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The rationale for GDP-linked bonds for the euro area

Lorenz Emter and Valerie Herzberg

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Performance related government bonds such as GDP-linked bonds can play a role in enhancing the architecture of the Economic Monetary Union. This Letter highlights the potential contribution of such instruments to reduce and share risks outside of financial crisis through more integrated capital markets. For governments to avail of this insurance, however, and to issue these bonds requires the additional cost or premium to be contained. Using the Capital Asset Pricing Model as a yardstick, we find that in the euro area this is likely to be the case for large issuers. Consequently, large member states should lead the development of this market.

By issuing state-contingent bonds Member States could harness CMU to simultaneously reduce and share risks, thus decreasing the chance of an adverse shock morphing into a full-blown crisis.

Introduction

The ability to effectively manage risk and absorb asymmetric shocks is a key feature of a well-functioning currency union (Mundell 1961; EC 1977). Despite the creation of the Banking Union, the Economic and Monetary Union (EMU) still displays deficiencies in this domain. Estimates vary, but it is generally thought that regional shocks are more absorbed in federal states such as the United States and Germany than in the euro area (Allard et al. 2013; Draghi 2018). Importantly too, while ex post risk sharing through the European Stability Mechanism (ESM) has developed significantly in recent years, ex ante risk sharing, including through fiscal means crucial for preventing countries entering into a crisis and to deal with persistent shocks, remains limited (Allard et al. 2013; Cimadomo et al. 2018; Farhi and Werning 2017). The creation of a euro area budget or other fiscal stabilisation could improve risk sharing (Arnold et al. 2018), but the political journey is likely to be slow-paced given the lack of consensus among Member States.

More integration through private financial markets could also support risk sharing. In the United States, market-based risk sharing through capital markets accounts for a large part of consumption smoothing between States (Nikolov 2016; Hoffmann 2018). Indeed, the process of removing bottlenecks to the cross-border movement of capital in the EU is a policy priority.[2] Measures proposed under the

[1] Email: lorenz.emter@centralbank.ie, valerie.herzberg@centralbank.ie. The views expressed in this Letter are those of the authors and do not necessarily reflect those of the Central Bank of Ireland or the European System of Central Banks. We would like to thank Gerard O'Reilly, Reamonn Lydon, Fergal McCann, Peter Dunne, Peter McQuade, Silvia Calò and Vahagn Galstyan for useful comments.

[2] See the Capital Markets Union Action Plan.

EU Capital Markets Union (CMU) project are however incremental and hence unlikely to have a measurable impact in the short-run.[3] This suggests that it would be wise to find alternatives that can, in the shorter term, plug the gap in macroeconomic stabilisation instruments. State-contingent government bonds could represent this alternative.

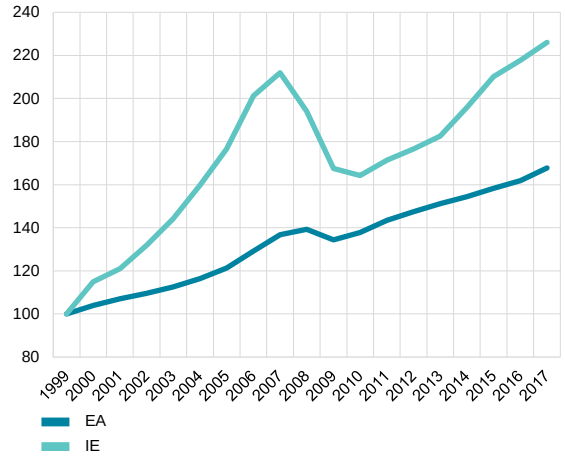
Benefits

By issuing state-contingent bonds Member States could harness CMU to simultaneously reduce and share risks, thus decreasing the chance of an adverse shock morphing into a full-blown crisis. Such government bonds can be structured in different ways.[4] Typically, they reference the country's Gross Domestic Product (GDP) to facilitate comparability and promote market acceptability. The crux, however, is that payments are a function of economic outcomes. In periods of economic downturns the issuer would pay less and the holder of the security would receive less, while in periods of economic upswing, the opposite would occur. This would have naturally stabilising effects on the fiscal balance of a government while, similar to equity, providing a buffer against default and hence reduce risk. Simulations of GDP-linked bonds have found the potential benefits for individual issuers in advanced economies to be compelling (Blanchard et al. 2016).[5] In addition, as these instruments would be bought not just by domestic agents but also by foreign entities, there are benefits for the system as a whole as risk sharing across EMU (and in fact across the world) would occur. A German bank that had bought a Portuguese government bond in the 1990s would have received a smaller or no coupon during the 2003 recession while the Portuguese government would have benefited from increased fiscal space in a period when this space would have been very valuable. So, the automatic stabilisation that a common euro area budget may achieve could be delivered via the market and without the need to find consensus on more fiscal or political integration.

For a highly open economy such as Ireland there is an additional rationale for introducing such instruments. Government revenues are highly volatile and depend, in part, on multinational companies' tax payments that are determined to a large degree by events exogenous to Ireland (Figure 1). For Ireland, finding mitigants for the volatility of government revenues and ways of sharing the risk with non-residents seems therefore a useful way to go. Indeed, during the crisis, foreign holders of subordinated bank debt and equity participated in the losses, and foreign investment funds are now major participants in the domestic commercial real estate market, indicating a potential to offload risk abroad (Central Bank of Ireland 2018). At the same time, with foreign ownership of the domestic banking sector now much reduced, and a large proportion of investment funds' assets located outside of Ireland, the mechanism may be less strong than what the data would suggest (ECB 2017).

[3] By way of example, one of the flagship measures to support non-bank finance, legislation for Simple Transparent and Standardised Securitisation was put forward in 2015, agreed in 2017, and will only come into force in 2019.
[4] For more details on how to structure GDP-linked bonds see Benford et al. (2018) and Demertzis and Zenios (2018).
[5] GDP-linked bonds can also help with unwinding existing debt stocks as discussed in Corsetti et al. (2015).

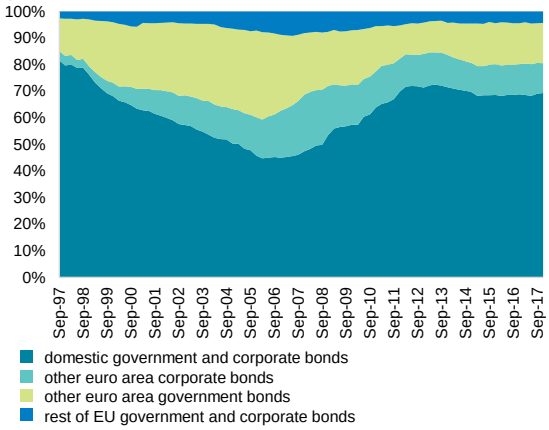
Figure 1 | Government revenue in the euro area and Ireland
(index, 1999 = 100)



Sources: Eurostat, CSO.

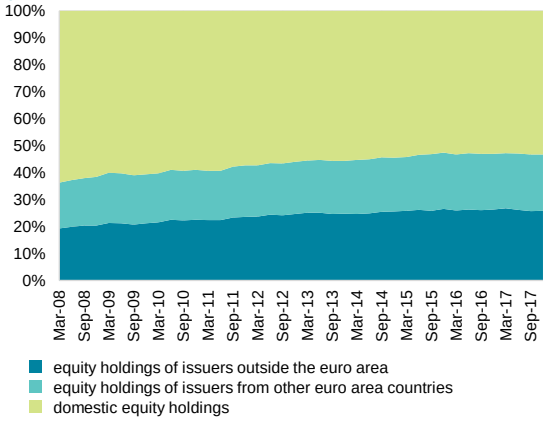
Evidence for the euro area as well suggests that the degree of cross-border risk-sharing has decreased since the Global Financial Crisis (GFC), especially the bond market has returned to high levels of concentration in exposures towards domestic issuers (Figure 2). On the other hand, there seems to be more appetite for cross-border equity holdings (Figure 3). This again indicates some potential for the introduction of an equity-like instrument for sovereigns. Long-term investors such as pension funds, official sector lenders, university endowments, as well as Islamic finance actors - given the absence of fixed interest - should be interested in such products.

Figure 2 | Bond holdings in the EU
(per cent of total)



Note: Share of MFI holdings of debt securities issued by euro area and EU corporates and sovereigns, excluding the Eurosystem. Last observation Dec. 2017. Source: ECB.

Figure 3 | Euro area holdings of equity
(per cent of total)



Note: Equity holdings include listed and unlisted shares, investment fund shares and other equities including, among other things, participations in international and holdings of real estate outside the domestic economy. Source: ECB.

Constraints

Like any financial innovation, introducing state-contingent bonds could face teething problems. First, there is a collective action problem. A new product, especially one that is viewed as being more complex and therefore more difficult to price, suffers from a novelty premium and possibly also a liquidity risk premium if scale does not pick up. Moreover, Acalin (2018) finds that positive effects on debt sustainability are limited if not issued on a large scale. This could be overcome if

several countries were to coordinate their issuances.[6] Costs could be reduced via standardisation of conditions such as proposed via the London template developed under the auspices of the Bank of England.[7]

Second, there remains a stigma attached to GDP-linked bonds. So far, based on the experience of Costa Rica, Argentina and others, it has been viewed as a means for post-crisis countries to emerge out of crisis or debt restructuring, thus discouraging issuance by sovereigns in normal times. For Ireland, too, this has been the angle taken so far.[8] Nevertheless, if large issuers in the euro area, plus highly rated supranationals such as the ESM or the EIB, supported such innovation to achieve more capital market integration, this stigma could be overcome and small issuers could follow.

A third constraint relates to data reliability and concerns of data manipulation. Importantly, statistical agencies need to be independent and robust. In a global comparison, euro area countries rank favourably. Data revisions or data that only very imperfectly reflect underlying activity represent a bigger issue, exemplified by the spike in Irish GDP growth recorded for 2015 caused by substantial MNE activity (Connolly 2018). Nevertheless, here too solutions have been proposed, e.g. agreeing on a certain cut-off date or on the use of better activity substitutes like GNI* in the case of Ireland (Lane 2017; Cecchetti and Schoenholtz 2017).

Simulations, however, suggest that beyond a certain risk premium the costs of issuing GDP-linked bonds outweigh the measured benefits and so despite the positive externalities outlined above, issuers would be reluctant to embrace this product. Blanchard et al. (2016) estimate that the risk premium needs to be below 200bp for these instruments to be viable. Ostry and Kim (2018) highlight that sovereigns' willingness to pay the risk premium increases with the volatility of GDP the country faces and find that high volatility countries would be willing to incur up to 260bp to insure themselves against this volatility. Clearly, if the risk premium can be contained, the incentive for sovereigns to issue state-contingent debt increases. The remainder of the paper discusses estimates of the risk premium for euro area countries, drawing on and refining existing models.

Considerations on the risk premium

We use a simple Capital Asset Pricing Model or CAPM to estimate the sovereign risk premium (Bowman and Naylor, 2016). The CAPM estimates investors' required returns from an asset given the degree of systematic risk – that is, the risk that cannot be avoided by holding a diversified portfolio of assets. As such, the CAPM tells us something about the compensation investors would seek for holding GDP-linked bonds.[9] There are two main assumptions underlying the CAPM, i.e. that investors are risk averse and that they only care about the mean and variance of expected returns of the assets. The price of a risky security is then calculated using the relationship between the relative riskiness of the security and that of the 'market portfolio', as shown in the following equation,

$$(1) \qquad \widehat{r_c} = r_f + \beta_c[E(r_m) - r_f], \text{ where}$$

$$\beta_c = \frac{Cov(r_c, r_m)}{Var(r_m)}.$$

[6] Acalin (2018) suggests a coordinated large-scale issuance via a centralized European Debt Agency.
[7] https://www.bankofengland.co.uk/-/media/boe/files/events/2015/november/gdp-linked-bonds-london-term-sheet-2.
[8] See IMF (2017), and Honohan in Benford et al (2018).
[9] For the purpose of this analysis, we ignore novelty or liquidity risk premia as these can be expected to disappear over time as outlined above.

Here, $\widehat{r_c}$ is the required return on a GDP-linked bond of country *c*, r_f is the risk-free rate, $E(r_m)$ is the expected return on a 'market portfolio' and β_c is the country-specific risk measure. Intuitively, investors seek higher returns on a country's GDP-linked bonds if returns on these bonds are highly correlated with the market portfolio – since this exposes the investors to a higher degree of systematic risk. This means that if country *c*'s GDP growth, r_c, is closely correlated with returns on the market portfolio, β_c will be higher. Moreover, the value of β_c also hinges on the overall volatility of the market portfolio. If the investor can invest in a market portfolio, which is not very volatile, i.e. $Var(r_m)$ is low, the required return on a new asset is going to be higher for any given degree of correlation between the new asset and the market portfolio.

We follow Bowman and Naylor (2016) in assuming a range of different market portfolios, i.e. world and US real GDP growth, as well as CPI-deflated world and US equity market returns. We use annual data from 1989 to 2017 and extend the analysis to all euro area countries. In order to gain the estimates for the required return on a GDP-linked bond we proceed as follows First, following equation (1), we estimate the coefficient β_c in an OLS regression of individual country growth rates on the respective market portfolio over the period 1989 to 2017. Second, we multiply β_c with the expected market return for the benchmark portfolio.[10]

The expected market return for these portfolios is assumed to be equal to projected real growth rates five years ahead taken from the IMF's latest April World Economic Outlook for world and US GDP growth, and to the long-run average return on US equities for world and US equity market returns.[11] Finally, we assume a risk-free rate of zero, which is broadly consistent with the returns of long-term government bonds in safe-haven countries such as the US and Germany observed in the recent low interest rate environment. In this case, the risk premium would also be equal to the growth premium and the required rate of return, given the assumption that novelty and liquidity premia are zero as well.

We confirm the results of Bowman and Naylor (2016) for euro area G20 countries. We also find that the required return or risk premium estimates depend highly on the choice of the market portfolio (Figure 4). More specifically, we find estimates for the euro area of around 32 to 342bp. In other words, a risk-neutral investor buying an activity-linked government bond of say the ESM would want to be compensated with an extra return of 342bp for holding this security if his alternative portfolio was world GDP; while he would only ask for 32bp if world equities were the market portfolio. Across all euro area member states, the estimates vary quite significantly with the highest values found for the Baltic countries and the lowest value for Cyprus.

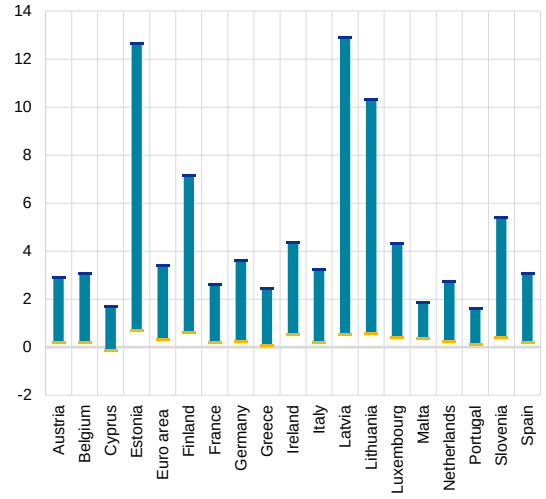
In a second step, we deviate from Bowman and Naylor (2016) by assuming a different and more investor-friendly structure of GDP-linked bonds. Instead of assuming r_c to be the individual countries' real GDP growth, we floor returns at zero, which will reduce the growth risk premium since investors do not face negative returns.[12] Capping returns at zero has been identified as important in the literature and by market research. It would facilitate the tailoring of the instrument to buy-and-hold investors who might be specifically suitable for first issuances

[10] For example, we estimate β_c = 0.924 for the euro area using world GDP as the benchmark portfolio. Then we multiply β_c with $E(r_m) = 3.7$ per cent. With the current risk free rate r_f assumed to be zero, we then derive $\widehat{r_c}$ to equal 3.42 per cent.
[11] This rate is assumed to equal 6.5 per cent, following Bowman and Naylor (2016).
[12] Specifically, we implement this by setting to zero values of GDP which are negative. Technically, the coefficients β_c will be rendered smaller since the correlation between the respective market portfolios and the countries' growth rates is reduced by flooring the latter.

given that they are less prone to liquidity and novelty considerations than other asset managers.[13] While this will, to a certain extent, limit the degree of risk sharing, it will also reduce the risk premium because investors cannot receive negative payments during severe recessions.

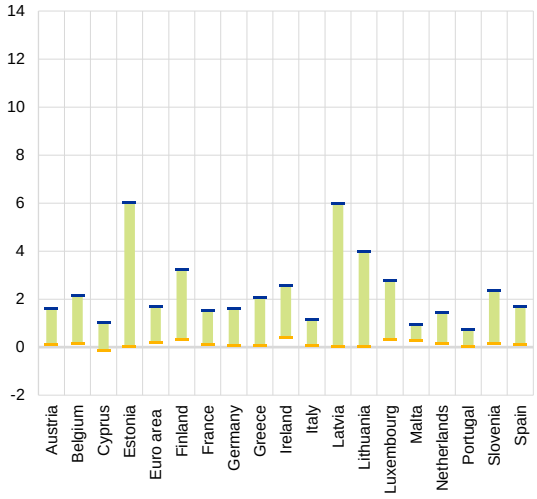
Using this alternative specification, we find estimates for the euro area of around 18 to 170bp (Figure 5). Hence, activity-linked government bonds would require only roughly half of the compensation for investors if returns are floored at zero. The significant reduction in risk premium estimates is observed for all euro area member states.

Figure 4 | Risk premium estimates based on different market portfolios
(percentage points)



Note: The graph range represents the minimum and maximum CAPM estimates of the growth risk premium using world GDP, US GDP, world equities and US equities as the benchmark portfolio. Sources: Datastream, IMF, authors' calculations.

Figure 5 | Risk premium estimates without negative returns on GDP-linked bonds
(percentage points)



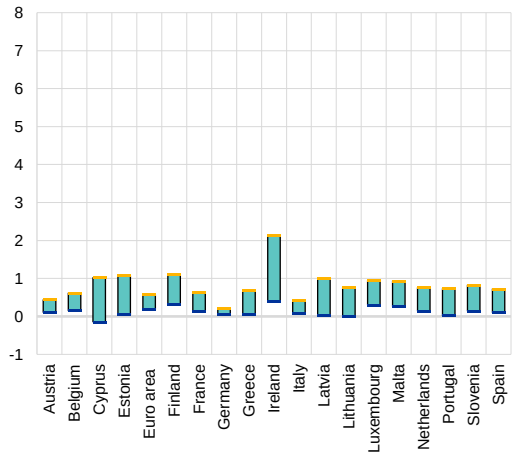
Note: The graph range represents the minimum and maximum CAPM estimates of the growth risk premium using world GDP, US GDP, world equities and US equities as the benchmark portfolio. Individual country growth rates are floored at zero. Sources: Datastream, IMF, authors' calculations.

Bowman and Naylor (2016) argue that the cost of borrowing using GDP-linked bonds is highly uncertain, largely due to the wide range of estimates for the growth risk premium. While true this is mainly driven by the assumption of world GDP being available as a market portfolio. The range for the estimates excluding this possibility narrows further (Figure 6).

If instead of world GDP or equity markets, we use euro area GDP as the benchmark for the market portfolio, the estimated risk premia also decline. From a European perspective, euro area activity may indeed be a suitable benchmark to refer to. For Ireland, the estimated risk premium in this case amounts to 217bp, while for Germany or France it is 68 and 74bp, respectively (Figure 7).

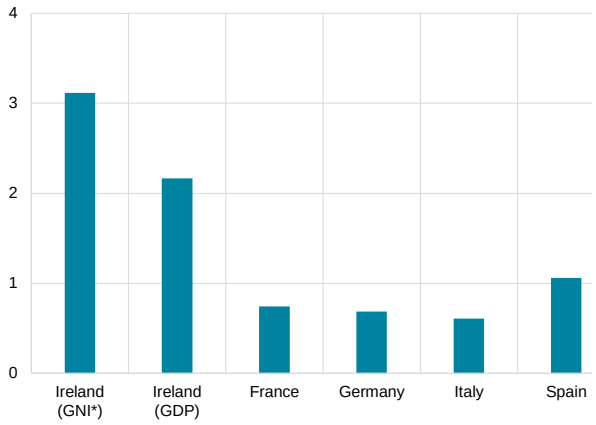
[13] See e.g. Chapter 6 in Benford et al (2018), also for more elaborate considerations regarding the exact structure of instruments (e.g. the term-to maturity).

Figure 6 | Risk premium estimates excluding world GDP as market portfolio
(percentage points)



Note: The graph range represents the minimum and maximum CAPM estimates of the growth risk premium using US GDP, world equities and US equities as the benchmark portfolio and individual country real GDP growth rates capped at zero Sources: Datastream, IMF, authors' calculations.

Figure 7 | Risk premium estimates based on EA growth as market portfolio
(percentage points)



Note: CAPM estimates using GDP and GNI* growth rates (capped at 0) and EA GDP growth as the benchmark portfolio. Sources: Datastream, IMF, authors' calculations.

Conclusion

The euro area needs better risk management and, in the absence of more fiscal integration, state contingent government bonds such as GDP-linked bonds could be part of the solution. There are benefits in terms of insurance for large and small member states alike. The answer to the question of how much compensation investors will seek for sharing the risk of macroeconomic shocks is however critical for assessing whether issuers have an incentive to consider such a novel product.

A focus on the required risk premia based on estimates derived from the CAPM model suggest that these are uncertain and likely to vary by country and chosen benchmark. Furthermore, risk premia may be reduced by increasing the investor friendliness in the structure of GDP-linked bonds which requires a careful analysis of the trade-off between risk-sharing benefits and the cost of issuance. In many cases, though, and especially for large Member States the calculated risk premia are relatively low, irrespective of the benchmark portfolio. This also holds for smaller countries when more EU relevant benchmarks or stock markets are used. This suggests that large Member States should lead the vanguard in introducing these new instruments, in turn bringing down novelty and liquidity premia for a subsequent introduction by smaller Member States.

The purpose of this Letter is not to offer a blueprint for issuance but to kick-start a policy discussion relating GDP-linked bonds to the design of EMU in a non-crisis setting. A blueprint would require more elaborate and detailed assumptions about the construction of the instrument and market preferences that are beyond the scope of this note. More research in this area is clearly warranted.

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T: +353 (0)1 224 6000
E: xxx@centralbank.ie
www.centralbank.ie

Banc Ceannais na hÉireann
Central Bank of Ireland
Eurosystem