

Sovereign GDP-Linked Bonds: Design, Investor Response and Open Issues ¹

15 March 2017

This note covers key commercial and legal features of the GDP-linked bond detailed in *The London Term Sheet*, feedback received on these features from key investor bodies (including ICMA, IIF and EMTA) and how that feedback has been taken on board. It also indicates issues that warrant further attention.

1. Design principles

Taking on board lessons from other financial instruments, in particular the successes of inflation-linked bonds and the shortcomings of "GDP warrants", especially Argentina's experience with them, the GDP-linked bond outlined in *The London Term Sheet* has been designed with the following principles in mind: (i) *simplicity*, avoiding the multiplicity of conditional payment triggers that caused Argentina's GDP warrants to trade out of the money for long periods and inhibited fair-value pricing; (ii) *familiarity*, taking many of the industry-standard terms present in inflation-linked bond contracts and adapting them; (iii) *symmetry* of risk-sharing, with the investor sharing in not only the upside but also the downside, which underpins the debt-stabilising characteristics of this instrument for the issuer; (iv) *robustness* to data revisions and quality, giving the investor comfort through the inclusion of clauses outlining data fall-back providers and put events; (v) *flexibility*, with the term sheet designed to be a template suitable for a range of advanced and emerging economies with minor adaptation.

As with any security's design, the key challenge is to address the trade-off between broad market liquidity and specific structures that appeal to individual investor groups. Many different designs could conceivably be issued in an effort to secure high prices from different groups with different preferences. However, there are likely to be gains from establishing a standardised product with sufficient appeal and depth of liquidity to make a durable, well-functioning market.

2. Nominal GDP as the reference variable

Since a country's nominal GDP tends to be closely correlated with its tax revenues, indexing debt repayments to GDP should stabilise the government's debt burden with respect to its repayment capacity. In a downturn, increases in the debt-to-GDP ratio should be held in check. This should, in turn, reduce the likelihood of a debt crisis and of the government having to default. As a reference variable, GDP fulfils a number of important qualifying criteria: it is regularly published, widely understood, comparable across countries and forecasts of it are readily available from both the official and private sectors.

For a country that depends heavily on the export earnings of a single commodity, indexing government debt repayments to the price of that commodity, determined on a global market, offers some attractions. Moral hazard would be reduced and any commodity importer that held the indexed debt instrument would have a

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natural hedge against terms of trade fluctuations. On the other hand, commodity prices are a narrow indicator of a country's economic performance and different countries would want to index to different commodities, factors which might hold back a global market from developing. At the margin, indexing to a single commodity's price might give the issuing country less incentive to diversify production.

Another alternative is to index to wages. Uruguay, in 2014, issued a government bond worth around \$1bn (5% of Uruguay's total outstanding stock of government debt) with principal and coupon payments indexed to nominal wages. The bond was sold to a state-owned insurer (Banco de Seguros del Estado) which has been using the instrument to cover liabilities linked to earnings. Indexing to wages has the attraction of being a direct natural hedge for pension funds with (defined benefit) liabilities indexed to nominal earnings. Against this, wages might be too stable (nominal earnings often exhibit downward rigidity) and therefore poorly correlated with the government's repayment capacity (empirical work suggests wages can be positively, negatively and un-correlated with GDP depending on the country), prone to large revisions² and to being measured differently across countries.

Investor feedback. The economic case for GDP being used as the reference variable for an indexed government-debt instrument has for the most part been accepted by those investors who have been canvassed for views. Questions have been raised though over practical implementation, in particular whether the contractual terms of the instrument provide sufficient comfort to investors over data revisions, data method changes and the possibility of manipulation. *The London Term Sheet* includes specific features to address these concerns, and these are discussed separately below (**Section 6, 8, 9 and 10**). Some investors expressed a preference for commodity exporters to issue commodity-indexed instruments.

Design choice. *The London Term Sheet* indexes to nominal GDP. Nonetheless, GDP-linked bonds would not or should not exclude the possibility of other indexed instruments, such as commodity-indexed or catastrophe bonds, being issued alongside or instead, for those countries that have tax bases reliant on a single commodity or are vulnerable to natural disasters.

3. Denomination in local versus foreign currency

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

There may be some instances, however, such as when new debt instruments are issued in a debt restructuring, where investors prefer to receive GDP-linked bonds that settle in a foreign currency, eg, US dollars. Allowing for this possibility, contractually, can be achieved fairly simply by keeping the same basic commercial and legal structure as a standard GDP-linked bond that has the coupon and principal indexed to GDP in domestic currency, but with payment made in a foreign currency. This has been done in the past for

² In August 2016, the US Bureau of Labour Statistics revised down 2016 first quarter year-on-year real wage growth (hourly compensation) from +4.6% to -0.4%.

other indexed and non-indexed government debt instruments in Latin America.³ An alternative to having GDP-linked bonds settle in a foreign currency might be to have them offered, sold and settled through an international settlement house.

Investor feedback. Feedback received suggests that many investor groups see the logic to denominating GDP-linked bonds in the issuer's domestic currency. However, a subset of the investment community (distressed debt emerging market investors) have expressed a strong preference for a foreign-currency instrument. They see this as important for GDP-linked bonds issued in distressed debt exchanges. They have noted that nearly all restructurings of sovereign debt in the past have involved existing debt instruments that were denominated in foreign-currency and that these were exchanged for new ones also in foreign currency to satisfy the preferences of those investors involved. Even when GDP warrants have been issued in exchanges they have typically promised to pay out in foreign currency even though they have been indexed to GDP in local currency.

Design choice. The GDP-linked bond in *The London Term Sheet* is denominated in the issuer's local currency. Denomination in local currency should be most suitable for those countries with already deep local currency bond markets and those looking to accelerate their development from a shallow base. It should be suitable for issuance in the normal course of debt management operations and in debt restructurings so long as the existing instruments to be restructured are also in local currency, or if those creditors holding foreign-currency instruments indicate an appetite to take on local-currency ones. Where, in a restructuring, the existing debt instruments are denominated in foreign currency, both the issuer and the creditors involved may prefer, as one option, a new GDP linked bond payable in foreign currency. The basic commercial and legal structure of the GDP-linked bond would be the same as the standard local-currency version, but with a different payment currency, matching the currency of whatever instrument the creditor held beforehand.

4. Level versus growth rate

The two canonical models of GDP-linked bonds are Robert Shiller's (1993) original 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 Eduardo Borensztein and Paolo Mauro's (2004) later variant which links the coupon to the *growth rate* (with the principal remaining fixed).⁴ We refer to these two different structures loosely 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 rather than its level results in more variable interest payments and requires payment floors for when growth drops below zero, but offers more interest relief to the issuer when growth falls. Because the principal is not indexed in this variant, it may also satisfy those investors who require principal protection. Floating rate instruments can stabilise the debt-to-GDP ratio in the same way as principle-indexed bonds provided certain conditions are satisfied: the government needs to use the savings on its interest bill to buy

³ Tovar, C. (2005), "International government debt denominated in local currency," *BIS Quarterly Review*, December 2005

⁴ Shiller, R. (1993), *Macro markets: creating institutions for managing society's largest economic risks*, Oxford: Clarendon Press. Borensztein, E. and Mauro, P. (2004) "The case for GDP indexed bonds," *Economic Policy*, Vol. 19(38).

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-bill savings to either pay down debt, or opt for fiscal expansion (in which case the debt ratio will rise). With principal-indexed bonds, debt stabilisation is automatic.

Investor feedback. Investors seem content with a structure that indexes to the level of GDP, citing comfort over its similarity to inflation-linked bonds. Some investors have shown interest as well in the structure that indexes the coupon to the growth rate keeping the principal fixed. Some have also shown an interest in letting the principal vary but having a floor on it of par (see **Section 13**). It is unclear, currently, whether this last option is just a preference or might be required for some investors in some jurisdictions due to investment mandates or for regulatory reasons.

Design choice. *The London Term Sheet* proposes a payment structure where both the principal and the coupon are indexed to the level of GDP. This structure is the most effective at stabilising the debt ratio, is closest to that of inflation linked bonds (which investors are already familiar with), and does not require the payment floors that growth-indexed structures do and which may complicate pricing. When the US issued its first inflation-linked bond in 1997, it decided against a floater-like structure indexing the coupon to the rate of change in prices partly because of the difficulties in dealing with negative payments.⁵ There remains some investor interest, though, in a GDP-linked bond where the coupon is indexed to growth and the principal fixed. Mostly this interest is from academics, but there is also a possibility that some debt management offices (in emerging market countries) may find this alternative structure better satisfies their preference for insurance against liquidity risk over solvency risk, and better meets appetite from some parts of the investment community for having principal protection.

5. Maturity

Robert Shiller suggests a GDP-linked bond could be perpetual in tenor. *The London Term Sheet* envisages it would be long-term in maturity, with a lifespan of 10 to 20 years, enough to cover more than one business cycle. For the issuer, the longer the maturity is, the higher the probability of its cumulative GDP-linked debt service payments evening 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 maturity means pricing is better able to reflect trend growth rather than short term fluctuations.

Investor feedback. The feedback we have received so far suggests potential investors would be comfortable with a long-dated instrument. One investment bank did note that a very long-maturity GDP linked bond without caps or floors could expose investors to too much uncertainty over lower trend growth. But the same bank added that the hypothetical returns consistent with average GDP and inflation forecasts for advanced economies could make the instrument an attractive investment opportunity for investors there.

Design choice. While a perpetual instrument would provide a hedge for the issuer against all negative shocks to trend growth, there appear to be limits to the market's appetite for perpetuals, so *The London Term Sheet* envisions an instrument with maturity that is finite in length and more than 10 years.

⁵ Roll, R. (1996) "US Inflation Indexed Bonds: Design of a New Security," *Journal of Fixed Income*, Vol.6, No.3.

6. Publication delay and dealing with 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 GDP-linked bonds their recession-proofing properties. For recession-proofing to be completely timely, all cash flows would have to be adjusted for GDP right up to the moment at which 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 advanced economies a first ("flash") estimate of GDP for a given quarter is typically published two months after the end of that quarter. Some, for example the UK, then publish a second estimate 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 the publication delay is to have the 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 3 months ().⁶ Having an indexation lag for GDP-linked bonds of 6 months (which for many countries would mean the third estimate of GDP would be available) still leaves the problem of what to do about subsequent data revisions.

Revisions

Ideally the investor wants to limit his or her uncertainty over future payments to the variability in GDP, which he or she has voluntarily signed up to by buying the instrument. Data revisions add an additional layer of (unwanted) uncertainty.

There are two main types of GDP data revision. One is the routine adjustment of already published GDP data that always follows initially released estimates, as less detailed early source data or less detailed estimates are replaced with later, 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.

Then there are non-routine revisions to GDP data that occur less frequently. These tend to be large, 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 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 economies rebase every year using a method that "chain-links" sector weights, again reducing the recorded impact on measured GDP growth.

⁶ Earlier issues of inflation-linked debt used longer lags, for example 8 months.

Below we set out two practical indexation methods, with different approaches for dealing with GDP revisions.

- i. 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 record 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 matures. 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 maturity, 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.
- ii. Indexing to a notional, chain-linked series that is constructed by cumulating together lagged estimates of recorded GDP-growth (we suggest below that a lag of six months should work for most countries). 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. The disadvantage is that payments are no longer tied to the latest available measure of GDP growth.

Investor feedback. In our outreach to investors, we have indicated that there is a question over how best to index to GDP to address concerns over revisions. Feedback has indicated a preference for the second option, where the bond's payments are indexed to a chain-linked GDP index, constructed from the lagged (six month) estimates of GDP growth that is not subsequently revised. This approach makes the instrument closer in form to an inflation-indexed bond, which are linked to an index that is not revised.

Design choice. *The London Term Sheet* is compatible with any of those indexation methods described above, but should be read as reflecting a preference for (ii).

7. Indexation lag length

For both the issuer and the investor there is a trade-off to be struck 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 should be if final GDP data was used instead (that is, they may be biased). They may also be difficult to predict (if early GDP data are a noisy estimate of the final data).

"Noisiness" of early estimates

In choosing a suitable lag length, repayments on the GDP-linked bond should be indexed to GDP estimates that correlate well with the final data. That is, at the chosen indexation lag, the noisiness of the early releases of GDP data that are indexed to should be sufficiently low as to ensure the primary driver of uncertainty over future coupon and redemption payments is uncertainty around the GDP forecasts themselves, and not over revisions.

To see just how "noisy" early estimates really are, we construct a signal-to-noise ratio for cumulative GDP growth, comparing estimates of different degrees of "earliness" against the final data. We define "final" as those estimates settled on five years after the period they refer to.

The signal-to-noise ratio of nominal GDP, "y", at vintage "i" is given by the formula:

$$\text{Signal to noise}_i = 1 - \frac{MSR_i}{\text{Var}(y_t^{60})}$$

where t is measured in months and MSR_i is the mean square revision from vintage i to vintage 60, given by the formula:

$$MSR_i = \frac{1}{n} \sum_{t=1}^n (y_t^i - y_t^{60})^2$$

If revisions between time t and 5 years later have historically been as large as the underlying variance in the data, then the signal-to-noise ratio at time t equals 0: technically, there is no signal. If subsequent revisions are half as large as the variance, the signal-to-noise ratio is 50%. If there are no revisions from t to 5 years later, the signal-to-noise ratio is 1 and the series is 100% signal. By definition the signal-to-noise ratio equals 1 after 60 months, which is when we consider GDP data to be final.

We look at a selection of G20 countries and report 6-month estimates of 5-year growth, which would be of most interest to investors in GDP linked bonds that have a 5-year maturity. The common dataset is too short to report estimates for 10-year growth.

Looking first at bias, in general bias is present, is positive and is usually statistically significant (**Table 1**). As discussed above, bias should not be a problem so long as it is measurable so that investors can factor it in.

Table 1. Mean revision to the 6-month estimate of nominal GDP growth over 5 years (ppts), 1999q1-2015q4

Canada	France	Germany	Italy	Japan	UK	US	Brazil	Mexico
0.72 *	0.97 *	-0.01	0.80 *	-0.33	1.12 *	-0.64 *	9.28 *	3.41 *

Source: OECD and author calculations. Notes: * indicates statistical significance at the 1% level, measured using a t-statistic adjusted to allow for autocorrelation.

However, even for those countries where bias is large, the signal-to-noise ratio is high (**Table 2**). That is, the vast majority of the variability of nominal GDP growth, as recorded in the final release, is already reflected in the estimate for GDP-growth available 6-months following the end to a quarter. For Brazil and Mexico, two of the largest emerging market countries, the six-month estimate gives close to a perfect signal (0.99), suggesting little further information is included in releases subsequent to the six-month estimate.

Table 2. Signal-to-noise ratio for the 6-month estimate of nominal GDP growth over 5 years, 1999q1-2015q4

Canada	France	Germany	Italy	Japan	UK	US	Brazil	Mexico
0.93	0.78	0.87	0.96	0.85	0.92	0.94	0.99	0.99

Source: OECD and author calculations.

Those countries with deep local currency bond markets or experience of issuing inflation-linked bonds, making them more suitable for issuing GDP linked bonds, typically also publish quarterly GDP, and with a short enough publication lag to be usable for indexing (**Table 3**).

Table 3. GDP data publication delay for selected countries

Country	Highest frequency of GDP data available	Lag to first GDP release	GDP release available after six months
	(Annual / Quarterly)	(In months)	(First, Second, Third)
G20			
Argentina	Quarterly	3	Second
Australia	Quarterly	2	Second
Brazil	Quarterly	3	Second
Canada	Quarterly	3	Second
China	Quarterly	2	Second
France	Quarterly	1	Third
Germany	Quarterly	1	Third
India	Quarterly	3	Second
Indonesia	Quarterly	2	Second
Italy	Quarterly	1	Third
Japan	Quarterly	2	Second
S. Korea	Quarterly	1	Second
Mexico	Quarterly	2	Second
Russia	Quarterly	3	Second
Saudi Arabia	Quarterly	3	Second
South Africa	Quarterly	3	Second
Turkey	Quarterly	2	Second
United Kingdom	Quarterly	1	Third
United States	Quarterly	1	Third
Selected Non-G20 Inflation-Linked Issuers			
Chile	Quarterly	3	Second
Greece	Quarterly	1	Third
Hungary	Quarterly	2	Second
Israel	Quarterly	2	Second
Colombia	Quarterly	3	Second
Sweden	Quarterly	1	Third
Other Non-G20			
Malaysia	Quarterly	2	Second
Nigeria	Quarterly	3	Second
Portugal	Quarterly	2	Third

Source: OECD Quarterly National Accounts Release Calendar and national statistical agencies.

Investor feedback. Broadly investors appear content with the proposal for a 6-month lag. Some investors have had concerns over whether a lag of this length would work for those emerging markets where the publication delays are longer than they are for advanced economies. Certainly at 6 months some less developed emerging markets may have only the first or second release of quarterly data available. One investment bank also indicated concern over the event risk posed at maturity by the publication lag for a principal-indexed GDP-linked bond. They proposed indexing repayments to GDP averaged over the previous 3, 6 and 9 months. In practice, though, the event risk at maturity should be small as the instrument's redemption value would be dominated by cumulative growth over the lifetime of the security, rather than recorded growth in the final quarter. Another suggestion was for there to be a threshold for cumulative "late" revisions over the life of a bond that would trigger an early redemption put option.

Design choice. *The London Term Sheet* includes a 6-month indexation lag that strikes a balance between timeliness of the payment date in relation to economic conditions and allowing for sufficient period of time for an accurate picture on GDP-growth to emerge.

8. Methodological changes to the measurement of GDP

One issue is methodological changes that could affect the future path of measured GDP. For example, at the start of the 1990s, there was a debate about the impact that "hedonic pricing" might have on measured GDP growth.⁷ 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 (**Box 1** gives details). 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.

Investor feedback. No explicit investor feedback was received on this issue.

Design choice. *The London Term Sheet* contains various provisions that give the investor the option to put the bond if the issuer no longer conforms to public standards, including IMF standards on data dissemination. Beyond that there is no explicit contractual device to protect the investor against methodological changes that may affect future GDP.

Box 1. Provisions in inflation-indexed bonds for dealing with methodological changes in the data

Holders of all UK inflation-linked gilts issued up until September 1992 had the right to redeem their holdings early, at (inflation adjusted) par, in the event that any change to the way the price index was constructed could be considered to be "materially detrimental" to them, and so trigger the relevant clause for early

redemption in their bonds. This right to early redemption was enshrined in a clause saying (although there were slight variants, depending on when exactly the bond was issued):

"If any change should be made to the coverage or the basic calculation of the [Retail Prices] Index which, in the opinion of the Bank of England, constitutes a fundamental change in the Index which would be materially detrimental to the interests of the stock-holders, Her Majesty's Treasury will publish a notice in the London Gazette immediately following the announcement to the relevant Government Department of the change, informing stockholders and offering them the right to require Her Majesty's Treasury to redeem their Stock in advance of the revised index becoming effective."

This clause was backed up by statute. Under Section 21 of the Statistics and Registration Service Act 2007, any change to RPI recommended by the Statistics Board would have to be submitted to the Bank of England, which is required to adjudicate "whether the change constitutes a fundamental change in the index which would be materially detrimental to the interests of the holders of relevant index-linked gilt-edged securities". This statute applies to only those bonds that contain the clause.

For bonds first issued between 2002 and 2005, holders have no recourse to early redemption, but could be switched to a substitute price index, as per the following clause.

"Index-linked gilts will be indexed to the General Index of Retail Prices (RPI), or any subsequent index that, in the opinion of the Chancellor of the Exchequer after consultation with a body that the Chancellor of the Exchequer considers to be independent and to have recognised expertise in the construction of price indices, continues the function of measuring changes in the level of UK retail prices. The selection of the new index by the Chancellor of the Exchequer shall be conclusive and binding on all stockholders".

For bonds first issued from September 2005, holders have no recourse to either a substitute index or early redemption. When they purchase these bonds they accept the risk that any future changes in measurement method could leave them worse off. In these bonds a substitute index is introduced only in the event that the index is not published for any relevant month.

9. Data unavailability

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

Investor feedback. No explicit feedback on this issue.

Design choice. *The London Term Sheet* allows explicitly for a grace period—which is left for the issuer and investors to agree the details and length of—before any put event is triggered. Also, where the put events refer to a failure to provide information as defined by the IMF's Articles of Agreement, the relevant Article takes into account circumstances where the issuer is not at fault.

10. 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. Those countries that exhibit less credibility would be charged a higher yield on their GDP-linked debt. In practice, though, some investors may want to be protected contractually. One way to do this would be to outline in 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 came about, would result in the investor having the option to get his or her money repaid immediately and in full ("put events").

Investor feedback. While some investors have not raised concerns about the risk of data manipulation, noting that political incentives are to over-state rather than under-record GDP growth, others have pointed to the need for adequate protections to guard against misreporting. Transparency in how GDP is calculated and published has been cited as being important. Investors need to be confident in the veracity of the reported data and to be assured that its dissemination is fair to all stakeholders. Some investors have suggested that any country issuing these instruments consider an independent calculation panel or a recognised third party (eg, the IMF or Eurostat) to validate the GDP calculations.

Design choice. *The London Term Sheet* provides investors with an extra layer of protection against the manipulation of GDP statistics by including put events that allow the investor to demand early repayment of the obligation if the issuer: (i) fails to publish an Article IV report in agreement with the IMF; (ii) violates data dissemination standards; (iii) receives an IMF censure; or, (iv) ceases to be a member of the IMF. *The London Term Sheet* also includes a fallback calculation mechanism for GDP and a penalty early redemption amount if GDP data are unavailable in a timely manner.

11. Annual or quarterly data

Indexing to calendar-year data would help smooth out any volatility that might be found in quarterly data, due for instance to unusual seasonal patterns. However, not all countries publish quarterly GDP data. Many small island states do not. For these countries, if they were to issue GDP-linked bonds, indexing to annual data would be the only option. An alternative might be to issue commodity-linked instruments, particularly if their economies are dominated by single sectors.

On the other hand, indexing to annual rather than quarterly data can extend measurement lags to up to 12 months, reducing the timeliness of debt-relief.

Investor feedback. Broadly, investors see indexing to quarterly data as providing flexibility over payment frequency and timing. Other feedback suggested there could be benefits in having the index published daily, to aid pricing and transparency.

Design choice. The London Term Sheet outlines an instrument that indexes to GDP measured at a quarterly frequency. To aid transparency and market liquidity, it would be possible to publish this index on an interpolated daily basis, as is done for inflation-linked bonds.

12. Provisions to ensure pricing at or 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 even 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 principle 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.

Investor feedback. Investor feedback on this issue has been limited. Those that are content with the idea of a security that has a principal that varies with GDP also appear comfortable with not having a device such as a principal factor that adjusts the redemption amount.

Design choice. The London Term Sheet does not have a principal factor as part of its core terms but includes it as an option.

Principal factor

The Redemption Amount, in respect of a Redemption Date, is an amount payable in K\$ by the Republic on such Redemption Date per K\$[.] determined as follows:

$$\text{Redemption Amount} = \text{Redemption Principal Amount} \times \text{Principal Factor}$$

Where the 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.]

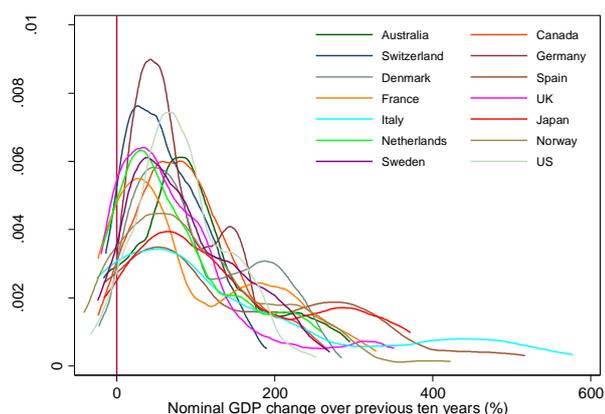
13. Principal protection

Many bond investors face restrictions on investing 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.

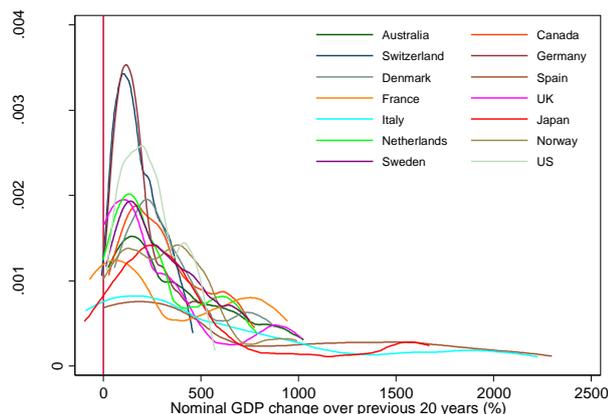
If the floor was needed only for technical reasons, an option could be to design one that is unlikely to be economically binding. A simple way to achieve this would be to set the instrument's maturity at a tenor that would make the probability of the redemption value of the bond falling below par at close to zero. **Chart 1** shows that there have been a low but significant number of episodes over the past 150 years of countries having nominal GDP fall over a 10 year period (outcomes to the left of the red vertical bar). **Chart 2**, though, shows that after 20 years, nominal growth is almost always positive (the exceptions in the data are for World War II), implying that even if a floor of par were to be set on a bond indexed to nominal GDP, that floor would be very unlikely to bind, based on past evidence.

Chart 1: Change in level of nominal GDP over 10 years for selected countries, data since 1870



Source: Author calculations and Schularick, M. and A. Taylor (2012) "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008," *American Economic Review*.

Chart 2: Change in level of nominal GDP over 20 years for selected countries, data since 1870



Source: Author calculations and Schularick, M. and A. Taylor (2012) "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008," *American Economic Review*.

Investor feedback. A number of participants have underlined the benefits of a floor on the principal of a GDP-indexed bond to increase the size of the potential investor base. It was noted that some rating agencies needed it to be able to rate the instrument and some funds noted their mandates required a floor in order to be able to invest. What is not clear, though, is the extent to which a floor would drive the pricing of a GDP-linked bond. More work needs to be done here to identify the jurisdictions and types of investors for which a floor on GDP-linked bonds are required.

Design choice. *The London Term Sheet* includes an optional clause for principal protection.

14. Status

Sovereign bonds issued under a law that is foreign to the issuing government typically contain a clause indicating that bond's "status". Often known as the "pari passu" clause, it is less of a clause which provides how the debt in question will be treated on the issuer's insolvency (there is no formal insolvency for sovereigns as there is for corporates) and more as a representation of how the sovereign sees the ranking of this particular category of debt by reference to its other debt obligations.

After recent high-profile litigation against Argentina by holdout creditors NML Capital, the consensus has been to ensure that this clause be drafted in a manner which focuses on equal ranking and not on equal or pro-rata payments. The clause, in its ranking form, will prevent the sovereign from legislating a discriminatory payment for this debt by reference to other equal ranking debt, but it will not force the sovereign to make pro rata payments.

Investor feedback. Many investors have indicated a strong preference that GDP-linked bonds should be ranked on the same legal footing as all other unsecured debt and that there should be no ambiguity here.

Design choice. The London Termsheet provides that GDP-linked bonds (a) have the same status as all other direct, unconditional, unsubordinated and unsecured obligations of the issuer and (b) rank equally with all other unsubordinated and unsecured borrowed money of the issuer. "Borrowed money" includes not only other capital market instruments, but also extends to loans, financial guarantees and more generally anything which can be considered as financial debt. *The London Term Sheet* clarifies that "equal ranking" does not mean rateable payment. *The London Term Sheet* does not seek to break new ground by questioning the need for equal ranking clauses in sovereign debt issuances, but rather seeks to follow the mainstream market practice in the use and drafting of this provision

15. Cross default

A cross-default clause in a bond allows the holders of that bond to require an early prepayment of the bond (an "acceleration" of the payment) if the sovereign issuer fails to pay some other debt, or if the holders of some other debt either are entitled lawfully to demand (a "pure cross-default clause") or have actually so demanded (a "cross-acceleration clause") an accelerated payment of their debt. The cross-default provision is included to ensure that, if the issuer has difficulties in making debt payments over a certain threshold to certain creditors, all other creditors can sit at the same discussion table to understand the cause of the non-payment and see that, if any restructuring is required and partial payment made, this is done on equal terms to them.

The cross-default provision has been drafted as a "cross-acceleration clause" and includes a minimum threshold before it can be activated. Both of these features are usual in sovereign bond issues with cross-default provisions. The key design question is over the extent of the universe of the "other debt" whose non-payment or acceleration would entitle the holders of the GDP-bond to take action.

In common with other bond issues, "other debt" should probably not extend to any type of borrowed money, but, at most, to debt capital market instruments. Beyond this, the considerations are more challenging. Including fixed-rate bonds in this "other debt" might strengthen creditor protection for holders of the GDP-linked bond. Against this is the consideration that, by design, the GDP-linked bond has payment terms that are more affordable for the issuer to service during an episode of economic stress. During a negative nominal GDP shock, holders of GDP-linked bonds automatically receive haircuts on nominal interest payments and accrued redemption principal. Depending on the magnitude of the shock and other factors, it may be in the government's and its creditors' interests to continue servicing its GDP linked bonds at the same time as it seeks debt relief from holders of its fixed-rate bonds. Any cross-default clause should,

arguably, give the issuer the option of doing this and not see that option frustrated by any early action from the holders of the GDP-linked bonds.

Investor feedback. At a joint meeting of members of the ICMA, IIF and EMTA in New York in December 2016, many participants saw the logic of permitting the issuer the ability to remain current on its GDP-linked bonds through a restructuring of fixed-rate debt, where holders of the GDP-linked bonds have received a haircut automatically through the link to GDP.

Design choice. *The London Term Sheet* outlines an instrument that cross-accelerates only with the sovereign's other GDP-linked securities. As a result, should there be a payment default on the sovereign's conventional bonds or an actual acceleration of these bonds (or, in both cases, of any other type of "borrowing"), this would not result in a right of the GDP-linked bondholders to accelerate their GDP-linked bonds.

16. Collective action

Collective action clauses (CACs) allow for relevant majorities of the holders of a series of bonds to agree to changes proposed by the issuer to the terms of these bonds, including changes to payment terms. Such changes, once accepted by the relevant majority of bondholders, are then binding on all holders regardless of whether an individual holder voted for the change or not.

The latest, best-practice "aggregated" CAC, endorsed by the ICMA, offers a full set of options allowing series-by-series decisions as well as "twin-limb" and "single-limb" aggregated voting procedures. Single limb aggregated CACs allow the issuer to propose changes to groups of individual bond series (as opposed to just on a series-by-series basis) and in such a case the voting will take across all series within that group on an aggregated basis. The cross-series vote outcome will, if it is approved by the relevant majority and is consistent with a number of safeguards, bind all bondholders. The purpose of aggregated CACs is to permit a sovereign in difficulties to restructure its debt in as global a manner as possible and bind dissenting minorities who could hold back the restructuring.

Given the right of the issuer to select the series of bonds which are grouped together for the purposes of a single-limb aggregated CAC vote, but also the constraints that the issuer has in making a "uniformly applicable" offer to series within the group, it has been argued that the sovereign will always have to treat GDP-linked bonds as a separate group and never include them with fixed rate bonds.

On the other hand, given the cross-default clause proposed in **Section 15** would prevent the GDP-linked bondholders from sitting at the table if there is a restructuring discussion of conventional bonds, there is a strong argument for having GDP-linked bonds adopt the aggregated CAC mechanism recommended by the ICMA, but with the single-limb aggregation being expressly limited to other GDP-linked bonds rather than allowing such aggregation to occur at the discretion of the sovereign issuer.

Investor feedback. Most investors have indicated a preference to follow industry best practice on any collective action provision, indicating either implicitly or explicitly a preference for the ICMA-endorsed, aggregated CAC. Beyond this, differences have been voiced over the desired perimeter of aggregation. Some

have indicated a strong preference that aggregation should be across all instruments, arguing that this does not limit flexibility, since with the ICMA's CAC, the issuer can, if it prefers to, offer different terms to different instruments. Others have seen logic in ring-fencing aggregation so that it applies to GDP-linked bonds and the issuer's other outstanding indebtedness separately.

Design choice. *The London Term Sheet* contains the most recent, ICMA-endorsed collective action clause, 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. Aggregation, however, is only over the universe of the sovereign's GDP-linked securities and not with its other bonds or warrants. This means that the GDP-linked bond and the sovereign's other GDP-linked securities will be necessarily treated as a separate and do not have to be included in a restructuring of fixed-rate government bonds, loans or other borrowed money.