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Beyond Conventional Sovereign Debt Instruments: Issuance of GDP-linked Bonds in OECD Countries?

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ABSTRACT

Debt-to-GDP measures in major OECD countries are at historical highs and a considerable part of sovereign debt needs to be refinanced soon, while projections of real GDP growth are fairly weak and uncertain and assessed sovereign credit quality has declined. Against this, the OECD Committee on Financial Markets discussed proposals for sovereign debt managers to consider issuing GDP-linked sovereign bonds. The Committee considered proposals timely and the idea conceptually attractive, as additional insurance against economic downturns over the medium term would be available. It identified however also a number of issues that would complicate issuance in practise. Questions arise in particular as regards investor demand for such instruments and how an additional novelty, liquidity and indexation premium would compare to a potentially reduced default premium on more traditional debt. Debt management offices confirm and stress such practical difficulties and remain sceptical, quoting a lack of sustainable demand for such bonds. As a result, issuance of such bonds would be too costly. It is not clear however whether debt management offices take into account the full macroeconomic and financial stability risk-return trade-off that a broader perspective would take into account. Proposals for issuance of sovereign GDP-linked bonds among advanced economies, which had received increased attention after the German G20-presidency included the topic in the G20 finance track, may have lost some momentum, but there continues to be considerable support from both academics and some practitioners.

1. Introduction

OECD sovereign debt has attained a historically high level in relation to GDP. Moreover, aggregate marketable debt is projected to increase, while the outlook for real activity is neither strong nor certain. Recent upwards revision notwithstanding, the investment

and productivity outlook are preoccupying. Against this background, the OECD Committee on Financial Markets (CMF) decided to focus its attention to the structure of sovereign debt in terms of instruments used, including in particular on proposals for OECD sovereign to issue GDP-linked bonds. Such instruments, in principle, afford sovereigns

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with additional fiscal space should the real activity outlook weaken noticeably.

In a world of Ricardian equivalence, with lump-sum taxes, infinite horizons and perfect capital markets, the composition of government debt does not matter (Barro, 1995) ^[1]. Even recognising that real-world taxes are distortionary, the form of debt instrument does not matter, and the government would use debt management only with the aim of smoothing over time the collection of required taxes. Once however the extreme assumption of certainty about interest rates, price levels, etc. is dropped, and uncertainty about these variables acknowledged, the composition of government debt and what types of instruments are issued matter. For example, in the presence of positive transaction costs associated with debt renegotiations, introducing additional flexibility by making debt instruments explicitly state-contingent can avoid such costs and enable different nominal debt trajectories. This situation can be preferable to one where debt payments are implicitly state-contingent, which effectively describes any nominal debt.

The composition of sovereign debt, that is, in terms of short-term versus long-term, fixed-rate nominal versus index-linked debt instruments, etc. has thus gained heightened attention among policy makers, academics and public debt managers in OECD countries. For example, calls for debt-financed public investment to boost potential output growth were made, on the basis that low interest rates allow sovereign debtors to restructure the term of outstanding debt and to “lock-in” low refunding costs for the long-term. Also, against the backdrop of historically high sovereign debt levels and an uncertain real activity growth outlook, the idea of governments issuing financial instruments whose repayments are indexed to domestic GDP has received renewed attention. Making part of sovereign debt explicitly state-contingent could enhance sovereign debt sustainability and provide additional fiscal flexibility, provide investors with greater diversification opportunities, as well as foster financial market resilience by facilitating transfer of specific types of macroeconomic risks to private investors who are willing to share in those risks against a premium payment.

The present article draws heavily on work prepared pursuant to the suggestions made by the OECD Committee on Financial Markets (CMF) when discussing selected sovereign debt issues in 2017. At that meeting, the Committee focused specific attention to proposals for OECD sovereigns to issue GDP-linked debt instruments. The Committee considered the idea conceptually attractive, but also identified a number of issues that would complicate issuance in practise. Questions arise in particular as regards investor demand for such instruments, and how an additional novelty, liquidity and GDP-indexation premium would compare to potentially reduced

default premium on more traditional debt.

To provide some background for the issue of GDP-linked sovereign debt instruments, the second section discusses selected recent developments regarding sovereign borrowing in the OECD. The third section discusses the rationale for recent proposals to consider issuance of debt instruments whose payments are linked to economic variables such as GDP, and draws some lessons from experiences with inflation-index-linked sovereign bonds. The fourth section reports various policy maker discussions and places a sharp focus on the challenges that were identified regarding issuance in practise. Section V concludes.

2. Background: Selected Developments Regarding OECD Government Borrowing

2.1 Continued Net Borrowing in an Environment of Low and Even Negative Interest Rates

The borrowing outlook in OECD countries has somewhat stabilised, with both gross and net borrowing needs of OECD governments flattening during recent years (Figure 1). That said, still positive net borrowing requirements imply a continued increase in central government marketable debt, even if that growth is at more moderate rates than previously. Nominal central government debt stands at around USD 45.0 trillion in 2018.

Interest rates continue to be low by historical standards in OECD countries. Interest rates have declined by more than GDP growth and the decline in interest rates more than offsets the increase in the debt-to-GDP ratio. As a result, even though debt-to-GDP levels are still at historically high levels, debt-servicing is facilitated and relatively larger burdens of debt can be sustained at current levels of interest rates, a situation that has also lead to calls to boost potential output growth by debt-financed additional public investment (Box 1).

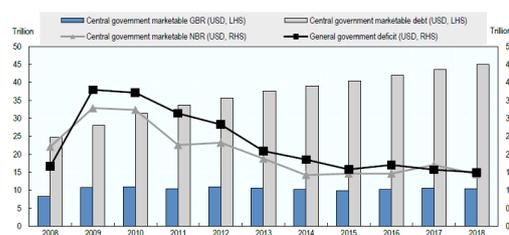


Figure 1. Sovereign borrowing has somewhat stabilised in OECD countries

Notes: GBR = gross borrowing requirement, NBR = net borrowing requirement. General government deficit is derived from the general government net lending as published in the OECD Economic Outlook No. 102 for all OECD countries except for Chile, Mexico and Turkey for which the source is the IMF World Economic Outlook (October 2017). Figures are calculated based on data in national currencies using exchange rates as of 1 December 2009.

Source: OECD Sovereign Borrowing Outlook 2018 ^[2].

Box 1: Calls for Debt-financed Public Investment to Boost Potential Output Growth

The observation that interest rates have declined by more than GDP growth has motivated calls to exploit the interest rate-growth differential, so as to escape what appears to be a low-growth trap of weak investment and productivity, reflected in low potential per capita output growth. As the role of monetary policy to address these issues is limited and monetary policy support for real activity growth is already exceptionally strong, policy advice has been reassessing the role of fiscal policies. In particular, in addition to structural reforms, a need to reassess fiscal policies has been diagnosed, with the suggested focus of such policies to be placed more sharply on the consequences for growth as opposed to budget balances and debt reduction. For example, according to the OECD Economic Outlook, fiscal space (broadly defined as additional room available for sovereign debt levels to grow before access to new borrowing would be compromised) has increased in many advanced economies, mainly as a result of declining interest rates. OECD governments could finance a 0.5 percentage point of GDP productivity-enhancing fiscal initiative in OECD countries for three to four years on average, without raising the debt-to-GDP ratio in the medium term, provided the selected activities and projects are sound. An easing of the fiscal stance through well-targeted growth-friendly measures is not expected to aggravate the debt-to-GDP ratio in the short term, whilst well-targeted fiscal measures are expected to raise potential output (not only raising soft and hard infrastructure or education spending, but also cutting harmful taxes) so that a temporary debt-financed fiscal expansion need not increase debt ratios in the longer term. In this context, a communication from the European Commission on fiscal policy in the euro area calls for a “positive fiscal stance”, defined as both expansionary and of high-quality composition (including with regard to the expenditure mix), although it recognises that countries which have not reached their medium-term objective or are under an excessive deficit procedure would find it difficult to achieve the suggested fiscal expansion.

Monetary policy measures such as lowering policy rates towards and below zero and purchasing government bonds have contributed to unusually low interest rates in financial markets. The current situation results however from a continuation of a trend that stretches over several decades, and it reflects reduced inflation expectations, compressed risk and

term premia and a decline in (inflation-adjusted) real interest rates. Already low, sovereign bond yields have turned negative in some countries. As a result, instead of paying interest, a number of OECD governments are now being paid by investors for the “privilege” to hold their bonds. This assessment describes a situation in which, for example, fixed-rate zero-coupon nominal bond that promises a payment of 100 is issued as a price exceeding 100; clarifications have been made to rule out the possibility of investors being charged negative coupons (Box 2). In any case, the widespread incidence of this phenomenon is unprecedented in financial market history.

Box 2: Ruling out negative coupon payments

In the case of some other securities, clarifications have been made to rule out the possibility of investors being charged negative coupons. Such a situation could arise in the case of variable-coupon government bond where the coupon is set by adding a spread to a reference interest rate that however might become sufficiently negative to erode this spread.

For example, Italian Treasury Credit Certificates (CCTs) pay semi-annual coupons that are calculated with reference to the 6-month Treasury Bills (BOTs) yield at issuance augmented by a spread of 0.30% on an annual basis. Similarly, the Ministry of Economy and Finance issues European Treasury Credit Certificates (CCTeu), which are securities whose semi-annual coupons are indexed to 6-month EURIBOR, augmented by a spread that varies from issue to issue. The considerations regarding the level of coupons in the event of negative interest rates discussed below apply to both CCTs and CCTeu.

As market interest rates declined below zero, a situation whereby the spread would be fully eroded became more likely, and authorities in Italy recognised that existing decrees did not rule out explicitly the possibility of negative interest rates. The question arose whether and how would the Treasury collect the related value from each individual investor and/or whether it should be understood that the lowest limit on the coupon is equal to zero. The Attorney General’s Office addressed the question in an opinion published on 3 December 2015 as follows: “The relationship that is established with subscription of redeemable public-debt securities, in which the nominal amount is equal to the sum to be repaid at maturity, is referable to a type of long-term loan contract. The CCT and CCTeu are instruments incorporating uncertainty due to the variability of the interest rate, but the borrower’s obligation to repay the principal is not uncertain. The

provisions of the Italian Civil Code with respect to a long-term loan contract provide that such contract naturally has a cost for the borrower only, and not for the lender, who is not required to sustain the risk of a negative interest rate such as to also affect the lender's capital (Article 1813 of the Italian Civil Code, in relation to the obligation to pay back the same amount of money). In essence, the maximum risk for the lender is that of the gratuitousness of the contract. In addition, the Italian Civil Code also provides that services qualified as interest must be for the account of the borrower, and this prevents one from considering, albeit implicitly, that, as such, the services are to be for the account of the lender. ... The Attorney General's Office concludes that the necessary solution is that "the regulation of the relationship includes an implicit provision, whereby, in the event of negative interest rates, the minimum coupon is equal to zero."

2.2 Using Low Interest Rates to Buy Insurance Against Sovereign Debt Roll-over Risk

An environment in which long-term rates are very low also makes it cheaper for sovereign debt managers to insure against rollover risk. Reflecting a response to a changed trade-off between the costs of such insurance and the refinancing risks with no insurance, sovereign debt management offices have tended to buy additional insurance. This situation is reflected in weighted average term-to-maturity (ATM) numbers that have increased, thus implying a slower pass-through effect of potential interest rate increases to government's interest payments in the future. By itself, this observation is reassuring, given the need to roll-over substantial amounts of debt coming due over the next few years. That said, buying this type of assurance is not costless; in fact, it has limited the extent to which the decline in interest rates has fed through to actual government interest rate expenses. In fact, Figure 2 illustrates that the interest rate decline is not matched one-by-one by a decline in net interest payments on government debt. In addition to the observation that not all debt is rolled over instantly, this observation reflects that OECD sovereign borrowing offices have taken advantage of declining and historically low interest rates to extend average terms of maturity of outstanding sovereign debt.

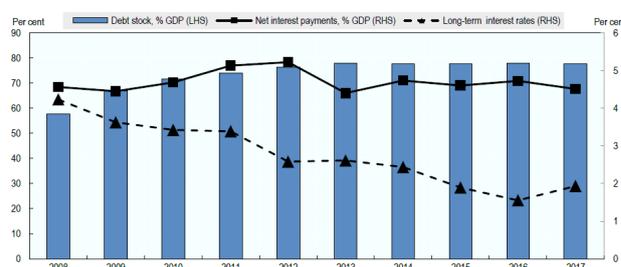


Figure 2. Central government marketable gross borrowing, interest payments and long-term interest rates

Notes: OECD area estimates. Net interest payments from the Economic Outlook database and refers to a wider concept of government liabilities than central government marketable debt. Long-term interest rates derived from long-term interest rate on government bonds calculated as a GDP weighted average.

Source: OECD Sovereign Borrowing Outlook 2018^[2].

Government debt managers routinely measure and monitor refinancing risk exposure of the government debt portfolio. In particular, they use various metrics that measure rollover risk so as to allow them to identify vulnerabilities in the government debt structure and to reduce portfolio risk in relation to a given benchmark. Widely used indicators include the ratio of debt maturing in a specific period expressed as a share of the total debt portfolio the average term to maturity (ATM). Figure 3 presents the debt service of outstanding medium- and long-term central government marketable debt for the next 12, 24 and 36 months. Total debt service of OECD governments for the following 3 years is around 40% of the outstanding marketable debt, one fifth of which is due in the next 12 months. This number is somewhat more favourable in risk terms than it was in previous years in the sense that the amount of debt coming due over the immediate future has declined. The flipside of this evolution is that it reduces to some extent the capacity to refinance maturing debt at what might be considered advantageously low interest rates. Figure 4 shows that the weighted ATM of outstanding marketable debt in the OECD area has increased by about 2 years compared to the pre-crisis period, from about 6 to about 8 years as of end-2017, compared to 10 years before. In several countries including Denmark, Ireland, Mexico, Switzerland and the United Kingdom), the average term-to-maturity of sovereign outstanding marketable debt rose by more years between 2007 and 2017. By contrast, some sovereigns, including the United States and Germany have stabilised average maturities at specific levels and taken advantage of very low short-term interest rates rather than extending the duration of their outstanding debt. Reflecting this strategy as well as the observation that the outstanding stock of debt as of GDP

is more limited than in other G7 countries, gross interest rate payments as of GDP are relatively low in Germany. Looking ahead, Maravalle and Rawdanowicz (2018)^[3] suggest an additional substantial lengthening of the average sovereign debt maturity in G7 countries would in several cases imply substantial additional cumulative fiscal costs over the next decades.

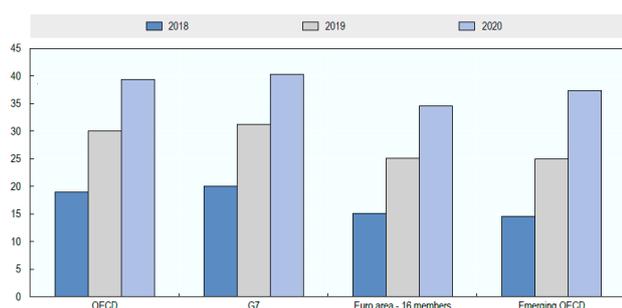


Figure 3. Cumulative percentage of debt maturing in the next 12, 24 and 36 months (As a percentage of total marketable debt as of 2017)

Notes: Cumulative percentage of debt maturing in the next 12, 24 and 36 months (i.e. in 2018, 2019 and 2020) as a percentage of total marketable debt stock (without cash) in 2016. Values of principal payments and marketable debt have been aggregated into a single currency by using fixed exchange rates, as of 1st December 2009, for all years. "Euro area - 16 members" includes the following OECD countries: Austria, Belgium, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Luxembourg, Netherlands, Portugal, Slovak Republic, Slovenia and Spain. "Emerging OECD" include Chile, Czech Republic, Estonia, Hungary, Latvia, Mexico, Poland, Slovak Republic, Slovenia and Turkey. "Other OECD" includes Australia, Denmark, Iceland, Israel, Korea, New Zealand, Norway, Sweden and Switzerland.

Source: OECD Sovereign Borrowing Outlook 2018^[2].

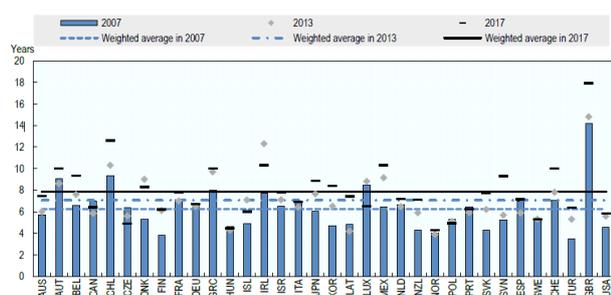


Figure 4. Average term-to-maturity of outstanding marketable debt in selected OECD countries

Notes: Average term-to-maturity in years (e.g. 0.5 years correspond to 6 months) of outstanding marketable debt. Data are not strictly comparable across countries. The weighted average was calculated based on the data of all countries for which the average term to maturity was available for 2007, 2013, and 2017. The values of central government marketable debt (without cash) in 2007, 2013, and 2017, expressed in USD values using the December 2009 exchange rates, were used as weights in constructing the average.

Source: OECD Sovereign Borrowing Outlook 2018^[2].

The lengthening of average duration of outstanding government debt instruments in many OECD countries

reflects the growing issuance of ultra-long bonds. The history of such bonds goes back at least to the 18th Century, when the United Kingdom borrowed through issuance of "undated" gilts (consols). More than two centuries later, the UK government redeemed its last outstanding consols in 2015. Issuance of ultra-long-term sovereign bonds, defined here as bonds with a maturity at issue equal to or exceeding 30 years, have been nonetheless a fairly rare phenomenon, until recently. For example, the economist Barro (1995)^[1], in a widely quoted NBER working paper on debt management, implied his astonishment about the issuance of some ultra-long term bonds in the United Kingdom by noting: "More recently, the UK government has issued indexed coupon bonds with maturities as long as 38 years, which is nearly infinity." Incidentally, before a shortened version of that article was published in 1999 in a journal (excluding that statement however), China and the Philippines had issued a 100-year bond in 1996 and 1997, respectively. Even if the actual amount of ultra-long-term bond issues is not very significant, with issues typically being not very large in size, these types of instruments might have become to be considered "conventional" (Box 3).

There are however also potential risks related to efforts to fix the rate of interest payable on debt over long periods for the issuer of such debt. When discussing the issue at the meeting of the OECD Working Party on Debt Management, several debt managers highlighted the relevance of "regret risk". This risk is meant to describe a situation where the issuer believes that rates have reached historical minimum levels, and based on this assessment issues significant amount of debt, only to find out that rates subsequently fell further. High volumes of ultra-long-term debt might also turn out to be unnecessary, as borrowing needs might decline. Issuing ultra-long-term debt "opportunistically" might also conflict with the idea of regular and predictable sovereign debt issuance policies, and it could also adversely affect liquidity in other segments of the yield curve. Debt managers agreed that careful consideration needs to be given to the depth and sustainability of investor demand for such instruments. It appears that the main buyers of these securities are insurance companies and pension funds that are characterised by long durations on their liability side, although a considerable amount of demand also reflects a search for positive nominal yields by other investors in an environment where sovereign bonds pay negative rates in some cases up to ten years of maturity.

In any case, taking a macro-perspective that goes beyond the analysis of the costs and benefits for the issuer of debt, the flip-side of (successful) efforts to limit sovereign debt portfolio refinancing risk exposures is an increase in the

interest rate risk faced by the investors in sovereign bonds. Admittedly, while the primary risk confronting many retail and institutional investors is a continuation of the very-low-rate environment which adversely affects, for example, defined benefit pension funds and life insurance companies with guaranteed products as well as investors attempting to secure a specific minimum retirement income from capital market investments, another risk is that of a rapid and unexpected increase in interest rates. To illustrate that point, Figure 5 shows a measure of duration risk and provides a simple numerical illustration of the magnitude of potential losses of G7 sovereign debt holders in the case of a 100 basis points interest rate increase. It contains a snapshot of such risks for March 2017, with estimates being prepared for a presentation given at a subsequent meeting of the FSB Analytical Group on Vulnerabilities. It uses the example of the outstanding debt of G7 sovereign borrowers, which incidentally account for more than 85% of total annual OECD central government borrowing. The circles indicate estimated mark-to-market losses on individual bonds assuming a 1% upward shift in the yield curve. Aggregating those losses, one obtains a total loss of about 1.6 trillion USD, which corresponds to a percentage loss of 6.5% on the outstanding stock of about 25 trillion USD of G7 sovereign debt at March 2017 (Table 1). It highlights that modified duration of the OECD sovereign bond universe and potential losses for bondholders from an interest rate increase have substantially risen during the observation period, as highlighted by the dots identifying individual bonds shifting towards the south-east of the chart.

Even though interest rates are generally projected to increase over the next few years in the major regions, although to different extents, the longer the situation of historically low rates lasts, the more observers come to believe that this situation might be the “new normal”. Exceptional as the current episode of low interest rates appears by historical standards, predictions of a reversal to the “normal” have so far repeatedly been proved wrong. As a result, investors might have been led to believe that the risk of a sudden snap-back of rates is limited.

Box 3: Debt Manager Considerations Regarding Ultra-long-term Bonds: From Opportunistic Issuance to Standard Practice?

The OECD Working Party on Public Debt Management (WPDM), a working party of the OECD CMF, at its meeting in November 2016, acknowledged the potential benefits and challenges associated with issuance of such ultra-long bonds. Such issuance limits refinancing risk, provides predictability of redemptions over decades in advance, and diversifies a government's debt portfolio. Reflecting these considerations, in the case of several

large issuers including the United States, the United Kingdom, Japan and Italy, 30-year bonds have been part of their regular borrowing programs for some time now, and issuance has met with strong and sustained investor demand. Many debt management officers noted that bonds with maturities exceeding 30 years allow the issuer to “lock in” historically low interest rates and reduce refinancing risk. In terms of issuance techniques, in countries where 30-year bonds are already part of financing programs, auctions are the most widely used method of bond sale. Bonds are often regularly issued and re-opened after the initial issuance, so that outstanding volumes and trade levels in the market are such that an efficient price formation of new issues through auctions is considered feasible. By contrast, in the case of a debt issue of an ultra-long-term bond, several debt management offices prefer syndications and a few small issuers use private placements.

As part of the discussions by the OECD Committee on Financial Markets in April 2017 of selected sovereign debt issues, one delegate noted that the Committee had discussed the issuance of long-term bonds and concluded that there would be considerable demand for long-duration bonds. Such demand would stem in particular from institutional investors that in turn have long-duration liabilities, exceeding several decades. This observation is consistent with earlier suggestions by the Committee. For example, in October 2006, the CMF concluded that the potential demand for long-term high-credit-quality sovereign bonds could, in principle, be very substantial, sufficient in fact to result in a scarcity of such bonds in circulation (Ervin and Schich, 2007) ^[4]. Back then, while many debt managers had already taken advantage of favourable bond market conditions and issued more long-term debt, the Committee concluded that the question whether they should follow a strategy of maturity-lengthening with the express aim to facilitate the task for pension fund managers is however a different matter. In fact, the Committee concluded “most policy makers would not recommend that governments undertake to issue long-term debt with the express intent of meeting this demand, not least because they expect the price mechanism to clear apparent imbalances in asset markets.”

Looking back, the financing of the immediate policy response to the global financial crisis involved some shortening of the maturity structure of new borrowing and debt outstanding, although already shortly afterwards a trend increase in the issuance of ultra-long-term bonds could be observed. This trend increase consisted in a gradually increasing number of sovereigns having issued at least one ultra-long-term bond. In 2006, no OECD government had issued any such bond. During the subsequent years, more

and more sovereigns issued such bonds, some of them even repeatedly. Notable exceptions include Germany and the United States. For example, in the United States, the longest Treasury bond maturity is currently 30 years (although issuance was discontinued between 2001 and 2006) and the United States Treasury Department is currently considering the idea of issuing longer-term bonds. As part of its Quarterly Refunding, the Treasury held discussions with the private sector members of the Treasury Borrowing Advisory Committee (TBAC), among other things, on the possible issuance of bonds with maturities of 40 or 50 years or longer. The feedback received will be combined with the results of research of an internal working group to study ultra-long bonds. The committee said it does not see evidence of “notably strong or sustainable demand” for ultra-long bonds, adding however that issuing more longer-term debt could make sense if Treasury wanted to raise its borrowing capacity. Such discussions are motivated by attempts to facilitate the financing of significant amounts of public infrastructure investments. Such an approach is not without precedence; for example, in 1911, the United States government issued bonds with 50 years of maturity-at-issue to fund the construction of the Panama Canal.

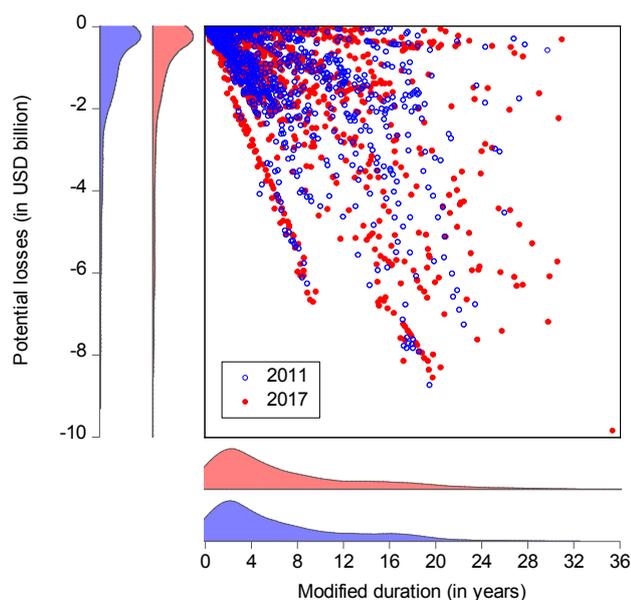


Figure 5. Duration risk of the portfolio of outstanding G7 government debt is high (Mark-to-market losses for a 1% yield-curve upward shift)

Notes: Approximate losses on government bonds issued by G7 governments in G7 markets for an assumed market interest rate increase by 1% (vertical axis, in USD billion), based on bond-specific estimates of modified duration (horizontal axis, in years) multiplied by the market value of the amount of bond outstanding. As of end-March 2017 and end-December 2011. Not considering exchange rate changes. Excludes short-term securities.

Source: Thomson Reuters; OECD Secretariat calculations.

Table 1. Aggregate mark-to-market losses on G7 sovereign bonds for 1% market rate increase

	2011	2017
Outstanding amounts (USD trillion)	20	25
Potential losses (USD trillion)	-1.2	-1.6
Memo: Losses in per cent of outstanding	-5.8	-6.5

Notes: Figure shows approximate losses on investments in government bonds issued by G7 governments in G7 markets and outstanding at the end of 2011 and end-March 2017 (each circle representing one bond), assuming a market interest rate increase by 1% (vertical axis, in USD billion), based on bond-specific estimates of modified duration (horizontal axis, in years) multiplied by the amount issued of this specific bond. Table shows aggregate for all bonds at each date.

Source: Thomson Reuters, and author calculations.

2.3 Developments in the assessed credit quality of (conventional) OECD sovereign bond issues

Most public debt managers have used the opportunity of the low-interest-rate environment to buy some insurance against roll-over risk by increasing the average remaining maturity of the stock of outstanding debt. Such measures are however not free of costs as long as the yield curve is upward sloping, which is currently the case in OECD countries. A notable exemption from the general trend towards yield average-maturity lengthening is Germany, where the average term-to-maturity has stabilised during the past five years. As a result, gross interest payments as of GDP are very low compared to other G7 countries (see e.g. Figure 1, panel B of Maravalle and Rawdanowicz, 2018^[3]). The amount of sovereign debt coming due over the short term differs considerably from one OECD country to another and is considerable for the group as a whole, with an estimated cumulative amount of 40% of total marketable coming due until the end of 2020 (Figure 3). That amount is equivalent to more than half of the total marketable debt stock in OECD countries a decade before, if expressed in 2009 US dollars (Figure 1). Given such considerable need to finance debt redemptions (and budget deficits), the assessed credit quality of OECD sovereign debt issues deserves some attention.

Measures of the assessed credit quality of OECD sovereign debt suggest that the latter has declined over the last decade. For example, a measure derived from credit rating agency assessments illustrates that more than 18 000 bonds debt instruments issued during the last decade of sovereigns from the OECD are characterised by a trend decline in their credit rating (Figure 6). The average credit rating of OECD sovereign debt issues was around 17 notches (on a scale up to 19) at the beginning of the sample, which is equivalent to high-grade. It has declined to around 15 more recently, which is upper medium grade. Much of the dynamics reflect the downgrade in May 2012

of Japan by Fitch. Incidentally, S&P downgraded Japan already more than a year earlier, in January 2011. Going further back, Japan lost its last prime rating from Moody's in May 2009 (at a point where S&P and Fitch had already considered Japan only as high grade).

Combining the data from all three credit rating agencies and considering the maximum of all three confirms the assessment that the universe of OECD sovereign debt issuance has evolved considerably. Figure 6 identifies through the two light-shaded areas the volume-weighted issuance of prime and high grade sovereign debt, respectively, from OECD countries. The area shrinks over time. Incidentally, that observation is also interesting as it qualifies to some extent the observation that an observed decrease in the ratings and in particular in the share of triple-A investments of institutional investors' fixed income portfolios can be interpreted as a sign for "search-for-yield". In fact, the chart shows that the supply of such debt is declining and that simply buying the same mix of sovereign debt issues from OECD countries every year implies already a trend decline in higher-rated investments. In any case, there is a risk that a deteriorating assessed credit quality will affect investor demand at one point.

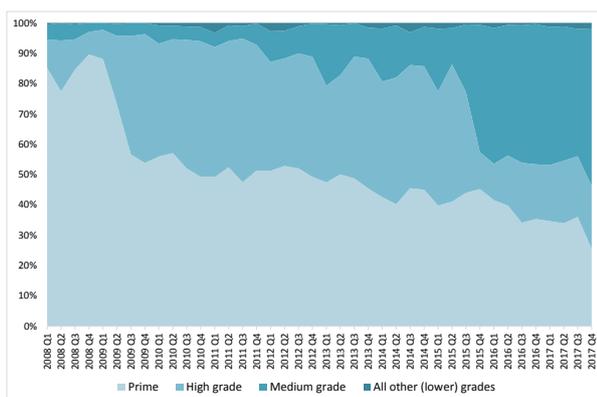


Figure 6. Prime and high-grade OECD sovereign debt issuance is declining

Note: Breakdown of quarterly issuance of long-term (ten years or more) sovereign debt issues from OECD countries into credit rating categories (i.e. maximum assigned by either Fitch, Moody's or S&P) from January 2008 to December 2017. Weighted by volume.

Source: OECD Secretariat estimates based on Thomson Reuters Datastream.

3. Rationale for Issuing Sovereign Bonds with Payments Linked to GDP

3.1 Proposals for Considering Issuance of Sovereign GDP-linked Bonds in OECD Countries

Given the current historically high sovereign debt levels (Figure 7), and the weak and uncertain real activity growth outlook, the idea of governments issuing financial

instruments whose repayments are indexed to domestic GDP has received renewed attention. While many OECD sovereigns have purchased some insurance against roll-over-risk by extending the average maturity of their outstanding debt, the assessed credit quality of conventional sovereign debt instruments in the OECD has declined over the past decade and it is hard to predict whether investor demand will remain strong if and when interest rate return to historical norms.

Fuelling that debate, a report developed by several central banks for the G20 argues that, in theory, the case for issuing such forms of state-contingent debt might be particularly strong now. The report argues that GDP-linked bonds offer additional fiscal space in downturns and an alternative way of reducing leverage from high debt levels, which implies that the benefits from issuing such instruments are likely to be largest when debt levels are already high relative to GDP and there is an attempt to minimize the probability of debt reaching an unsustainable trajectory.

Related work prepared for the G20, which included the topic of state-contingent bonds as one of its priorities of the finance track under the German presidency in 2016, encourages policy makers and debt management offices to consider proposals for issuing new types of index-linked bonds, in particular, debt instruments whose repayments are linked to domestic GDP developments. Such proposals to issue debt the servicing of which is linked to GDP shocks is considered attractive according to its proponents, especially given currently high sovereign debt levels. The Communiqué of the meeting of G20 Finance Ministers and Central Bank Governors March 18, 2017, in Baden Baden referenced related follow-up work as follows: "With a view to ensuring debt sustainability, we welcome Operational Guidelines for Sustainable Financing reflecting responsibilities of borrowers and lenders. The Compass for GDP-linked Bonds provides an overview of important aspects of this instrument."

Many academic proposals were made for debt instruments with payments indexed to economic variables although the role of moral hazard on the part of the debtor was recognised as a potential major impediment. Against this background, indices were thought preferable to the extent that they were less directly influenced by debtors' actions. Historical examples have been mostly confined to inflation. A widely quoted early example of a type of inflation-indexed bond is a "depreciation note", indexed to a basket of goods including corn, beef, wool and leather, by the State of Massachusetts in 1780. In more recent history, Israel paved the way with inflation-linked bonds issued in 1955. The United Kingdom has been issuing inflation-

linked bonds in 1981, Australia since 1985, Canada since 1991, Sweden since 1994, the United States since 1997 (Treasury inflation protected securities, TIPS), France since 1998, Italy since 2003, Japan since 2004 (in this case deflation-linked bonds) and Germany since 2006.

Following the 1980s debt crises, there was growing interest in the idea of sovereigns issuing bonds whose service or repayments would be linked to measures of the debtors' payment capacity, exports or commodity prices. Mexico has issued bonds indexed to oil prices. Brady bonds by Mexico, Venezuela, Nigeria and Uruguay were issued to commercial banks foresaw additional payments as a function of commodity price developments (Borensztein and Mauro, 2004) ^[5]. Also as part of restructuring agreements in the 1980s and 1990s, Costa Rica, Bulgaria, and Bosnia and Herzegovina -- and later Argentina (Benford et al., 2016, Box 3) ^[6], Greece and Ukraine -- have issued bonds containing an element of indexation to domestic GDP (IMF, 2017, Table 3). In particular, these bonds include clauses or warrants that increase the payoff to bondholders if the absolute level of GDP or GDP per capita of the debtor country rise above a specific threshold value.

As regards debt instruments whose repayments are linked to domestic GDP developments, it is useful to distinguish between potential issuance in sovereign debt restructurings, on the one hand, and during "normal times", on the other (Benford et al., 2016) ^[6]. In debt restructurings, GDP-linked bonds can help by back-loading debt repayments to when recovery is fully underway. These bonds thus allow governments to insure themselves against subsequent negative growth shocks and having to restructure again. Traditionally, the relevance of this advantage was discussed in relation to emerging countries' external financial obligations during the 1980s and 1990s, although a more recent restructurings involves OECD member country Greece. In normal times, that is, outside of debt restructurings, GDP-linked bonds offer additional fiscal space in downturns, another way of deleveraging from high debt levels and a way of preventing solvency crises. These benefits are likely to be largest when debt levels are already high relative to GDP and there is a non-trivial probability of debt reaching an unsustainable trajectory.

In fact, the argument for considering the issuance of debt whose payments are indexed to GDP by sovereigns in mature economies might currently be stronger than it was over the past few decades. Public debt levels in several major OECD economies are at post-World War II highs, as illustrated in Figure 8. Moreover, real economic activity - that would allow a country to grow out of relatively high

debt levels - is currently weak and its prospects uncertain. One main advantage of this proposed new kind of debt would be to limit the variation of the debt-to-GDP ratio, and thus limit the risk of a debt crisis. In a recession, when tax revenues are relatively low, GDP-indexed bonds would only pay a low interest rate. Such an advantage is particularly attractive to an issuer when the real activity growth outlook is fairly weak and uncertain, as it is now.

It should be noted, however, that the argument in favour of issuing such debt appeared also to be particularly strong in the case of emerging market sovereigns during and after the 1980s, when the latter experienced costly crises that involved default on countries' external debt obligations. Even under those circumstances, such debt did not become an established form of sovereign issuance outside of debt restructurings. The state-contingent bonds issued by emerging markets have formed only a small part of the debt stock, complementing a much larger stock of conventional debt, and have often been discontinued after a small number of issues (IMF, 2017) ^[7]. So what are the pros and cons of issuing and buying sovereign debt using GDP-linked bonds in the case of advanced economies?

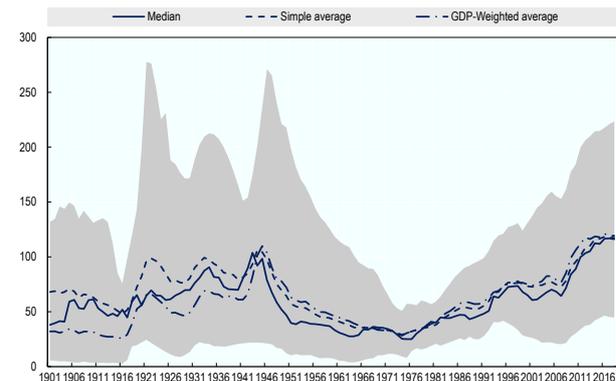


Figure 7. Gross general government financial liabilities of selected OECD countries (percentage of GDP)

Notes: The chart shows the evolution of several metrics (minimum, maximum, median, mean and GDP-weighted average) of general government gross financial liabilities expressed as a percentage of GDP for a selection of 9 OECD countries (Australia, Canada, France, Germany, Italy, Japan, Spain, the United Kingdom and the United States). The grey area shows the range of minimum and maximum values all countries included. Recent data from OECD Economic Outlook No 98 and earlier data estimated by extrapolating the recent data applying the dynamics observed in the gross general government debts as reported in the IMF Historical Public Debt Database. The value for Germany for the year 1925 was dropped as its low value generated an unusual volatility of debt given the pattern for Germany around that period. The remaining gaps in the time series were imputed by fitting piecewise cubic splines. Individual countries' time series may include methodological breaks. GDP-weights from 1954 to 2017 from IMF International Financial Statistics and for earlier period assumed identical to values in 1954.

Source: OECD Secretariat estimate. Update from Sovereign Borrowing Outlook 2016 (Figure 1.6) ^[8].

3.2 Issuer Perspective

From the issuer perspective, the need for additional fiscal consolidation would be lessened in cases where real activity growth performance turned out to be disappointing, provided a substantial part of the debt outstanding is in form of GDP-linked bonds. In such situations, the adverse feedback effects potentially associated with fiscal retrenchment could be avoided and the automatic stabilisers be allowed to function as desired. Additional room would become available for sovereign debt levels to grow before access to new borrowing would be compromised, as – effectively -- the sovereign's maximum sustainable debt threshold would rise. When and whether such additional space should be used is however another question.

GDP-linked bonds lower the probability of contractual default on outstanding sovereign debt, relative to conventional debt instruments, which turn could in principle also lower the default risk premium on the sovereigns' outstanding conventional debt. Such advantages tend to be largest where debt levels are already high relative to GDP, especially if that situation is reflected in low sovereign credit rating assessments. For example, Hilscher and Nosbusch (2010)^[9] find that the default risk premium typically accounts for a larger share of the overall borrowing costs for lower-rated emerging market sovereign debtors. Credit ratings of OECD sovereign borrowers tend to be much stronger, although the assessed credit rating quality of bond issues from OECD countries has somewhat declined over the past decade, as shown in Figures 6 and 7.

Not just debt-to-GDP levels but also their volatility matter for borrowing costs. Considering the basic logic of option-pricing theory that follows the intuition of Merton (1977)^[10], the volatility of the debt-to-GDP matters for the pricing of sovereign debt: Assuming all else equal, a sovereign with more volatile debt-to-GDP developments is more likely to experience a severe worsening of such ratio, making it more likely that the sovereign is faced with a situation where it needs to undertake costly fiscal adjustments to avoid contractual default or decide to default. There is some empirical evidence that is consistent with such an interpretation. For example, Schich (1997)^[11] finds that the trade financing of emerging markets with volatile external financial positions is saddled with higher costs than that of countries with more stable positions and Hilscher and Nosbusch (2010)^[9] identify a similar link between emerging market sovereigns borrowing spreads and the volatility of their terms of trade. Thus, issuing GDP-linked bonds would be expected to bring benefits

that are greatest to sovereigns of countries that face more volatile fundamentals.

Admittedly, the underlying economic fundamentals tend to be more stable in advanced economies than in emerging economies. That said, the benefits in terms of volatility-limiting effects from GDP-linked bonds to sovereigns from advanced economies can also be substantial. For example, GDP-linked bonds could generate substantial stabilising effects on debt-to-GDP developments even for G-7 countries where GDP growth is relatively stable. Consider that the evolution of sovereign debt-to-GDP ratios is determined by two types of shocks, that is "spending shocks" emanating from structural primary balance and interest payment developments and "growth shocks" that affect the denominator of the above-mentioned ratios. While GDP-linked bonds are not helpful in avoiding undesirable debt-to-GDP developments as a result of the first type of shocks, they can provide a form of "recession insurance" to avoid that the second types of shocks leads to unsustainable debt-to-GDP ratios (Brooke et al., 2013)^[12].

Sharp declines in nominal GDP growth occur both in advanced and emerging economies and such shocks occur roughly every 12 years, at fiscal costs that are on average equivalent to an adverse shock equivalent to 6% of GDP (IMF, 2016)^[13]. Remarkably, such macroeconomic shocks are estimated to be as costly as the materialisation of contingent fiscal liability risks stemming from the financial sector (roughly 9% compared to a situation where GDP growth had continued to grow at its five-year average), but they are twice less likely to occur than the latter. The costs arising from other potential contingent liabilities such as failures of SOEs or natural disasters are much lower on average and occur much less frequently, by contrast (see Figure 2 in IMF, 2017)^[12]. Thus, mitigating the effects of macroeconomic shocks should be an important element of effective sovereign balance sheet risk management. Obviously, one important factor that determines the ultimate effect on fiscal positions of such GDP declines is the extent to which monetary policy offsets such pressures by lowering interest rates and thus government borrowing costs as well as disinflationary pressures on fiscal positions. In a common currency area, monetary policy flexibility is however more limited; thus, there would be an additional premium on the availability of instruments that mitigate fiscal risks.

3.3 Investor Perspective

From the investors' perspective, GDP-linked bonds can provide portfolio diversification benefits. GDP-linked bonds provide exposure to a country's growth

performance, which is not available from any other single investment instrument. For example, while some exposure to corporate earnings can be acquired through investment in listed corporate equity, such exposure is only to a narrow subset of such earnings, namely to private corporate profits after tax GDP. Moreover, exposure to GDP growth reflects a much broader set of developments including in corporate earnings, wages, salaries and other labour income. While portfolios of assets and derivatives could be constructed to replicate exposure to GDP growth, any such approach would lack the standardisation and tradability advantages that a single benchmark GDP-linked bond might provide.

Investors in conventional bonds require the issuer to pay default risk and liquidity risk premium. Compared to such bonds, investors in GDP-linked bonds would require an additional novelty premium (related to the difficulties of pricing a new financial instrument) and an indexation premium; the latter to compensate for greater volatility of total return on GDP-linked as opposed to conventional bonds. While the addition of these two premia would tend to make GDP-linked bonds more costly than conventional bonds, the introduction of the former lowers the risk of default on contractual debt, implying a reduced default risk premium not only on GDP-linked bonds (as opposed to conventional bonds) but also on the remaining conventional bonds. The net effect on the aggregate risk premiums is uncertain and depends on the mix of GDP-linked and conventional bonds, the track record of the new instruments and the country characteristics.

How significant might the diversification benefits be? For an investor attempting to diversify his portfolio by investing in another country either through equities or GDP-linked bonds, choosing the latter is always preferable to choosing the former when the investor considers the aim of reducing the variance of the overall portfolio, if one assumes that the initial portfolio consisted of US stocks and Treasury bills. This finding reflects the combined effect of the lower variance of nominal GDP growth compared to stock returns and the lower correlation with the initial portfolio return of nominal GDP growth as opposed to stock returns. Figure 10 provides an illustration.

GDP-linked bonds also raise a number of practical challenges. One is to deal with revisions in GDP numbers, which can be very large, including for long past years. Another one is to accommodate methodological changes in the measurement of GDP, which can also be far reaching. Finally, the complexity of GDP compilation, which also involves considerable imputation for many unmeasured items, may raise questions of trust, which

could generate a substantial risk premium for GDP bonds. To address these issues, a term sheet has been developed that sets out a basic structure for such bonds. The term sheet is modelled against the background of inflation-linked bonds and addresses some key element of a suggested structure. For example, bonds would be denominated in domestic currency and have maturities between 10 and 20 years and be indexed to nominal GDP. The principal would be indexed to cumulative growth in nominal GDP since issuance, so that debt moves with the level of GDP, hence stabilising the debt-to-GDP ratio. A six-month indexation lag to quarterly GDP is suggested, which roughly corresponds to the third GDP revision.

3.4 Quantification of Costs and Benefits

Benford et al. (2016) ^[6] quantify the costs and benefits of issuing GDP-linked bonds, analysing how the debt-to-GDP ratio for a government would evolve in response to a series of shocks assuming that its debt is either all in conventional or all in GDP-linked bonds. The shocks considered include shocks to GDP, interest rates, the primary balance and, where debt is issued in foreign currency, the exchange rate. Case studies are undertaken for a “representative” advanced and emerging economy with a debt-to-GDP ratio of 100% and 65%, respectively. The shocks are calibrated to be similar to those that the representative advanced and emerging economy experienced on average every year over the past decade and a half. The results suggest that GDP-linked bonds considerably reduce the risk of explosive debt dynamics in both advanced and emerging economies. For example, an (unfavourable) outcome in the 99% (upper) tail for the debt-to-GDP ratio of an advanced economy corresponds to a value of 120% in the case of GDP-linked bonds compared to 175% in the case of conventional bonds. By contrast, in the case of an emerging economy, the corresponding reduction gained through the issuance of GDP-linked bonds amounts to about 20% (i.e. from below 80% to below 60%).

The simulations may either overstate or understate the benefits to be gained from issuing GDP-linked bonds for a variety of reasons. On the one hand, they are based on the assumption that historical correlations remain constant; the results regarding the gains to be had from issuing GDP-linked bonds would change if these correlations evolved, however. For example, the correlation between growth and interest rates was negative during the observation period 1999 to 2015 for the two representative case study countries. If that correlation was positive, however, the undesirable effect of slower growth on debt sustainability would be partly offset by the effect of lower

interest rates on sovereign borrowing costs. Thus, the benefits from GDP-linked bonds would be smaller. Also, the sovereign might decide to increase its total borrowing following the introduction of GDP-linked bonds, in which case the benefits also would be smaller. On the other hand, the benefits to be gained from issuing GDP-linked bonds might also be understated: In the past, at least some countries have been able to borrow more cheaply as growth declined. Going forward, they may experience the constraint of an effective lower bound for interest rates. Or, institutional arrangements might constrain the ability of central bank to accommodate a deteriorating growth outlook.

In any case, a crucial issue that determines the benefits of the issuer of GDP-linked bonds is the size of the GDP risk premium, which is the premium investors would want to be paid over the risk-free rate to accept holding an asset that pay out lower returns during low-growth periods. Some academic studies have attempted to calculate the GDP risk premium and estimates range between 35 and 150 basis points (Abbas, 2017) ^[14]. Assuming a GDP risk premium of 150 basis points, the advantage of issuing GDP-linked bonds as opposed to conventional bonds would narrow considerably for both advanced and emerging market sovereign debtors (Carnot and Pamiès Sumner, 2017) ^[15], although it would remain sizeable in both cases.

3.5 Selected Observations Based on Experiences with Inflation-indexed Bonds

One form of debt instrument with indexed payments that has met with some success, in terms of actual proliferation of instruments, is an inflation-indexed bond. Such a bond offers the investor protection against inflation. Both the value of the principal and those of the coupons are typically protected against inflation, although protection may not be perfect from the perspective of the investor given that the price index might not be the most relevant for the investor and that indexation occurs with some lag. In fact, indexation method and lag as well as choice of reference index differ from one country to another. That said, the main attraction of an inflation-indexed bond is that it provides the investor with a long-term predictable stream of "real" returns. It is thus a "natural" investment for institutional investors that themselves have fixed long-term "real" return promises, such as defined-benefit pension funds or some life insurance companies. From the point of view of the issuer, borrowing costs can be reduced to the extent that investors are willing to pay a premium for protection against inflation; this premium will be reflected in a lower yield paid by the government

on debt instruments that provide such protection. Issuance of inflation-linked bonds has been shown to have effectively generated ex-post savings in the real cost of financing for a government.

Issuance of index-linked sovereign debt has been robust despite a trend decline in inflation over the last decade or so. The outstanding volume of index-linked debt increased more than twofold between 2007 and 2015 and has remained broadly constant thereafter. It exceeds USD 3 trillion for the OECD as a whole in 2017 (Figure 8), with the overwhelming part of it being accounted for by the G7 country sovereigns. Admittedly, fixed-nominal-rate instruments are the dominant sovereign borrowing instrument accounting for 90% of the amount of outstanding marketable sovereign debt in the OECD. That said, such area-wide figures hide considerable variation across countries and index-linked bonds have in fact become an important debt instruments in several countries. For example, index-linked bonds in the United Kingdom, Italy and France account for 27.4%, 13.5% and 12.4%, respectively, of total domestic outstanding central government marketable debt (Figure 9).

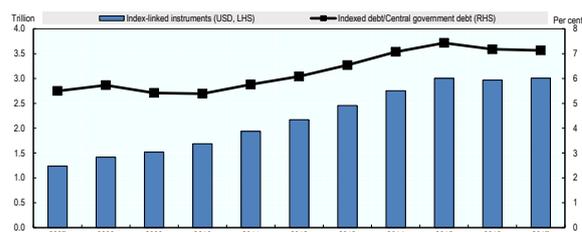


Figure 8. Index-linked sovereign debt in OECD countries

Notes: Values of marketable index-linked debt and total central government marketable debt have been aggregated by using fixed exchange rates, as of 1st December 2009, for all years.

Source: OECD Sovereign Borrowing Outlook 2017 ^[16].

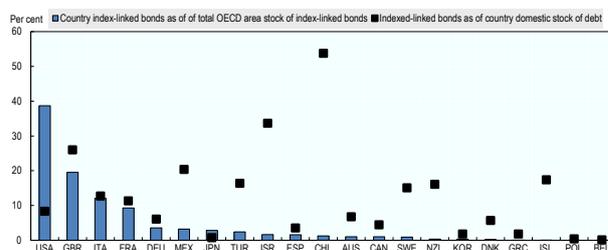


Figure 9. Relative importance of outstanding index-linked bonds in 2016

Notes: Values of marketable index-linked debt and total marketable debt have been aggregated by using fixed exchange rates, as of 1st December 2009.

Source: OECD Sovereign Borrowing Outlook 2017 ^[16].

The considerations regarding issuance of such bonds differ from country to country, but typically involve

strategic costs-risk optimisation, an attempt to maintain a specific balance between nominal and index-linked debt as well as to diversify the investor base, an expectation of strong and sustainable investor demand and efforts to limit budget volatility and/or strengthen the credibility of anti-inflationary policies. For example, some countries that decided to issue inflation-indexed bonds did so during periods of high inflation (e.g. Brazil, Israel, and the United Kingdom), while other countries with high inflation decided not to issue such bonds, and yet other countries issued such bonds during periods of low inflation (e.g. Canada, Germany, Sweden and the United States). Against the background of the observation that inflation-indexed bonds are by now “standard”, some observers have wondered why GDP-linked bonds should not experience similar “success”.

Just like inflation-indexed-linked bonds could be understood as a portfolio of a nominal interest rate bond and an insurance contract against inflation, GDP-indexed sovereign bonds could also be understood as a portfolio of two financial contracts, that is a “plain vanilla” sovereign nominal-fixed-rate bond and an insurance contract with payment specified as a function of actual real GDP development in reference to a benchmark performance. Then the question is why the former bundle of contracts implying risk-sharing between sovereigns and their creditors has become “standard”, while no sovereign has yet issued a GDP-linked bond with returns that vary symmetrically, falling with lower GDP and rising with higher GDP?

It is clear that indexation to GDP offers additional challenges as compared to inflation. For example, it is more difficult to estimate real GDP accurately than it is to measure consumer price inflation and GDP data revisions are often larger than for the CPI, and go several years back. Indexing to inaccurate preliminary GDP estimates would be problematic and the question is after what round of revisions to define the indexing. The moral hazard argument might be particularly relevant, as GDP measurement is not straightforward and includes the need to make choices at different levels of the data collection and aggregation. In any case, creating a liquid market for any new financial instrument is challenging.

4. Challenges of Issuing GDP-linked Sovereign Bonds in Practise

The OECD Committee on Financial Markets, in 2017, held an initial discussion of the issue of potential issuance of GDP-indexed-linked bonds as part of a broader discussion of selected sovereign debt developments

and related challenges. This discussion was motivated among other things by an attempt to further explore potential synergies between the work of the Committee on Financial Markets (CMF) and its Working Party on Debt Management (WPDM), respecting each entities’ specific characteristics. To summarise the initial discussions, the Committee expressed concerns regarding current levels of sovereign debt level and considered the idea of issuing GDP-linked bonds conceptually attractive. That said, the Committee also concluded that there are unresolved practical issues. Questions arise in particular as regards the investor base for such instruments, the cost-effectiveness of such issuance and market pricing.

The CMF discussions concluded that follow-up work could place a sharp focus on the demand side and in particular on the question who might be a natural investor for what kind of instruments and how deep such investor interest might be. In terms of concrete next steps, several delegates recommended to revisit the issue as part of a CMF Financial Roundtable, the extra-plenary discussion between the CMF and private market participants. Pursuant to that suggestion, the OECD financial roundtable held in April 2018 included a discussion of GDP-linked bonds. Also, as part of the follow-up work, a survey was conducted by the Agence France Trésor in collaboration with the Secretariat of the OECD Working Party on Public Debt Management (WPDM). The results are described in Chapter 2 of the OECD Sovereign Borrowing Outlook 2018 and were presented by the Chair of the WPDM at the CMF Financial Roundtable in April 2018. The remainder of this chapter reports on the results of the various discussions including those held as follow-up to the initial CMF discussions.

The initial CMF discussions concluded that, while the idea has conceptual merits, there are unresolved practical issues related to the pricing of such bonds, with additional liquidity and GDP-uncertainty premia being potentially prohibitively high. The size of the indexation premium remains a controversial issue, however. On the one hand, the observation that GDP uncertainty can be substantial is considered by proponents of GDP-linked bonds as the crucial economic motivation for considering their issuance. For example, Robert Shiller asks pointedly “If we acknowledge that, historically, uncertainty about GDP is as important as it has been, then why, globally, is there such limited risk-management of that uncertainty?” in his introductory chapter of a recent monograph on sovereign GDP-linked bonds (Shiller, Ostry and Benford, 2018) ^[17]. Moreover, some recent conceptual analysis suggests that under fairly plausible assumptions regarding GDP dynamics for OECD countries, GDP uncertainty

premiums would not be prohibitively high, so that investor and issuer interest do meet. On the other hand, debt management offices emphasise that the size of the additional indexation premium might be prohibitively high in practise.

Follow-up work to the initial CMF discussions included a survey circulated among members of the OECD Working Party on Debt Management (WPDM). As background, when considering the potential introduction of a new debt instrument, DMOs explain that they take a long-term debt issuance perspective and consider various parameters including investor demand, additional costs due to novelty and liquidity premium, potential impact on existing instruments and investor diversification. Moreover, DMOs monitor primary and secondary market developments closely to assess changing investor needs to help devise an appropriate strategy with suitable instruments for financing debt redemptions and budget deficits. The survey circulated among DMOs asked pointedly whether and to what extent debt management offices (DMOs) have considered issuing such bonds. Remarkably, not a single DMO responded that it had done so. This observation was stressed by the presentation of the Chair of the WPDM as part of the OECD financial roundtable.

Asked for the motivations for considering or not such issuance, DMOs quoted the lack of robust and sustained investor demand and difficulties in pricing. The recent OECD Sovereign Borrowing Outlook 2018 provides more details on the considerations of debt management offices. It concludes, among other things, that the latter do not consider such issuance feasible as there would be a lack of investor demand. While some lessons can be learned from other state-contingent bonds such as sovereign inflation-index-linked bonds, GDP uncertainty (to include data revisions and potential revisions in the basic methodology) tends nonetheless to be more substantial than inflation uncertainty, and there might be no “natural investor base” for GDP-linked sovereign bonds. Summarising the various concerns among DMOs at the CMF Financial Roundtable, the Chair of the WPDM noted that the most common response was the higher cost compared to conventional bonds. Uncertainty about GDP developments and its measurement was large and makes issuance practically not feasible.

A recurrent theme in the discussions of GDP-linked bonds by the CMF and in other fora is the distinction between potential conceptual benefits and practical difficulties. As highlighted by a joint workshop on sovereign GDP-linked debt instruments undertaken by the OECD and the EC in Brussels in January 2018, the

accumulated evidence of the potential theoretical benefits has further grown. For example, Carnot and Pamies Sumner (2017)^[15] use stochastic simulation frameworks to show the results of thought experiment, which is to consider that all sovereign debt in Europe had been issued in form of GDP-linked bonds. They demonstrate that a substantial reduction in the debt-to-GDP ratio would have resulted, reflecting in large part the negative relationship between the debt-service of GDP-linked bonds and actual GDP growth. Benefits are larger the higher is the uncertainty on future interest rates and future growth rates. They are especially large when debt levels are medium to high, that is when there is limited degree of fiscal space and uncertainty on exactly how much fiscal space there is. From an investor perspective, exposure in a symmetrical way to GDP developments, acquired through purchase of such bonds could provide diversification benefits that might be higher than those gained through stock index investments for any given country, which stems from the observation that nominal growth in USD is usually less volatile and less correlated with standard financial portfolios than are equity returns, thus implying better diversification gains from investments in GDP-linked bonds than in local stock market indices (see also Cabrillac et.al., 2017)^[18].

Practical issues remain, however. To address some of them, a model set of terms and conditions for GDP-linked sovereign bonds (the “term sheet”) has been developed by an ad hoc working group consisting of investment managers, lawyers and economists, including from central banks, together with support from ICMA and other trade associations. The “London term sheet” aims to standardise the features of these bonds. The intention is that with greater standardisation, the market will become more liquid and appealing to investors and issuers. The aim is to have them governed under either NY or London law to reduce the risk of local law negatively impacting investors, although that issue is especially relevant for emerging market economies.

Another session of the above-mentioned EC/OECD workshop focused squarely on the practical issues including the size of the required risk premium, understood to be non-trivial. That session concluded that issuance of such bonds by advanced economies sovereigns are in principle feasible, although a reasonable but not excessive premium would have to be offered. In fact, it is recognised that the potential benefits for the issuer of sovereign GDP-linked debt could be undercut in case a very high risk premium is demanded by investors. For example, Carnot and Pamies Sumner (2017)^[15] estimate that a total premium of 150 basis points would reduce

the debt-stabilisation benefits brought about by GDP-linked bonds. In particular, under such circumstances, and considering debt-to-GDP outcomes between the 10th and 90th percentiles, the debt level would turn out to be higher with GDP-linked bonds than with conventional nominal bonds (other things equal), given the increased cost of borrowing associated with the former as opposed to the latter. That said, in the case of more unfavourable shocks that go beyond the 90th percentile, debt-to-GDP ratios would turn out to be lower with GDP-linked bonds than with conventional bonds. Considering that shocks are persistent, which tends to further increase the required risk premium, Fournier and Lehr (2018) ^[19] suggest that the risk premium that compensates for GDP volatility looks nonetheless acceptable. This risk premium tends to shift the median debt level slightly upwards, but has the advantage that extremely high debt levels become less likely. As noted as part of the CMF discussions, determining what might be the net effect in terms of the various risk premiums remains challenging, not least as the effect depends not only on the volume or relative share of issuance of GDP-linked bonds, but also on the specific characteristics of each country.

As additional background, as compared to conventional bonds, two additional factors can affect the risk premium that applies to GDP-indexed bonds. In addition to a liquidity and credit risk premium, a novelty and indexation premium characterise the latter, although the novelty premium can be expected to disappear and the liquidity premium to be further compressed if this type of bond becomes more firmly established as part of the range of sovereign debt instruments. The indexation premium compensates investors for the greater volatility in total return. This premium reflects uncertainty about GDP developments and the level of the premium charged to compensate for that uncertainty. The OECD Committee on Financial Markets agreed that this premium remained a key issue, while many but not all delegates expected to see the novelty and liquidity premium to decline with time and amounts issued. That said, the net effect in terms of risk premiums after issuance of GDP-indexed bonds both on such bonds and on conventional bonds depend not only on issuance volumes but on the specific characteristics of each country, as highlighted in the stylised illustration in Figure 10, which is adapted from Cabrillac et al. (2017) ^[18]. Unfortunately, to have a noticeable effect in terms of reducing debt variance, the share of GDP-linked debt issued may need to be quite substantial, so much that such ratios would not be reached any time soon (Acalin, 2018) ^[20].

A market for GDP-linked bonds has the potential to emerge if issuer and investor expectations on the path of

real activity growth and related risks diverge, especially if investors are more optimistic than the sovereign. Yet another condition is that there exist differences in risk tolerance. In particular, if investors are less risk averse than fiscal authorities and DMOs, the former would be expected to be willing to hold GDP-development-related risks at a price that is satisfactory to the latter. In this regard, hedge funds and institutional investor with long-term liabilities, such as pension funds (especially where pension liabilities are indexed to real activity growth as is the case in Italy and Turkey according to the World Bank Pensions Database), were quoted as potential investors and one investment fund manager mentioned at the EC/OECD workshop on GDP-linked bonds that its own fund would invest at a low but reasonable premium. While DMOs argue that there might not be a “natural investor base” for GDP-linked bonds, others note that it is important to get the design right and tailor instruments to buy-and-hold investors (see also Benford and Eguren-Martin, 2018) ^[21].

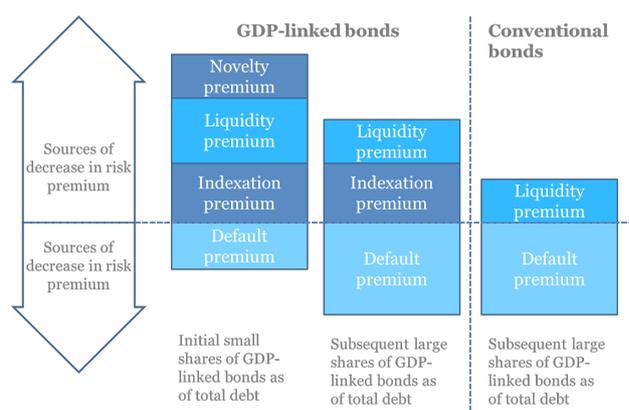


Figure 10. Possible evolution of risk premiums after issuance of GDP-linked bonds

Note: The proportions shown in the chart are chosen arbitrarily for illustration purposes, in this case assuming that the overall net effect, at the level of the total risk premium, is broadly nil.

Source: Adapted from Cabrillac et al. (2017) ^[18].

Yet another conclusion of the EC/OECD workshop session focusing on practical issues was that one obstacle for issuance of GDP-linked bonds might relate to the debt management mandates. DMOs aim at minimising longer-term sovereign borrowing costs at an acceptable level of risk, although the focus of the risk mitigation mandates appears to be more on micro portfolio optimisation and on budgetary risk than on broader fiscal actual and contingent risk smoothing. For example, the World Bank/IMF Guidelines for public debt management identify that best practises are to “ensure that the government’s financing needs and its payment obligations are met at the lowest possible cost over the

medium to long run, consistent with a prudent degree of risk.” The definition in this context of risk refers essentially to a “micro portfolio optimisation objective” rather than to “macro stabilisation” in the form of tax smoothing (Barro, 1995)^[1] or budget smoothing (Goldfajn, 1998^[22]).

The main concern for debt management offices is to maximise the net present value of the stream of proceeds from issuing government debt today and in the future for a given risk tolerance. The costs and risks of debt issuance and management are the guiding posts for the funding strategy of debt management offices. The assessment of such costs and risks by debt management offices will thus determine the choice of funding instruments and whether or not to add new instruments to the existing range of instruments. While formal mandates can also include references to macroeconomic objectives, including the need to ensure broad consistency with macroeconomic policy objectives, such mandates typically have a clear microeconomic focus, which is to reduce borrowing costs for a given risk profile. Funding strategies do not operate in a vacuum however and, given that debt management offices have a vested interest in the quality and reputation of the “products” that they are selling, they take into account a broader set of current policy challenges. As a result, these broader policy challenges also inform debt management decisions.

That said, debt managers might take a more narrow interpretation of the potential economic benefits of such bonds, placing comparatively less attention to the potential fiscal and broader economic benefits from a potentially better international sharing of risk related to GDP developments than some other commentators or actors: In theory, issuing governments receive welcome fiscal space through debt relief when growth weakens and fiscal revenues decline, while investors gain an alternative to being locked into low interest rates through exposure to the real economy. According to Shiller, Ostry and Benford (2018)^[17]; foreword by Haldane and Obstfeld), “both sides would stand to benefit if the debt-stabilising effects of issuance mean default risks become more remote.”

At the OECD/CMF financial roundtable, the Chair of the WPDM emphasised that not a single of the surveyed debt managers had considered the issuance of GDP-linked debt, but that the feedback regarding proposals to issue sovereign green bonds was somewhat less negative. France and Poland have issued and Belgium did consider such issuance, but an issue remains that funds are typically not earmarked and that some extra due

diligence process would have to be introduced, which raises costs. A representative from a credit rating agency noted that GDP-linked bonds are currently not rated but that they might, depending however on a number of issues, many of which are already successfully addressed in the London term sheet. The closer the instruments are to debt the more easy credit rating agencies would find it to rate them (see also S&P Global, 2018)^[23]. Equity, by contrast, would not be rated. On a different but related issue, given the large amounts of conventional debt outstanding, the credit rating agency representative did not think that there would be a significant effect on the credit ratings of the debtors’ conventional debt. One private market participant suggested that it is important to keep the bigger picture in mind and that, just like for any new type of debt instrument, there would obviously be implementation challenges, but that this aspect is a key feature of financial innovation. Another private sector participant drew special attention to the London term sheet, which provides a model bond description setting out a broad structure that is similar to an inflation-indexed bonds, although it also deals with the risk of statistical manipulation and uncertainties related to GDP developments. Such instruments could be seen as a first step in a long-term project that should bring about a more resilient financial system. Discussions with investors have highlighted that this instrument would make it easier to take exposure to GDP developments across different countries, easier so than in the case of alternative strategies involving several types of currently available instruments. Another participant noted that GDP-index-linked are more similar to derivatives than to standard plain-vanilla conventional bonds with fixed coupons. In fact, all GDP-linked bonds issued so far are warrants that allow the investor to participate in the upside risk, and the securities were issued as part of debt restructurings.

In summarising the discussions at the CMF Financial Roundtable in April 2018, the Chair suggested that the issue remains open. Debt management offices remain sceptical, although it is not clear whether they take into account the full macroeconomic and financial stability risk-return trade-off that a broader perspective would take into account. He also suggested that the example of green bonds suggests that new types of sovereign debt instruments can be issued with success. While the Chair of the WPDM noted in this context that there were however some issues, the Chair suggested that the overall experience seemed to have been positive and that minor issues would be expected in a new market. In any case, careful instrument design, robust institutions and

contracts and an appropriate regulatory framework are recognised as important conditions to reap the efficiency and stability benefits that GDP-linked bonds promise in theory. As emphasised by several private market participants at the CMF Financial Roundtable, work on addressing the practical issues is ongoing.

5. Concluding Remarks and Selected Policy Issues

Sovereign borrowing levels in the OECD area have stabilised in recent years, although sovereign debt burdens remain high by historical standards. Moreover, redemption profiles pose serious challenges, and a large part of current historically high debt levels need to be refinanced over the next few years. Debt management offices are aware of, and many of them respond to, these challenges among other things by adapting the composition of public debt, in the process lengthening the average duration of outstanding instruments.

The CMF has paid special attention to the types of sovereign debt instruments issued by public debt managers and discussed proposals for sovereign debt managers to consider issuing GDP-linked bonds. Such proposals are timely as the resilience of global financial markets could be strengthened by transferring part of the macroeconomic risk of undesirable real activity growth outcomes to private investors, while at the same time allowing the latter to share in the upside risk. Issuance of significant amounts of GDP-index-linked bonds could stabilise the debt ratios of issuing countries, and help prevent potentially costly debt restructurings. That said, CMF discussions concluded that, while the idea has conceptual merits, there are unresolved practical issues related to the pricing of such bonds, with additional liquidity and GDP-uncertainty premia being potentially prohibitively high.

Debt management offices remain particularly sceptical, as emphasised by the Chair of the CMF's WPDM at the CMF's financial roundtable discussion and based on a survey conducted among members of the WPDM. That said, it is not clear whether they take into account the full macroeconomic and financial stability risk-return trade-off that a broader perspective would take into account.

Proposals for issuance of GDP-linked bonds among advanced economies, which had received increased attention after the German G20-presidency included the topic in the G20 finance track, may have lost some momentum. That said, work on resolving practical issues is ongoing and involves several private market participants including potential investors.

The Committee concluded that follow-up work in

the broader topic area could enlarge the perspective of the work on sovereign debt by also considering other types of bonds, such as in particular ultra-long-term bonds and those indexed to other state variables such as demographics or longevity indices. The Committee could revisit some of its work produced a decade earlier on the issue of long-term government bonds as potentially desirable investment for financial intermediaries with long-term fixed payment promises. Such a focus would be particularly useful as one key uncertainty surrounding the issuance of GDP-linked and other unconventional bonds relates to the potential investor demand for such instruments. Financial intermediaries with long-term liabilities would appear to be an example of a natural investor in at least some type of such instruments, such as ultra-long-term bonds and those with longevity-indexation.

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