovereign issuers – is one milestone in these consensus-building efforts.[1]

Building consensus on the LTS

Historically, it has been difficult to take the discussion of GDP-linked instruments from the theoretical to the practical. Past debates have largely been informed by market experience with poorly designed GDP-linked warrants.[2] These have provided ample material for criticism from both investors and issuers – from pricing difficulties to data integrity issues to their association with distressed sovereigns. With the development of the LTS, however, market participants and potential issuers can now begin to envisage

1 The most recent version of the LTS developed by the Ad Hoc Working Group is available at https://www.icmagroup.org/resources/Sovereign-Debt-Information/ and also in the Annex to this book.

2 The original Brady deals included GDP-linked warrants (or other 'sweeteners') which offered creditors the promise of additional future payments if certain growth thresholds or other payment milestones were met in exchange for greater up-front debt relief. In recent years, Argentina, Ukraine and Greece have issued GDP-linked warrants in their debt restructurings.

how such an instrument (the LTS Instrument[3]) might work in practice, including how investor concerns about data integrity, data revisions or principal floors can be addressed contractually, and how the GDP-linked instrument would relate to a sovereign's other debt.

Having a draft LTS that stakeholders can analyse has been a milestone in the process of building consensus on how a GDP-linked instrument might work in practice and integrate into the financial architecture. However, there is still work to be done to secure agreement on certain key features of the term sheet.

In its current iteration, the LTS Instrument can address different market needs depending on the issuer. It allows highly indebted AEs to borrow to invest in growth-enhancing policies. It prevents costly restructurings in EM and low-income countries. It achieves these goals through a combination of its economic and legal structures. In terms of the economic structure, it mimics inflation-linked bonds in that both principal and coupon are linked to an index, in this case, nominal GDP. Market participants have welcomed this simple structure.

The LTS Instrument is a risk-sharing instrument which permits investors to realise returns linked to economic performance, in some cases more efficiently than by buying stock indices. It allows investors to purchase GDP risk of different countries – including across uncorrelated markets – without cross-border documentation risk. At the same time, it gives investors greater certainty in a debt crisis because debt service on the LTS Instrument falls in line with a known formula, and is not driven by vagaries of debt restructuring negotiations. As such, the LTS Instrument is not a conventional bond and will not respond like one in the face of debt distress.[4]

For this reason, a key feature of the legal structure of the LTS is to treat the LTS Instrument as separate from a sovereign's conventional bonds for purposes of collective action clause (CAC) aggregation in the event of a debt default. We[5] believe it would

3 Rather than use the term 'GDP-linked bond' to refer to the instrument described in the LTS, the author uses 'LTS Instrument' here, in order to highlight the truly innovative nature of the product.

4 The risk-sharing nature of the LTS Instrument means it may not be suitable for traditional fixed-income investors.

5 This is the shared view of members of the Ad Hoc Working Group for the LTS.

undermine the objectives of the LTS Instrument to pool its holders, who would have already taken a prescribed haircut under the terms of the LTS, with holders of conventional bonds who would have been entitled to a fixed coupon under the terms of their bond contract.[6] Moreover, if an issuer chose to continue servicing the LTS Instrument through a period of debt distress, it is likely that LTS Instrument holders would refinance, allowing the issuer to retain market access, which promotes financial stability. More investor engagement will be required to persuade stakeholders that this kind of legal structure makes sense, and building consensus on this design point will help facilitate development of the market.

Building consensus on the LTS instruments: Lessons from past innovations

In the past, critics have cited the fact that no sovereign has yet issued GDP-linked instruments as proof of their lack of viability. This ignores the fact that, prior to the drafting of the LTS, there was no common understanding of what a GDP-linked security might look like. It also discounts just how difficult innovations in the public debt markets are to achieve. Successful examples that provide lessons for GDP-linked instruments include the development of the inflation-linked and EM bond markets, and more recently, initiatives to reform sovereign bond documentation to include CACs. These have all required consensus building, international coordination and collective commitment to overcome obstacles to change.

Now that the LTS provides an outline for a GDP-linked security that stakeholders can use as a reference, building consensus about the rationale for issuing these instruments is key to developing the market. Do these instruments provide the best remedy to address the chronic high levels of debt currently challenging many AE governments, on the one hand; and the high costs associated with even small numbers of debt defaults by EMs on the other? Ad Hoc Working Group members and others argue that they do. Moreover, the LTS Instrument provides a hedge for issuers against unanticipated growth shocks, and provides both issuers and investors with clarity in the face of debt distress.

6 Nor does it make sense to aggregate LTS Instruments, a domestic currency offering, with hard-currency bonds.

Sceptics counter that conventional bonds are the cheapest and most effective financing option for sovereigns (although this fails to recognise the real threat to economies of chronic high debt and the real costs of debt defaults). This debate continues.

Consensus must also develop around how best to achieve the intended benefits of including GDP-linked instruments in the financial architecture, and how to overcome hurdles to market development. One strand of current thinking is that niche issuances of GDP-linked instruments are most likely. However, these will have little beneficial impact for any given sovereign, and will only add to its financing costs. Indeed, it is more likely that a significant amount of a country's debt stock will need to be issued or refinanced with GDP-linked instruments for them to have the intended beneficial impact in terms of restoring debt sustainability, or be cost-effective for the issuer. Other strands of thinking only envisage EM issuers of these securities. These views ignore the lessons of past innovations.

The UK's entry into the inflation-linked bond market in 1981 was the game-changer for that asset both due to its status as an AE issuer, and due to the UK government's strategy for market entry.[7] In short, the government made three commitments (Shen 2009). First, it promised investors sizeable issuance to ensure liquidity, which in turn gave impetus to the research and market infrastructure needed to support trading. Second, it invested in market education and in data provision; and third, it promised ongoing issuance even when market conditions changed. Other AE issuers later followed the UK's lead with the US issuing with similar commitments in 1997.

Likewise, to resolve the Latin American debt crisis of the 1980s, the US Treasury, US and foreign banks, and the indebted countries, coordinated to transform the troubled loan market into a market in EM bonds. The US government provided Treasuries as collateral for some Brady bonds to incentivise banks to write down and exchange loans for the new securities. Brady bond issuers committed to honour the new obligations, while the banks grew their trading and research capabilities to support the market.

7 It is interesting to note that prior to the UK's issuance of inflation-linkers, the market was the preserve of EM sovereigns with a history of high or very high inflation. This stigmatised the instruments and deterred their adoption by AE sovereigns.

Without these commitments, and the multiple issuers of EM debt securities, the EM bond market, thriving today, would not have developed successfully.

Just as the entry of the UK and US into the inflation-linked markets helped boost investor interest in those assets, and the coordinated launch of Brady Bonds by multiple issuers facilitated the quick development of the EM bond markets, such an approach should be considered for GDP-linked instruments. Coordinated issuance of LTS Instruments by a group of both AEs and EMs would reduce issuance costs and amplify investor interest. Likewise, just as the decision by reputable EM issuers to include CACs in their bond documentation helped with the wide-scale market adoption of those provisions, early advocacy of the LTS Instrument by reputable EM issuers would be useful.[8]

There are other actions stakeholders can take to support development of this market. EM sovereigns who may not be able to issue initially due to cost concerns or credibility issues, can take steps to build confidence in their data, which underpins the economics of the instrument. The IMF can continue to support countries in this area. The official sector can also facilitate development of the market by taking the lead in linking their development lending to GDP. For example, linking International Development Association (IDA) lending to a borrower country's GDP, which has been proposed (Missale 2005),[9] would provide a number of benefits including improving data provision and transparency. This would help prepare low-income countries to issue the LTS Instrument once they gain market access. This kind of capacity building was important to prior market innovations.

The LTS provides a viable economic and legal model for a GDP-linked instrument suitable for both AEs and EMs. Consensus around the economic and legal characteristics of the LTS Instrument, and its many benefits, is developing as familiarity with the LTS grows.

8 On this point, a shift in thinking by sovereign debt managers (DMs) may be needed to convince issuers of the benefits of the LTS Instrument. A market for GDP-linked instruments will not develop if debt managers continue to define their objective in raising market finance solely to obtain the lowest cost in its narrowest sense. They need to define their goals more widely, taking into account debt sustainability, costs to the economy of debt default, or long-term costs to the economy of extremely high debt to GDP ratios. Consensus must develop that the role of debt managers is to optimise debt management over the long term, not just to minimise short-term costs. Support from market participants and international policymakers may help to nudge DMs in this direction, but this may take time.

9 Tabova (2005), Missale and Bacchiochhi (2012).

However, as lessons from past innovations demonstrate, while the LTS is a starting point, a great deal more consensus building, international coordination, and collective commitment is needed to make a global market in GDP-linked securities a reality.

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14 Making a reality of GDP-linked bonds

Stephany Griffith-Jones
Columbia University [1]

There is increased consensus on the need for more stable capital flows to help moderate boom-bust patterns of capital flows that are so damaging for the real economy and can cause costly financial crises. It is therefore important to develop market instruments that can diminish this boom-bust pattern. Growth-linked bonds are an excellent example.

The global financial crisis focused attention on instruments that allow countries to minimise risks associated with increasing capital flows. The idea of a growth-linked debt instrument is not new. John Maynard Keynes sketched the concept for allowing space for counter-cyclical fiscal policies; he also designed a bisque clause, that allowed the UK to pay less on its debt to the US after WWII in years when its economic conditions deteriorated, paying normally when the economy grew more.

A first wave of interest in the indexing of debt servicing to GDP (Gross Domestic Product) emerged in the 1980s and received fresh impetus after frequent debt crises. The idea was supported by several of the most distinguished economists, such as Nobel-prize winners Robert Shiller, who pioneered interest on this topic, and Joseph Stiglitz, and by John Williamson. The IMF also studied and took a favourable position on these instruments. Recently, Bank of England did important research on the topic, and worked with the private sector to design a standardised term sheet for such a GDP-linked security, as well as help launch a valuable initiative in the G20.

1 I wish to thank Mark Joy and David Beers from the Bank of England for encouraging me to write this chapter, and for insightful discussions.

The main challenge is for countries with good macro-economic fundamentals to start issuing GDP-linked bonds in a precautionary way – as a self-insurance mechanism. Because of their good situation, investors would be keener to buy them than in bad times. Any premium paid on the new instrument should hopefully be relatively low, if risks are correctly priced. However, in good times, governments have less incentive to issue such bonds, as they see downturns or crises as unlikely, especially during their mandate. Nevertheless, countries adopted other self-insurance mechanisms on a significant scale, such as accumulation of foreign exchange reserves, with relatively high costs. If the additional cost of issuing GDP-linked bonds proved to be relatively low, the incentive for governments to issue them could become strong.

GDP-indexed debt has been issued, to a limited extent, and only by countries with difficulties in servicing their debts. However, the 2007/8 global financial crisis, as well as many preceding ones, made the case for these bonds far stronger. World economic recovery makes the present a good time to issue growth-linked securities.

There are important advantages to issuing GDP-linked bonds for both the issuing countries and the investors, as discussed in this book (see also Griffith-Jones and Hertova 2012). The system-wide benefits provided by these instruments are greater than those realised by individual investors or countries. Hence, there are externalities that do not enter considerations of individual financial institutions or countries.

There are coordination problems, whereby a fairly large number of countries must issue a new instrument in order for investors to be able to diversify risk.

GDP-indexed securities can be viewed as desirable vehicles for international risk sharing and for avoiding the disruptions arising from formal default. The dead-weight costs of long debt restructuring at times of crises would be avoided, as debt was automatically modified (Bank of England 2016).

GDP-linked bonds have characteristics of a public good as they generate systemic benefits above those accruing to individual investors and countries. If GDP-linked bonds lowered risk of default, they would make remaining conventional bonds safer, in the same country. By reducing likelihood of defaults, they would also benefit a broader range of investors than just those directly affected, along with economies not issuing them, but which would reduce their chance of contagion from other countries, as well as economies and multilateral institutions that may finance bail-out packages.

John Williamson (2017) perceptively notes that the above analysis is done from the standpoint of the borrowers, the international financial system and the ultimate lender or investor, with their interests not necessarily coinciding with those of some financial intermediaries. Some financial intermediaries benefit from market instability. The important political economy question is whether an instrument that is likely to reduce market instability may have difficulty in winning acceptance in some parts of the financial industry. Some traders can see the emergence of these instruments as a threat to profits. Also, there may be unwillingness to introduce innovations, due to inertia, both from issuing countries and investors.

For all these reasons steps by public institutions, and specifically multilateral or regional development banks, and the IMF, to facilitate the creation of such instruments, to showcase their advantages and help create a market for them, seem highly desirable.

Multilateral or regional development banks could play an active role as 'market makers' for GDP-linked bonds. They could begin by developing a portfolio of loans, the repayments on which could be indexed to the growth rate of the debtor country. Once they have a portfolio of such loans to different emerging and developing countries, they could securitise and sell them on the international capital markets. Such a portfolio of loans could be particularly attractive for investors, as it would offer the opportunity to take a position on growth prospects of a number of economies simultaneously. Alternatively, the multilateral development banks could buy GDP-linked bonds that developing countries would issue via private placements.

As economies' growth rates are less correlated globally, the World Bank may be best placed to perform such securitisation, since it lends across a wide range of emerging and low-income countries. Regional development banks, such as particularly the European Investment Bank, which lends to developed, emerging and low-income countries, could play a valuable role. The new development banks, owned exclusively or largely by emerging and developing economies, such as the AIIB (Asia Infrastructure Investment Bank) and NDB (or New Development Bank) could be innovative, and lend in ways such that the repayments on these loans would be indexed to growth rate of debtor countries. As much of these new banks' lending is for infrastructure investment, they could use other state contingent instruments, such as debt servicing linked to revenue streams of these projects.

Once financial markets and borrowers become familiar with such instruments, and their advantages, these multilateral or regional development banks could reduce their role. This initial show-casing by development banks would be similar to the pioneering role they played in helping introduce local currency debt.

Another avenue for the issuing of GDP-linked bonds could be for developed countries, whose GDP growth typically varies less than that of emerging and developing economies, to start issuing such bonds. This has previously been a fruitful avenue for financial innovation, as occurred with the introduction of collective action clauses into debt contracts, first by developed economies, followed by emerging economies.

A third path would be to deal with the collective action problem, which implies that a first issuer would have to pay higher premiums, by encouraging a number of emerging economies to issue GDP-linked bonds simultaneously. As Bank of England (2016) argues, the more countries that issued at the same time, the lower the spreads; it would also enhance market infrastructure and standards.

The related problem of initial illiquidity would make it difficult for these GDP-linked bonds to be traded in secondary markets, reducing the appetite of investors for buying them. This could lead to a large 'novelty' premium, which would discourage countries from issuing. Standardised contracts would help reduce this premium. The work the Bank of England did in a working group with private investors, in producing a model contract, also called a term sheet for GDP-linked bonds, is an important step.

There is a question though over whether the model contract that has been arrived at is the optimal one. Further work needs to be done to socialise it beyond the international investor groups that have already engaged and contributed to its drafting, to domestic investor groups too, and also for national debt management offices to engage further. Conceivably there could be variations of the model contract depending on each issuing jurisdiction's particular set of preferences. Against this, standardisation and liquidity would be eroded.

The involvement of the IMF could be key, going well beyond their valuable contribution to research (see for example Pienkowski and Ostry, in this volume, for recent contributions). The IMF could help countries analyse cost-benefits of introducing GDP-linked bonds into its debt structure. This could be done during Article IV consultations.

When countries go to the IMF for financing, this could be a good moment to encourage major re-shaping of a sovereigns' debt structure, as IMF influence is at its highest point, though clearly it is better for countries to issue GDP-linked bonds in good times. As the Bank of England (2016) argues, the IMF could amend its debt sustainability analysis framework to make clear the benefits offered through GDP-linked bonds

A long-standing issue, allegedly a problem, is that it is said that GDP is difficult to measure, with estimates prone to revision, re-basing, and in extreme cases manipulation. Borensztein and Mauro (2004), Griffith-Jones and Sharma (2006) and Brooke *et al.* (2013) suggest that these problems have been exaggerated, and can be overcome, if indeed they really are significant. Firstly, economic authorities in issuing countries do not have an incentive to manipulate data to under-estimate growth; indeed, as governments seeking re-election, if anything they would prefer to over-estimate their growth record, and certainly not to under-estimate it. To reduce the unlikely problem of manipulation of GDP data further, support from international institutions that revise data on GDP, such as the United Nations and the IMF, could be used. Modifying a proposal from Bank of England (2016), the IMF's SDSS (Special Dissemination Standards) could be used by including a clause in the GDP-linked contract that the issuing country would be obliged to meet these standards.

Data revisions can be dealt with by linking debt servicing to lagged data of GDP, (for example, a six month lag), that would incorporate initial revisions, but would not affect the counter-cyclical nature of the servicing of the GDP-linked bonds.

A key next step is to identify investors who would be willing to buy GDP-linked bonds. These may include investors beyond traditional purchasers of bonds, as GDP-linked bonds would have some equity elements. So, equity investors, and investors interested in hybrid instruments, need also to be targeted as potential purchasers. One interesting issue is whether the GDP-linked part of the debt servicing could be allowed to be detached from the rest of the bond, which could then become plain vanilla. This would attract other potential investors for both parts. This requires further study, to ensure that, for example, greater volatility of the value of these bonds is not caused by having the GDP-linked part sold separately, possibly to more short-term financial actors.

It would also be valuable if meetings were organised between different categories of investors and potential country issuers of GDP-linked bonds. Such meetings may benefit from support and participation, or even the initiative, from institutions like the IMF, the multilateral development banks, and institutions like the Bank of England. Such meetings could be combined with presentations about advantages of GDP bonds to both issuers and investors, as well as discussions of how to overcome possible remaining problems.

Whilst further analysis is always welcome, the key focus should be on making GDP-linked bonds happen. Issuing such bonds would have clear economic benefits and help the financial sector community, as well as governments, regain trust from the rest of society that they can deliver instruments beneficial for increasing countries' welfare.

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Annex

Indicative Term Sheet — GDP bonds

London Term Sheet (English law version)
Draft: 16/03/2018

REPUBLIC OF ARCADIA

This Term Sheet sets out the indicative terms for a GDP-linked bond (GDP Bond) of a fictitious sovereign, the Republic of Arcadia. It is intended to generate discussion and debate on the usefulness of such instruments. It has not been prepared in contemplation of any transaction for any sovereign entity.

It is intended that this Term Sheet will go, in the context of this discussion and debate, through several iterations and that further work will be done on it as the discussion and debate on sovereign GDP-linked bonds continue.

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Issuer:	The Republic of Arcadia (the **Republic** or the **Issuer**).
GDP Bonds:	The bonds issued by the Republic under this issue.
Form:	The GDP Bonds will be bearer or registered in global form held on behalf of Euroclear and Clearstream, Luxembourg.
GDP-linked Securities:	The Republic's GDP-linked securities similar to the GDP Bonds (excluding any GDP warrants) including, where the context permits, the GDP Bonds.
Currency:	Arkadins (**K$**). [*only domestic currency issues*]
[Settlement Option / Conversion of Payment Amounts:	[*The Issuer and its investors may wish for all payments of interest and principal to be settled in a currency that is not the domestic currency of the Issuer (for example, in circumstances where the Issuer's currency is not a settlement currency accepted by the Clearing Systems), in which case the following provision on Conversion of Payment Amounts may be included*] [All amounts of interest and principal due and payable will be paid in [*specified international hard currency*], calculated by the [*Calculation Agent*] by converting the K$ amounts into [*specified international hard currency*] at the specified spot foreign exchange rate on the specified determination date (*2 business days prior to the relevant payment date*)]]
Status:	The GDP Bonds constitute direct, unconditional, unsubordinated and unsecured obligations of the Republic. The GDP Bonds rank, and will rank, equally among themselves and with all other unsubordinated and unsecured borrowed money of the Republic; provided, however, that, consistent with similar provisions in the Republic's other indebtedness, this provision shall not be construed so as to require the Republic to pay all items of its indebtedness rateably as they fall due. The due and punctual payment of the GDP Bonds and the performance of the obligations of the Republic with respect thereto are backed by the full faith and credit of the Republic. [*Status and ranking to be drafted to meet the requirements of individual issuers*.]

GDP:	In respect of a Reference Quarter, the Republic's seasonally-adjusted nominal gross domestic product (**GDP**) in K$ for that Reference Quarter as published by the relevant Publishing Entity.
Denomination:	K$[●] and integral multiples of K$[●] in excess thereof up to and including K$[●]. No Notes in definitive form will be issued with a denomination above K$[●]. [*Denomination to be set for 'wholesale' investors only*]
Principal Amount:	K$[●]. [*Size should be large to enhance liquidity.*]
Principal Factor:	[●]. [*A number, greater than zero but less than one, (rounded if necessary to the fifth decimal place, with 0.000005 being rounded upwards) as specified at the Issue Date*.]
Issue Price:	[●]% of the Principal Amount (rounded if necessary to the fifth decimal place, with 0.000005 being rounded upwards) as specified at the Issue Date.
Issue Date:	[*Issue date*]
Base Date:	[DATE]. [*The Base Date will be at least a few business days prior to the Issue Date but may be a longer period depending on the overall issuance programme of the Republic. The Republic may, for example, choose to have the same base date for a number of issues, so as to have a common pricing base for all of its GDP-linked issues.*]
Base Interest Rate:	[●]% [*A positive number expressed as a percentage specified at the Issue Date.*]
Interest:	The interest payable on each Interest Payment Date per K$[●] shall be an amount equal to: $$\text{K\$ [●]} \times \frac{\textit{Base Interest Rate}}{2} \times \textit{Nominal GDP Index Ratio}_{\text{Payment Date}}$$ Each amount of interest so calculated shall be rounded if necessary to the fifth decimal place, with 0.000005 being rounded upwards.

Interest Payment Dates:	Interest is payable semi-annually on [●] and [●] in each year (each an **Interest Payment Date**). [*Interest Payment Dates will be dates falling on integral multiples of six month intervals from the Base Date*] [*Annual coupons are also possible depending on an Issuer's and its investors' preferences.*]
Maturity Date:	[*Maturity date*] [*Term should be sufficiently long to provide for a smoothing of payments over a number of economic cycles, for example 10 or more years*]
Redemption Date:	(a) The Maturity Date; or (b) an early redemption date (**Early Redemption Date**) following: (i) the exercise of a Put Option; or (ii) an acceleration on an Event of Default.
Payment Date:	An Interest Payment Date or a Redemption Date.
Calculation Date:	The date falling five business days prior to a Payment Date.
Final Redemption Amount:	In respect of the Maturity Date, an amount in K$ (rounded if necessary to the fifth decimal place, with 0.000005 being rounded upwards) equal to: **Option 1** *(where no floor on the redemption amount is required by investors)*: ***Principal Amount x Nominal GDP Index Ratio*** $_{\textit{Redemption Date}}$ ***x Principal Factor*** **Option 2** (*where a floor on the redemption amount is required by investors*): ***The greater of (i) the Principal Amount and (ii) the product of the Principal Amount x Nominal GDP Index Ratio*** $_{\textit{Redemption Date}}$ ***x Principal Factor***

Early Redemption Amount: In respect of an Early Redemption Date, an amount in K$ (rounded if necessary to the fifth decimal place, with 0.000005 being rounded upwards) equal to:

Option 1 *(where no floor on the redemption amount is required by investors)*:

Principal Amount x Nominal GDP Index Ratio $_{Redemption\ Date}$ ***x Principal Factor plus Accrued Interest***

Option 2 (*where a floor on the redemption amount is required by investors*):

The greater of (i) the Principal Amount and (ii) the product of the Principal Amount x Nominal GDP Index Ratio $_{Redemption\ Date}$ ***x Principal Factor plus Accrued Interest***

Nominal GDP Index Ratio $_{Payment\ Date}$**:** In respect of a Payment Date, the ratio of Reference GDP applicable to such Payment Date (**Ref GDP** $_{Payment\ Date}$) *divided* by the Reference GDP with respect to the Base Date (**Ref GDP** $_{Base\ Date}$), (rounded if necessary to the fifth decimal place, with 0.000005 being rounded upwards), as expressed by this formula:

$$Nominal\ GDP\ Index\ Ratio_{Payment\ Date} = \frac{Ref\ GDP_{Payment\ Date}}{Ref\ GDP_{Base\ Date}}$$

Accrued Interest: Where interest is to be calculated in respect of a period which is less than a full six months, interest shall be calculated by applying the Base Interest Rate to each K$[●] and multiplying such amount by the applicable Day Count Fraction, and rounding the resultant figure to the nearest cent, half a cent being rounded upwards or otherwise in accordance with applicable market convention. [*The applicable Day Count Fraction will be specified at the time of issue and should conform with the relevant currency and market conventions*]

Reference Quarter: Each calendar quarter for which the Republic is scheduled to publish GDP statistics.

Reference GDP for the Base Date:

The result of a straight-line-basis calculation between (i) the GDP for the Reference Quarter ended six months prior to the Reference Quarter in which the Base Date falls, and (ii) the GDP for the Reference Quarter ended three months prior to the Reference Quarter in which the Base Date falls, each as published by the Statistical Institute as at the Base Date, using the following formula:

$$\textit{Nominal GDP for calendar quarter ended six months prior to Base Date} + \frac{\textit{Actual number of days between end of the previous calendar quarter and Base Date} - 1}{\textit{Actual number of days in calendar quarter in which Base Date falls}} \times \left(\begin{array}{c} \textit{Nominal GDP for calendar quarter ended three months prior to Base Date} \\ - \textit{Nominal GDP for calendar quarter ended six months prior to Base Date} \end{array} \right)$$

Reference GDP for the Payment Date:

The result of a straight-line-basis calculation between (i) the GDP for the Reference Quarter ended six months prior to the Reference Quarter in which the Payment Date falls, and (ii) the GDP for the Reference Quarter ended three months prior to the Reference Quarter in which the Payment Date falls, each as published by the Statistical Institute as at the relevant Calculation Date, using the following formula:

$$= \textit{Nominal GDP for calendar quarter ended six months prior to Payment Date} + \frac{\textit{Actual number of days between end of the previous calendar quarter and Payment Date} - 1}{\textit{Actual number of days in calendar quarter in which Payment Date falls}} \times \left(\begin{array}{c} \textit{Nominal GDP for calendar quarter ended three months prior to Payment Date} \\ - \textit{Nominal GDP for calendar quarter ended six months prior to Payment Date} \end{array} \right)$$

	If the Publishing Entity has not published such statistics for all relevant Reference Quarters by the Calculation Date, (subject to any agreed fallback provisions relating to non-publication for technical non-fault based reasons) the Reference GDP for all such Reference Quarters shall be the nominal GDP for the immediately preceding Reference Quarter for which the Publishing Entity has published such statistics for all such Reference Quarters, *multiplied* by 1.1. [*Investors' requirements with respect to the sources of GDP, revisions of GDP and relevant fall-backs for late or non-publication of GDP may vary depending on the particular sovereign and investors' concerns as to the reliability of the GDP data available for that sovereign. In this regard, an earlier warning trigger for non-availability of GDP may have to be considered*].
No post-Calculation Date adjustments:	No adjustments will be made to any future payments as a result of any rebasing or revisions of Reference GDP following a Calculation Date.
Statistical Institute:	The Republic's nationally recognised statistical institute being [●].
Central Bank:	The Republic's central bank being [●].
Publishing Entity:	The Statistical Institute or, if the Statistical Institute fails to publish the relevant statistics, the Central Bank. [*For issues with annual coupons and depending on the issuer, the IMF and its relevant statistics in the most recent issue of the World Economic Outlook could be a further fall-back*].
Trustee:	[●]. [*Trust or Fiscal Agency structure will have to be discussed on a case by case basis as a matter of preference and policy for each issuer.*]
Calculation Agent:	[The Republic] [*Entity entrusted with this role*].
Calculation of Payments:	All calculations relating to the GDP Bonds will be calculated by the Calculation Agent and any announcements will be made as set out under '**Notices**' below.
Call Option:	None.

Put Option: The holder of any GDP Bond may, on the occurrence of a Put Event, exercise an option to require the Republic to redeem such GDP Bond on a specified Put Date (as defined in the relevant put notice delivered to the Republic by such holder) at the Early Redemption Amount.

Put Event: Will be deemed to occur if any of the following occurs:

(a) the Republic and/or the Central Bank fails to publish GDP data by the agreed date and in the manner agreed (subject to any agreed grace period or agreed fallback provisions relating to non-publication for technical non-fault based reasons);

(b) an Article IV report for the Republic has not been published for two consecutive calendar years prior to any Calculation Date;

(c) the Republic's subscription to the IMF's Special Data Dissemination Standard ceases for any reason howsoever described;

(d) IMF's Executive Board finds that the Republic fails to provide information required under Article VIII, Section 5 of the IMF's Articles of Agreement and specified in Annex A to the IMF's "Decision on Strengthening the Effectiveness of Article VIII, Section 5"; and

(e) the Republic ceases to be member of the IMF.

[Requirement for a Put Option, the nature of the specified Put Events and interplay with Events of Default will be determined by the relevant parties on an issuer by issuer basis.]

Negative Pledge: So long as any GDP Bond remains outstanding, the Republic shall not create or permit to subsist any mortgage, pledge, lien or charge upon any of its present or future revenues, properties or assets to secure any Relevant Indebtedness, unless the GDP Bonds shall also be secured by such mortgage, pledge, lien or charge equally and rateably with such Relevant Indebtedness or by such other security (A) as the Trustee shall in its absolute discretion deem to be not materially less beneficial to the interests of the holders or (B) as may be approved by a resolution of the requisite majority of holders or written resolution of the holders.

[Inclusion of and/or scope of Negative Pledge to be determined by individual issuers.]

"**Relevant Indebtedness**" means, for the purpose of the Negative Pledge, any borrowed money in the form of bonds or similar debt instruments (and whether linked to any index or not) issued or guaranteed by the Republic which are, or are capable of being and intended to be, quoted, listed or ordinarily purchased and sold on any stock exchange, automated trading system or over the counter or other securities market.

Events of Default: Each of the following events is an Event of Default:

(a) the Republic fails to pay principal or interest on any GDP Bond (subject to appropriate grace periods);

(b) the Republic is in default in the performance of any covenant, condition or provision and continues to be in default for [appropriate grace period] after written notice has been given to the Republic by [any holder] [the Trustee];

(c) (i) any payment of principal in relation to any GDP-linked Indebtedness is not paid when due after giving effect to any applicable grace period or (ii) any GDP-linked Indebtedness has become due and payable prior to its stated maturity by reason of an event of default (however described), [provided that the amount of GDP-linked Indebtedness referred to in sub-paragraph (i) and/or sub-paragraph (ii) above individually or in the aggregate exceeds K$[●] (or its equivalent in any other currency or currencies)];

(d) the Republic declares a moratorium with respect to the GDP Bonds, including where such moratorium forms part of a general moratorium over all or part of the Republic's indebtedness;

(e) the Republic rescinds, repudiates or expropriates, (or purports to do so) any of the GDP Bonds or its obligations arising under the GDP Bonds or otherwise declares invalid its obligations under the GDP Bonds; and

(f) any applicable order, decree, enactment, treaty or regulation prevents the Republic from performing its obligations under or in respect of the GDP Bonds.

The Trustee at its discretion may, and if so requested in writing by the holders of at least one-fifth in principal amount of the GDP Bonds then outstanding shall, give notice to the Republic that each GDP Bond is, and shall forthwith become, immediately due and payable at the Early Redemption Amount if any of Event of Default occurs.

"**GDP-linked Indebtedness**" for the purposes of cross-acceleration ((c) above) will be limited to the Republic's other GDP-linked Securities and not to any other borrowed money obligation in the form of bonds or similar debt instruments.

[These are sample Events of Default. Events of Default to be set by individual issuers and to be consistent across all of such issuer's GDP-linked Securities.]

Listing: Yes

Rating: Yes

Security: None

Holders' Voting Rights/CACs: The GDP Bonds will contain provisions, commonly referred to as "collective action clauses", regarding approval of certain modifications and actions:

(a) in respect of the GDP Bonds only, with the consent of the holders of at least [75%] (for Reserved Matters) and at least [66 2/3%] (for all other matters) of the aggregate principal amount of the outstanding GDP Bonds; and

(b) in respect of the GDP Bonds and at least one other series of GDP-linked Securities (capable of aggregation for voting purposes with other series of GDP-linked Securities) issued by the Republic, with the consent of the holders of at least [75%] of the aggregate principal amount of the outstanding GDP-linked Securities of all affected GDP-linked Securities (taken in aggregate).

Aggregation will only be possible across series of GDP-linked Securities and not include any series of the Republic's other outstanding debt.

GDP-linked Securities held by the Republic or entities controlled by the Republic will not be considered to be outstanding and their holders will not be capable of voting.

Multiple series aggregation and modification may only take place provided the 'Uniformly Applicable' condition is satisfied. Such Uniformly Applicable conditions will be satisfied if, *inter alia*, (i) the holders of all affected series are invited to exchange or convert their GDP – linked Securities for the same new instruments or new instruments from an identical menu of instruments or (ii) the amendments proposed result in the amended GDP-linked Securities having identical provisions (except as necessarily required) including without limitation the methodology for the calculation of the GDP-linked interest and principal payment amounts.

The above conditions will only be satisfied if all exchanging, converting or amending holders of each aggregated series are offered (i) proportionally the same amount of consideration in respect of principal and interest accrued but unpaid as offered to each other holder of an affected series or (ii) where a menu of instruments is offered to holders, proportionally the same amount of consideration in respect of principal and interest accrued but unpaid as offered to each other holder of an affected series electing the same option from such menu of instruments.

Recognising the potential economic differences between series of GDP-linked Securities, proposed modifications or actions pursuant to the abovementioned aggregation may be made in respect of some series only or different offers may be made to different groups of GDP-linked Securities.

[*Eurozone sovereigns are obliged to include the mandatory form of eurozone collective action clause known as the Model CAC which was published on 26 March 2012 which differs in certain respects from the form of clause set out above which is based on the ICMA form of CAC*].

Reserved Matters: These will include resolutions proposing changes to:

(a) the date, amount, method of calculation, currency, place of any amounts payable;

(b) the majorities required for the passing of certain resolutions;

(c) certain definitions (including that of GDP-linked Securities, Uniformly Applicable and Reserved Matters) or certain other provisions, including majorities required, in the voting arrangements;

(d) disenfranchisement provisions, ranking of GDP Bonds and calculation of outstanding GDP Bonds;

(e) the Events of Default, the Put Events, the calculation of Reference GDP, the governing law and jurisdiction provisions; and

(f) exchange of the GDP Bonds in a manner which results in inequitable treatment of the holders.

[*Reserved Matters will seek to follow industry standards for aggregated CACs as published from time to time by ICMA.*]

Taxation: All payments by the Republic on the GDP Bonds will be paid free and clear of any Arcadian withholding taxes or other applicable Arcadian taxes.

Selling Restrictions: [*Depending on type of offering*].

Documentation and structure: Trust structure. The GDP Bonds will be constituted by a Trust Deed which will be available for inspection at the offices of the Trustee.

[*Trust or Fiscal Agency structure will have to be discussed as a matter of preference and policy for sovereigns. For Arcadia a trust structure is proposed.*]

Notices:	Notices will be given in accordance with the rules of the stock exchange where the GDP Bonds are listed and via Euroclear and Clearstream in customary fashion. Notices will also be published on the website of the Ministry of Finance of Arcadia at [●]
Governing Law:	English law [or such other law as customarily governs the Republic's international debt issuances].
Jurisdiction:	[The courts of England and arbitration (at the option of the holder). The Republic will appoint an independent process agent to receive service on its behalf in England.] [*Jurisdiction to be consistent with choice of governing law.*]
Clearing Systems:	Euroclear Bank S.A./N.V. and Clearstream Banking SA

The theoretical case for governments issuing debt instruments whose repayments are indexed to gross domestic product would appear to be strong. The question, then, is why is it that no large government has so far issued one?

Drawing on work commissioned by the recent Chinese and German presidencies of the G20, and with contributions from leading economists, lawyers and investors, this eBook explores what has been holding back innovation, weighs up the pros and cons from both the issuer's and investor's perspective, and looks at what an intelligently designed GDP-linked bond that overcomes the perceived impediments to issuance might look like in practice.

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