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State contingent debt as insurance for euro-area sovereigns

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The euro-area sovereign debt crisis is receding. Europe is on a recovery path, growth is broad-based and unemployment is falling. One after the other, countries hit hardest by the crisis are exiting their adjustment programmes. However, debt remains high in most countries and future debt crises should not be ruled out. While the memories are fresh, it is a good time to think about insurance against future shocks. Such insurance schemes must involve risk sharing with the markets. They weaken the bank-sovereign doom loop from the sovereigns' side, and not just from the banks' side as pursued by the banking union, and make for a more resilient euro area.

The promotion of the banking union and the establishment of a European Monetary Fund are institution-based solutions to crises. Banking union provides the safety regulations that will make banking institutions more resilient, while the EMF is a 'fire brigade' to be called on in emergencies. What has not been tapped are the markets, whose tolerant behaviour to sovereign demands encouraged the built up of debt, while their finicky response exacerbated the crisis.

Taking ongoing G20 discussions on sovereign contingent debt as the point of departure, we argue that these instruments could provide market-based insurance to protect the euro area from future debt crises. Risk-sharing with the markets is a constructive way forward in the context of the Franco-German debate on risk-sharing among states versus system-wide risk reduction. The financial innovation of contingent debt is a practical euro-area reform that would not introduce risk-sharing between states or require institutional reforms or Treaty changes. However, coordination would be needed.

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1 Introduction

The G20 finance ministers and central bank governors who met in Chengdu, China, in 2016, revived the old idea of *contingent debt for sovereigns,* or debt with payment obligations that is contingent on the economic conditions of the sovereign. In their final communiqué, they asked the International Monetary Fund to *"analyse the technicalities, opportunities, and challenges of state-contingent debt instruments"*. After consultations with investors and sovereign debt managers, the IMF submitted a comprehensive report (IMF, 2017). IMF staff argued that state-contingent debt instruments are an appealing countercyclical tool for risk-sharing with the markets, and suggested that careful instrument design, robust institutions, contracts and regulations could address the barriers to market development.

The debate on their relative merits is ongoing and additional work is currently under way, including analytical work to understand their merits and potential shortcomings, and legal work to develop formal term sheets[1]. Benford *et al* (2018) provide an edited volume on the state-of-the-art on GDP-linked bonds.

We contribute a novel angle to the study of these instruments:

Sovereign contingent debt can provide insurance against future sovereign debt crises in the euro area.

We discuss the insurance potential of GDP-linked bonds, and generalise to another class of instruments, namely sovereign CoCos (S-CoCos) which are debt instruments with a potential payment standstill and maturity extension mechanism built-in. We highlight in particular the potential they might offer the euro area. The insurance perspective goes to the core of the Franco-German debate about risk sharing. Germany argues for system-wide risk reduction and France argues for risk sharing among euro-area states. In insurance parlance, Germany argues for actuarial fairness and France for sustainable insurance mechanisms. Demertzis (2018) and Bénassy-Quéré *et al* (2018) have argued that this is a false dichotomy, since both are needed for an insurance market to function. Well-designed insurance systems need to deal with both moral hazard and adverse selection. In the reported words of Benoît Cœuré at an IMF event on 18 January 2018, *"There is a lot of discussion about risk-reduction. But diversification and integration are part of risk-reduction"*. We contribute to this debate with a discussion of the use of sovereign contingent debt that introduces risk-sharing with the markets, thus bringing more market discipline and reducing overall risks.

There are many arguments in favour of the insurance potential of these instruments. The main one, in our opinion, is that contingent debt makes the no bail-out rule more credible by weakening the bank-sovereign doom loop. Systemic benefits for the euro area create incentives for coordination, and existing institutional arrangements could overcome the coordination problem, removing first-mover disadvantages.

[1] For instance, IMF executive directors deliberated on the staff report and concluded that these novel instruments, *"in principle, [have] the potential to broaden the sovereign toolkit for debt management, reduce the probability of sovereign debt crises, make financial systems more resilient, diversify opportunities for investors and debt managers, and strengthen the international financial system"*. Nevertheless, many directors were skeptical of the potential for broader use of these instruments in the face of *"practical complications and risks […], including high initial liquidity and novelty premia demanded by investors, adverse selection, moral hazard, weaker incentives for sound fiscal management, and adverse consequences for conventional debt instruments"*. Allen & Overy, at the prompting of Bank of England, took the initiative to design the 'London Term Sheet for GDP-linked bonds', providing a template for discussion and analysis. Staff from Bank of Canada and Allen & Overy are currently taking a similar initiative on extendible bonds.

In the rest of this section we discuss the bank-sovereign doom loop, before reviewing sovereign contingent debt in section 0. Section 3 discusses the insurance function of sovereign contingent instruments and how they weaken the doom loop. Section 4 uses simple simulations to illustrate the maximum fiscal space that could have been created during the period 2002-17 from contingent debt, and the insurance protection during the troughs in 2008 and 2011. Section 5 discusses the challenges of introducing these instruments and the catalytic role of the European Stability Mechanism. Indeed, one of the contingent debt instruments we discuss could be used to operationalise modifications to the ESM treaty already suggested by the German Ministry of Finance (and others). Section 6 concludes.

1.1 The sovereign-bank doom loop challenge

Article 125 of the Maastricht Treaty, the so called *no bail-out* clause, ensures that countries remain fully responsible for repaying public debt. In the event of loss of market access, the country will default and re-negotiate with creditors bilaterally on restructuring its debt.

The Greek crisis has shown that the no bail-out clause was not credible. Banks in euro-area countries owned considerable Greek debt, creating a bank-sovereign doom loop whereby a sovereign default would have jeopardised the viability of the banks. Member states found it important for the stability of their own financial systems to interfere and 'rescue' Greece by effectively buying most of its non-tradeable debt.

This has shown that steps were needed to reduce the risks of the doom loop. Banking union, and the bail-in institutionalised in the EU Bank Recovery and Resolution Directive (2014/59/EU), reduced the likelihood that weak banks would jeopardise a sovereign's finances, but did not eliminate the possibility of a bail-out.

Three conditions would have to be fulfilled to make the no-bail-out clause credible (Pisani-Ferry, 2016):

1. Define insolvency procedures, for example in the context of ESM (future EMF) programmes, for extreme and rare situations. This is equivalent to allowing for an 'orderly' default in an attempt to avoid a financial crisis.
2. Provide a fiscal backstop for rare yet very distorting default events, since countries that default require support to get their economies back on track.
3. Reduce the exposure of banks to sovereign debt risk. This would weaken the doom loop from the direction of the sovereign, by contrast to the banking union which addresses the loop from the banks' direction.

We discuss the third of these conditions. One suggestion, by Véron (2017), was that there should be 'curbs' on the exposure of a bank's balance sheet to each sovereign; here we discuss an option for that building on contingent debt. Unlike curbs on banks' exposure to sovereign debt, contingent debt can be viewed as a form of insurance that would be triggered in the case of certain adverse events. Banks (and others) that hold sovereign contingent debt would receive payments linked to the sovereign's outlook: in good times they would receive more and in bad times they would receive less. This would reduce banks' dependence on sovereigns *ex ante*, since the likelihood of sovereign default would be reduced. Furthermore, the premium received by banks that these instruments would provide additional regulatory capital.

There are two ways to improve the resilience of a system to unavoidable shocks: either support provided by the healthy to the weak (ie transfers) or universal insurance. This is *not* to say that steps

should not be taken to impose fiscal discipline and to regulate banks to ensure that every component of the system remains healthy. Risk reduction benefits each and all. However, no system is fool-proof, and when the unavoidable shock hits one or more of its components there is a need to restore system-wide stability. To do so requires either transfers in the form of bail-outs, or universal insurance. We explain how the later could work using sovereign contingent debt in a way that is actuarially fair, with each member paying premiums commensurate to its own risks. However, for the insurance markets to kick-start there is a need for all parts of the system to participate, not only the riskier parts. The sustainability principle therefore applies, since it is the stronger economies that must take the lead to offer their own contingent debt first. (We will see later how Canada played such a role, successfully and without increasing its financing costs).

2 Debt or equity financing for sovereigns

We examine the two main types of sovereign contingent debt discussed in the IMF report: *GDP-linked bonds,* and *extendible sovereign CoCo* (sovereign contingent convertible debt).

- **GDP-linked bonds** have returns indexed to the real growth rate of GDP. There are two variants of indexation, *coupon-indexed* or *floaters* Borensztein and Mauro, 2004) and principal-indexed or *linkers* (Kamstra and Schiller, 2009; see also Benford *et al*, 2018).
- **Sovereign CoCos, or extendibles,** convert into a bond of extended maturity and, potentially, a standstill of coupon payments, when a trigger breaches a threshold. The event triggering the conversion reflects difficulties faced by a sovereign in meeting its debt servicing obligations (Brooke *et al*, 2013; Consiglio and Zenios, 2015). See also IMF (2017).

Both instruments are *contingent contracts* in legal speak. As such, they allow for risk sharing between the contracting parties, and the 'neglected risk' of sovereign default is no longer neglected[2]. The former are continuous instruments providing 'health insurance' against economic cycle volatility. However, they are not fiscal instruments *per se*, and are not used to stabilise the cycle in lieu of government intervention. Instead they create fiscal space for the government to act during the deep troughs of the cycle. The latter are discrete instruments and provide 'accident insurance' against extreme catastrophic events.

There are of course many practical issues to be specified for well-defined contracts, and, as shown by Consiglio and Zenios (2018), the design specifications make a difference to the risk premium and determine whether an instrument is beneficial for a sovereign or not. Box 1 gives details on both GDP-linked bonds and sovereign CoCos, and we highlight an overarching distinction between the two.

1. GDP-linked bonds are *equity-like* instruments. They are comparable to (non-voting) shares in a corporation, with dividends paid as a share of national income rather than of corporate profits. Floaters are puttable shares since coupon payment has a floor.
2. Sovereign CoCo are *debt* instruments with limited downside risk.

GDP-linked bonds inherit the economic cycle volatility without capital guarantee. They appeal to long-term investors, such as pension funds or university endowments, that wish to diversify their risks and share in *"the wealth of the nation"* (Kamstra and Shiller, 2009). For pension fund participants, the linkers provide protection for standards of living since the payments received are a constant fraction of GDP. Official sector lenders are potential buyers, since they already provide substantial support to

[2] The notion of neglected risk as a root cause of financial fragility was introduced by Gennaioli *et al* (2012).

sovereigns and they have long horizons that allow them to absorb volatile returns. In the current low interest rate environment, these instruments could provide relatively high yields, while they shield investors from counterparty risk. IMF (2017) also point out that these instruments would be attractive in Islamic financing, since linkers are compliant with Sharia law, which bars fixed interest.

Sovereign CoCos have limited downside risk with capital guarantees. Liquidity rich investors can weather a maturity extension and/or a standstill, and benefit from higher yields. There is also a potential market for (re)insurers of tail risk, since they provide a natural hedge against tail risk, if the risk factors in the sovereign CoCo and the tail risks of the (re-)insurer are correlated.

The main argument of the proponents of contingent debt is that they create countercyclical fiscal space acting as automatic stabilisers. Sovereign CoCos provide stabilisation only during a crisis, in a discrete intervention, whereas GDP-linked bonds provide continuous smoothing. Creating fiscal space is particularly relevant during a crisis when a country might need a combination of concessional financing and austerity to create primary surplus and reduce public debt. This leaves limited room for countercyclical fiscal support, but contingent debt lowers primary surplus needs and creates space. Fiscal space also relaxes the time constraints for privatisation plans, avoiding fire sales of state assets. We add to the main argument some complimentary viewpoints showing how these instruments act as insurance[3].

[3] Brooke *et al* (2013); IMF (2017); Consiglio and Zenios (2015).

Box 1. GDP-linked bonds and sovereign CoCos

Coupon-indexed GDP-linked bonds, or floaters (Borensztein and Mauro, 2004)

These bonds link the coupon c_t to GDP growth using the formula

$$c_t = \max\ [\, c_0 + (\ g_t - \bar{g}\ ), 0] \qquad (1)$$

where c_0 is the base coupon rate that is adjusted by the deviations of the real growth rate g_t from its target value $\bar{g}$. If growth exceeds the target, the coupon increases from the baseline, otherwise coupon payments decrease with a floor at zero.

Principal-indexed GDP-linked bonds, or linkers (Kamstra and Shiller, 2009)

These bonds pay principal at maturity according to the formula

$$B_t = B_0 \frac{Y_t}{Y_0} \qquad (2)$$

where B_0 is the original amount issued, typically 100, and Y_o, Y_t are the nominal GDP values at the issuing date and at *t*, respectively.

Sovereign CoCo (S-CoCo), or extendibles (Brooke *et al*, 2013; Consiglio and Zenios, 2015)

These bonds allow payment standstill when some indicator(s) breaches a threshold. During the standstill period coupons might or might not be paid, but principal payments are delayed. A three-year standstill is broadly aligned with the duration of official assistance programmes.

Suggested triggers:

- 30-day average of CDS spread (Consiglio and Zenios, 2015)
- 100-day average of the excess interest rate above German bunds (Mody, 2014)
- Signing an assistance programme with the official sector such as the IMF or ESM (Andritzky *et al*, 2016)

Threshold: For the market driven triggers above, the threshold is set to correspond to a probability of default about 5 percent.

2.1 Understanding how they help

Reducing liquidity and insolvency risk

The two instruments provide insurance against different adverse events. Sovereign CoCos provide short-term relief that is effective only if the sovereign faces a liquidity crisis. GDP-linked bonds, especially the linkers, offer protection from insolvency as debt service payments are adjusted with GDP (Brooke *et al*, 2013; Consiglio and Zenios, 2015).

Reducing the probability of default

Floaters reduce debt service costs, putting downward pressure on debt levels and providing protection against potential default arising from external shocks. Linkers reduce debt directly, since the nominal value is linked to growth. With sovereign CoCos, the payment standstill provides time and fiscal space so that a liquidity crisis does not morph into an insolvency situation, thereby also reducing the likelihood of default. We will see later that there is ample fiscal space in euro-area countries to be created from the use of either instrument, so that default insurance can be effective.

Diversification of the funding base

Both instruments appeal to a broader investor base with a higher risk appetite than investors currently holding risk-free low-yield government bonds. Diversifying the investor base is attractive for two reasons. First, in normal times the sovereign can draw financing from a broader set of investors. Second, during stress episodes the risks are spread more broadly. This is the same argument used for CAT ('catastrophe') bonds. In the case of sovereign contingent debt, it has the added advantage of making the system more resilient. When an insurance company taps the market via CAT bonds, it protects its shareholders from catastrophic events. When a sovereign taps a broader market base for its debt, it protects not only itself but also its creditors, by having more shoulders to carry the burden of a default.

Risk sharing between creditors and debtors

The cost of potential default is (partially) shifted from the international institutions that deal with sovereign bail-outs to the sovereigns' creditors. Either way, the debtor shares the cost of default through balance sheet consolidation, with adverse welfare affects. However, the burden on the official sector is lighter, since the size of an assistance programme is reduced. Creditors cannot count on international taxpayers to carry all costs.

Risk sharing removes creditor moral hazard. Creditors have a propensity to buy short-term debt from crisis countries on the assumption that, in the short run, a crisis country is likely to be bailed out, but the long-term prospects are unclear. In the short-run, the country is treated as having a liquidity problem to be solved with official sector assistance, but in the long-run the country might be facing an insolvency problem that could require private-sector involvement. With sovereign contingent instruments, short-term creditors will receive reduced coupon payments or face a standstill in the same way that long-term creditors might witness a default. Hence, flight to short-term debt – with its adverse effect on long-term yields – is arrested.

Transparent risk pricing

Sovereign debt is considered risk free and carries zero weight in the regulatory capital requirements of Basel III. However, as the Greek debt restructuring reminded us, sovereign debt is not risk free. Prior to

the 2010 Deauville agreement between President Sarkozy and Chancellor Merkel, euro-area sovereign default risk was neglected. When risks are neglected, security issuance is excessive *ex ante*, and when investors eventually recognise the risks, they precipitate a flight to quality and markets become fragile *ex post* (Gennaiolo *et al*, 2012). In state-contingent debt, those risks are explicitly priced. Hence, sovereign default risk is no longer neglected, and excessive debt issuance is moderated. This reduces fragility.

Speedy response to crises

One of the arguments in favour of contingent debt for banks was that supervisory discretion would be replaced by rules, thus avoiding problems of regulatory forbearance that play a significant role in banking crises. The equivalent malaise in sovereign crises is the *"pathological procrastination"* exhibited by the sovereigns in trouble and the international organisations that come to the rescue (Buchheit, 2011). Sovereign CoCos force creditors and debtors to act as soon an objective threshold is breached.

3 Insurance for sovereigns in the euro area

Sovereigns do not buy insurance, and a search for 'insurance for sovereigns' produced zero hits on Google Trends. Sovereigns use the resources of the state to address whatever calamity befalls their citizens. But now and then the state falters, as Reinhart and Rogoff (2009) show using eight centuries of data, and international assistance comes to the rescue. International assistance is forthcoming when it comes to exogenous disasters, such as hurricanes or earthquakes. But when the disaster is a financial crisis, no matter what precipitated it, the sovereign is left to its own devices. International assistance is deliberate, comes with strict conditions and is expensive. It should be like this, to avoid moral hazard and discourage profligacy.

Sovereign contingent debt can provide insurance during the deep troughs of the economic cycle and the rare, but not unexpected, banking crises. These events have significant economic and social costs, and the sovereign's resources might not be sufficient to pull itself out of trouble. That's when contingent debt insurance kicks in.

Insurance theory tells us that diversifiable risks should be diversified away. Non-diversifiable risks should be shared. A sovereign might diversify its economy but cannot diversify away its GDP risk, so the risk of sharp GDP drops must be shared. The banking sector can diversify both assets and liabilities, but there is a strong evidence for home bias on the asset side, and liability diversification is limited since banks cater to local depositor bases. Luxembourg, Malta and Singapore are rare exceptions, and so was Cyprus until it was hit by the 'perfect crisis' (Zenios, 2013). Asset diversification is promoted by Basel III, although the zero risk weight on sovereign assets and the political economy of scarce credit (Calomiris and Haber, 2014) encourage home bias. Véron's curbs diversify banks' assets among multiple sovereigns. While this is a good idea, it exposes – indirectly, through bank guarantees and the doom loop – each sovereign to other sovereigns. In the euro area, all banks will hold diversified but highly correlated (if not identical) portfolios. This increases systemic risk that must be shared. Risk sharing appears unavoidable.

We reiterate that sovereign contingent debt goes beyond the controversial risk-sharing between member states and adds the concept of risk-sharing with the markets. There is still a need to coordinate and eliminate the first-mover disadvantage and kick-start a liquid market. However, each sovereign pays a premium commensurate with its own risks, thus avoiding moral hazard and indirect

fiscal transfers. The payment of the risk premium comes from each sovereign during the good days. Averaged over the long run we expect this to be near to, but higher than, zero, much in the same way most of us pay, during our lifetime, more in insurance premiums than the insurance payments we receive. Insurance premiums are paid by everybody, who may receive no paybacks, while a few may receive large payments for health-related expenses.

Having resolved the moral hazard problem, we anticipate that collective action will be possible since there are positive systemic effects from reduced individual vulnerabilities. At the country level, the banking union, if effective, will help reduce banks' exposures to their own sovereigns. At the aggregate level, and given the degree of interdependence, it is important to approach Europe as more than just the sum of its parts and any attempt to further integrate should be driven by a desire to strengthen the system. Strengthening systems, in turn, requires both reforming their parts (risk reduction) and the putting in place of mechanisms to hold these parts together as a system (risk-sharing between countries and with the markets). This is not unlike a national health policy: we promote healthier lifestyles to strengthen each part of the system (the individual), but we also enforce collective insurance so that the healthcare system as a whole survives. The collective nature of agreements, effectively forcing the healthy to also subscribe, helps resolve this and recognises that the current healthy may also be its future consumers. This resolves the problem of *adverse selection*.

Is there sufficient depth in the markets to provide the required insurance? The global capital markets stood at €175 trillion in 2010, with equity and private debt securities at €96 trillion, and €79 trillion in bank deposits and government debt. By comparison EU28 sovereign debt stood at €10 trillion. The equity and private debt markets are sufficiently deep to provide insurance to sovereigns, for a premium of course. The asset base of buy-side entities is expected to reach around €80 trillion by 2020[4], so tapping 8 percent of these assets through contingent debt could insure half of the sovereign debt.

It would not be the first time that capital markets are tapped to provide insurance. CAT bonds have been used to provide market-based risk transfer solutions for catastrophic events, such as hurricanes and earthquakes. These instruments have been gaining popularity since Hurricane Andrew in 1992 and the introduction of insurance futures and options by the Chicago Board of Trade.

3.1 Weakening the sovereign-bank doom loop

We have argued that in the absence of a fully credible no-bail out clause, the only other thing to do is to attempt to avoid the need for a bailout, and to reduce its size if it cannot be avoided. This is achieved by weakening the sovereign-bank doom loop. Banking union does that by putting a number of earlier corrective steps in place (bail-in) to cushion shocks and absorb losses in order to reduce the need for a bail out. Banks' fragility therefore becomes less of a danger to sovereigns.

State contingent debt attempts to do the same thing, by reducing the speed at which sovereign fragilities jeopardise banks' health. First, for a given risk profile, banks will not replace standard bonds with GDP linked alternatives because they carry a higher premium. In this respect, they would need to hold less of the latter in order to maintain an equivalent risk profile. This in turn would reduce both the home bias and excessive lending. Second, the stabilisation properties of such forms of debt reduce

[4] See *Global Capital Markets 2016*, Boston Consulting Group, available at https://www.bcg.com/publications/2016/financial-institutions-technology-digital-value-migration-global-capital-markets-2016.aspx, accessed April 2018.

the probability of default and help countries escape problems easier, especially when they are not extreme. Third, if contingent debt is pursued by all – the only way that it can remain sustainable – then systemic risk is reduced. No single country can easily jeopardise the health of a system because risks are shared with the markets, which become the first line of defence when a country gets into trouble. Banks in turn will have provisioned for such outcomes by collecting appropriate premiums *ex ante*.

All of this rests on the assumptions that markets for such instruments develop, and that financial markets price in these risks in ways that are interesting for the banks' balance sheets in terms of both return and safety. In section 5 we discuss some of the challenges that arise and how to overcome them.

4 Fiscal space to insure against deep troughs in economic cycles

We ran simple simulations for EU countries over the period 2002-17 to estimate the fiscal space margins from contingent debt. We assumed that all marketable securities are floaters or S-CoCos and proceeded as follows. First, we calculated current interest service payments as a fraction of GDP and estimated the effective interest rate on the sovereign's debt. Second, we adjusted this interest rate according to the contingent provision. Third, we compared the current debt service payments with payments under the adjusted rates to estimate the fiscal space. This is positive during recessions, and negative during above-average growth[5]. We also consider the effects of a fiscal stimulus equal in magnitude to the savings from the contingent debt, with an appropriate fiscal multiplier. Our simulation is in a partial-equilibrium setting, to illustrate the maximum fiscal space that could become available from the use of contingent debt. More work is needed with a general equilibrium model to get a fine-tuned assessment of the benefits. Nevertheless, our simulations show that (1) there are significant insurance potential benefits; (2) all countries would benefit from GDP-linked bonds and several from sovereign CoCos, in difficult circumstances; and (3) the overall net contribution during the 15-year period does not seem prohibitively large as the price to pay for insurance. Naturally, some counties would benefit more than others.

4.1 Fiscal space from GDP-linked bonds

For GDP-linked bonds we consider floaters (eqn. 1) paying the effective interest rate when growth rates equal the European Commission's GDP growth projections (AMECO data) for 2002-16. We first assume that the sovereign converts all its debt into contingent at zero premium, and there are no fiscal multipliers. With these simplifying assumptions we obtain the maximum possible space created by GDP-linked during recessions. The fiscal space created during the euro-area double dip crisis in 2008 and 2011, for a few select countries, is shown in Table 1 (top panel). This fiscal space can be used to provide stimulus and spur growth, and using fiscal multiplier 0.6 during growth periods and 0.9 in recessions we obtain more accurate estimates of fiscal space in Table 1 (bottom panel).

[5] The differences of debt service payments with GDP-linked bonds for all countries are reported in Table 5 (see the Annex), and with sovereign CoCos in Table 3 for those countries that would have seen the payment standstill triggered during a crisis.

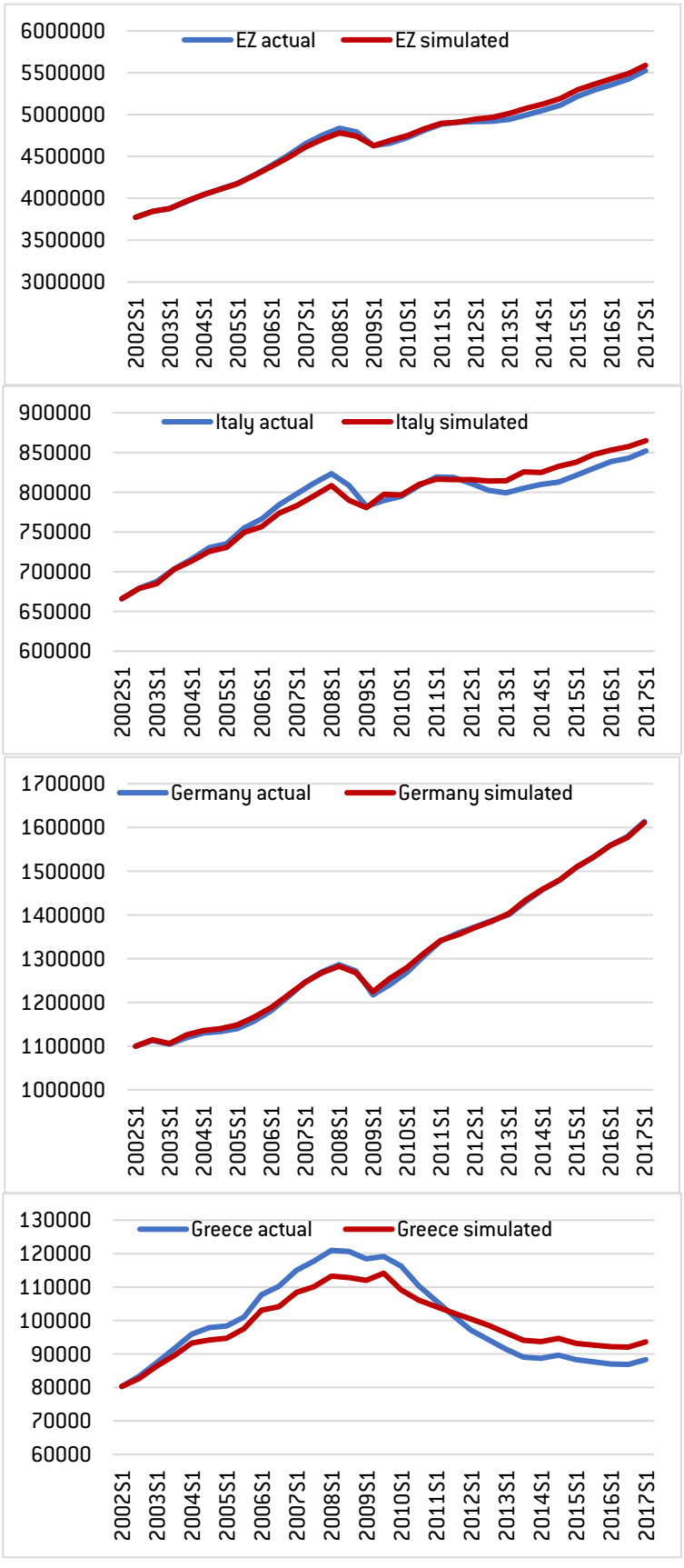
Table 1: Fiscal space created during the trough of the euro-area crisis with GDP-linked bonds

Country	Period 2008S2-2010S1	Period 2011S2-2013S2
Without fiscal multipliers		
Euro area	1.40 % of GDP	1.01% of GDP
Germany	0.92% of GDP	0.12% of GDP
Greece	3.27% of GDP	2.33% of GDP
Italy	2.31% of GDP	2.19% of GDP
With fiscal multipliers of 0.6 during growth periods and 0.9 in recessions		
Euro area	1.09 % of GDP	0.70% of GDP
Germany	0.81% of GDP	0.15% of GDP
Greece	2.13% of GDP	2.23% of GDP
Italy	1.44% of GDP	1.25% of GDP

We note from Table 1 that all countries benefit from these instruments during recessions. The highest benefits accrue to Greece, but even Germany would benefit by almost 1 percent of GDP during the crisis of 2008. When we apply fiscal multipliers, the fiscal space is reduced. This is understandable, and desirable, since economic conditions improve from the stimulus. Using the insurance analogy, countries receive less healthcare because their economies heal faster.

Figure 1 illustrates GDP growth with and without the stimulus provided from GDP-linked bonds. Again, we consider GDP-linked bonds issued with a zero premium, assuming that the premium for GDP volatility is compensated for from the reduced default risk. Clearly Greece gets significant protection during the downside and so does Italy, but the changes are slight for the euro area as a whole, while Germany has imperceptible changes.

Figure 1: GDP with and without GDP-linked bonds issued with zero premium
(With fiscal multiplier 0.6 during growth periods and 0.9 in recessions)



6000000 EZ actual EZ simulated

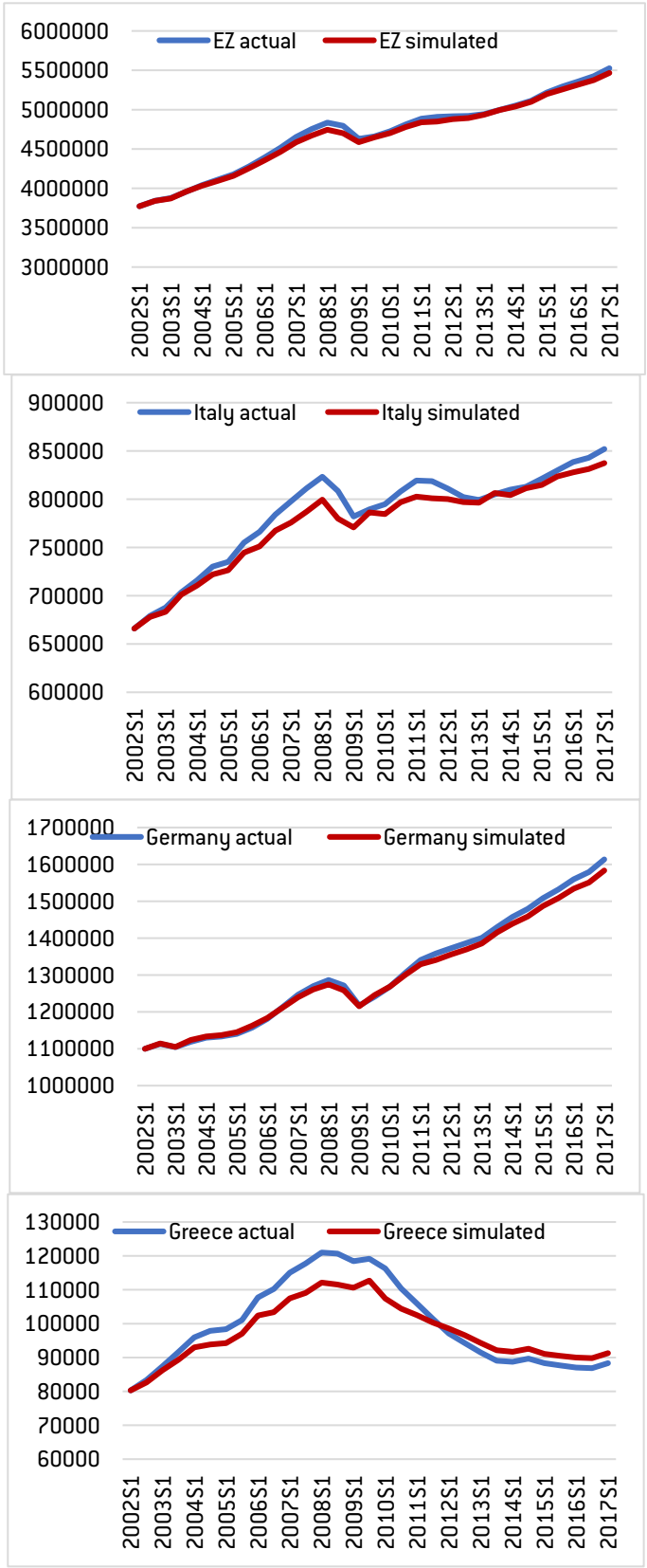
Table 2: Net contribution from the use of GDP-linked bonds averaged over 2002—2017, as a percentage of GDP

Country	Premium		
	100bp	*50bp*	*0bp*
Euro area	0.41% of GDP	0.19% of GDP	-0.04% of GDP
Germany	0.41% of GDP	0.22% of GDP	0.03% of GDP
Greece	0.25% of GDP	0.03% of GDP	-0.19% of GDP
Italy	0.62% of GDP	0.29% of GDP	-0.03% of GDP

In reality, the countries would pay a premium *ex ante* to issue linked debt, and *ex post* they pay a higher percentage of their GDP during times of above-average growth. These are the insurance premiums that markets demand to assume the GDP volatility risk and provide protection during a downturn. Table 2 shows the total net payments during the testing period for different premiums. With increasing premiums the net benefits erode, and this is illustrated further in Figure 2 where we repeat the GDP growth simulations with a premium of 50bp.

Figure 2: GDP with and without GDP-linked bonds issued with 50bp premium

(With fiscal multiplier 0.6 during growth periods and 0.9 in recessions)



4.2 Fiscal space from sovereign CoCos

We now look at the fiscal space created by sovereign CoCos with a payment standstill, assuming that all sovereign debt was of this type. We set a threshold at 600bp, and after a three year standstill all missed payments are made (with interest) over 10 semesters. During the testing period six countries would benefit from a standstill activated at some point during the crisis. Table 3 shows the average annualised fiscal space and its timing.

Table 3: Fiscal space created during the euro-area crisis with sovereign CoCos

Country	Standstill triggered	Fiscal space
Bulgaria	2009S1	0.4% of GDP
Ireland	2011S1	2.6% of GDP
Greece	2010S1	4.1% of GDP
Cyprus	2011S2	1.6% of GDP
Portugal	2011S1	2.5% of GDP
Romania	2008S2	0.7% of GDP

Assuming fiscal multipliers of 0.6 and 0.9 for growth and recession periods, we look at the net difference between the average GDP growth of the countries with and without the sovereign CoCos during 202-2017, for different risk premiums (Table 4). As the premium for issuing CoCos increases, the net benefits erode and might even become net losses. However, the premium depends on the probability of breaching a threshold, and not on GDP volatility as in the case of GDP-linked bonds. We will see in the next section that countries can potentially issue sovereign CoCos with zero premiums. Naturally, countries like Greece would have to pay a high premium, given its high CDS spreads before the crisis. However, if Greece had issued CoCos in 2002 the spreads would have been much smaller.

Table 4: Average net growth with and without sovereign CoCos during 2002-17

Country	Premium		
	100bp	*50bp*	*0bp*
Bulgaria	-0.07% of GDP	-0.03% of GDP	0.02% of GDP
Ireland	0.08% of GDP	0.18% of GDP	0.28% of GDP
Greece	-0.06% of GDP	0.18% of GDP	0.41% of GDP
Cyprus	0.00% of GDP	0.11% of GDP	0.21% of GDP
Portugal	-0.01% of GDP	0.18% of GDP	0.34% of GDP
Romania	0.05% of GDP	-0.01% of GDP	0.02% of GDP

Are these premiums excessively high to pay for insurance to weaken the doom loop? This is hard to answer without quantifying the costs, financial and other, of the doom loop and recessions.

4.3 What about Germany?

A pressing question arises from the fact that the strong economies, such as Germany, do not obtain a net benefit from issuing more expensive debt, as shown in Figure 2. Even if a consensus is reached that insurance is essential, and that further weakening of the doom loop is desirable, and the premiums to be paid are reasonable, there remains an important coordination question: how to kick-start the insurance market for sovereigns? Clearly, a distress period is not the right time to do it. It is better to redesign the system in good times, but also to not wait too long for the memories of the crisis

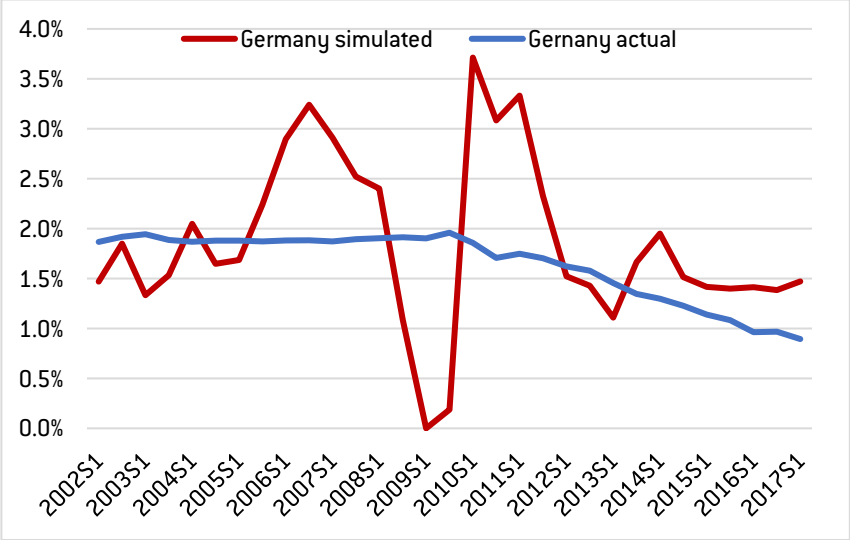
to fade. But why should the robust economies of the EU agree to issue GDP-linked bonds and pay the premium? The question remains even if the premium is calculated to reflect each country's own risk, satisfying the principle of actuarial fairness without cross-country subsidies. The robust economies could argue that they would rather benefit from the good times in full and use their own resources to handle a downturn when it arises.

There are two reasons why we believe it is in everyone's interest to buy into such schemes.

1. **System-wide benefits from weakening the bank-sovereign doom loop**. As risky countries benefit from shallower troughs (having paid for them in boom years), the probability of default decreases. This implies that debt crises, such as the one we have seen in the euro area, will become rarer. The system, ie the euro area, is better protected by strengthening the weaker links. This is better for the weaker links, it is better for the system, and by implication, it is better for the stronger economies, which are also part of the system. Given the interdependence of euro-area member states and spillover effects, this is, in our opinion, the predominant reason.
2. **Risk aversion, that makes us all buy insurance**. Even the most robust economies suffer recessions, and our simulations show that Germany, for instance, would have also benefited from reduced interest payments during the crisis (Figure 3).

It is worth noting that no country is paying anyone else's premiums. Each pays a premium commensurate with its own risk. However, all countries must pay to kick-start an insurance market of liquid instruments, and create a diversified pool of instruments without a stigma that will be (eventually) well understood. This was the same rationale for pushing for international reforms to adopt Collective Action Clauses (CACs). Canada, a country that needed CACs the least, was the first developed economy to announce in 2000 the adoption of CACs, "*providing leadership to the international community with respect to the development of an orderly framework for debt restructuring by debtors and creditors*"[6].

Figure 3: Germany debt service payments as proportion of GDP are reduced significantly during the crisis when growth dropped to -4%, with the use of GDP-linked bonds



[6] CACs for euro-area countries were reformed circa 2014 by the International Capital Markets Association (Gelpern *et al*, 2016).

5 Challenges

There are several challenges on the road to making contingent debt part of the financing toolbox of sovereigns. The potential benefits justify discussions to understand these instruments and find ways to overcome the challenges.

A challenging question is estimating the risk premiums. We address this issue below.

The regulatory treatment of these instruments on bank balance sheets will determine how a major sovereign creditor class, ie banks, will respond to these instruments. Sovereign CoCos should have the same capital requirement risk weights as standard sovereign bonds, since capital is guaranteed. It is not obvious that the same treatment should be afforded to GDP-linked bonds. Certainly, GDP-linkers cannot be considered risk free since even the capital is not guaranteed. Floaters classified as 'held to maturity' can be treated like nominal sovereign bonds. However, if classified as 'available for sale' they must be marked-to-market with higher volatility than nominal bonds.

The use of a market-based trigger needs further discussion. Market triggers contribute to transparency and speedy reaction to crises, the merits of specific triggers can easily be discerned, and we will see below that the ESM could play an important role in launching them. However, there are concerns about delegating to the markets such important decisions as a maturity extension or payment standstill. This concern has merit, but in any event sovereigns seek official sector assistance when they are cut out of the markets.

Furthermore, though we argued that these instruments could serve to stabilise economic cycles, there are also concerns that they could be destabilising under some conditions. For instance, as the threshold is approached for a sovereign CoCo, a flight to safety could be triggered. While the payment standstill stabilises the cycle, the flight can be destabilising and could even be provoked by 'bear raiders'.

Finally, we reiterate the need for coordination to overcome first-mover disadvantages. Unless there is some coordination, no sovereign will be eager to pay by itself the premium today for the future benefits. Also, first movers will be charged innovation and liquidity premiums, unless there is sufficient volume. Institutions like the European Monetary Fund could be the first mover.

5.1 Computing the risk premium

The price of contingent debt has an impact on the fiscal space created and on the net effect on growth, so we turn to an estimation of the premium. Actually, there are several premiums:

1. Innovation premium, for issuing novel instruments not understood by the market.
2. Liquidity premium, for trading in illiquid markets in the early launching stages.
3. Volatility premium, due to the volatility of GDP growth or CDS spreads.

The first two premiums are transient (and there is a first-mover disadvantage), but can be reduced through coordination. However, the long-term suitability of these instruments hinges on the volatility premium, and the following question arises:

Are the premiums so large that they erode any benefits for the sovereign?

The total benefits net premium payments, will be, on average, negative.. Sovereigns will be paying the premium for the benefit of avoidance of the costs of a crisis, knowing that crises are an equal

opportunity malaise (Reinhart and Rogoff, 2009). Risk aversion dictates a willingness to pay a premium to avoid the catastrophic consequences of a crisis, even as we expect that a crisis will not happen to our country. So, given the protection a sovereign receives from contingent debt, we ask if the price is worth it. We turn this question on its head and ask instead:

Can we design contingent debt for a fair price that is acceptable to sovereigns?

The insurance products should be tailored to the needs of each sovereign and should be priced fairly to avoid moral hazard. These are important issues that deserve analytical work to produce realistic estimates and inform the debate. We illustrate the risk premiums for both GDP-linkers and sovereign CoCos in Box 2[7].

For GDP-linkers we observe that for a broad range of design parameters, the buyers expect to be compensated for assuming GDP volatility risk. However, there are designs with low risk premium which can be acceptable to the sovereigns. Naturally, the less expensive designs provide less protection. For instance, for very low target growth rates, the country will rarely benefit from reduced coupon payments and the markets will not demand a premium (the premium could even be negative with the country issuing *ex ante* cheaper debt but paying *ex post* higher rates). Naturally, the measurement of GDP and delayed revisions of these statistics by the national agencies can be a stumbling block for introducing GDP-linked bonds. In particular the audit of GDP cannot be under the control of the government making GDP-linked payments. In the EU the presence of independent agencies that report reliable statistics – Eurostat and the ECB – alleviates these concerns.

For sovereign CoCos the par yield is, in general, higher than the risk-free rate. Since the CDS process was calibrated for a period that included the euro-area crisis, Greece has a higher rate than Italy, which has higher rate than Germany. The rate is higher for lower thresholds that are more likely to be breached. Note that for Germany the sovereign CoCo par yield is identical to the risk-free rate, since the probability of German CDS breaching the threshold is virtually zero.

These results provide evidence that there are designs with sufficiently low premiums to make contingent debt attractive for sovereigns. For sovereign CoCos the premium could be zero *ex ante* for safe countries, which this is encouraging for the prospect of countries adopting it. GDP-linked bonds, as equity-like instruments, carry a GDP volatility premium that no country can avoid.

[7] Drawing on results from Consiglio and Zenios (2018) and Consiglio *et al*, 2016).

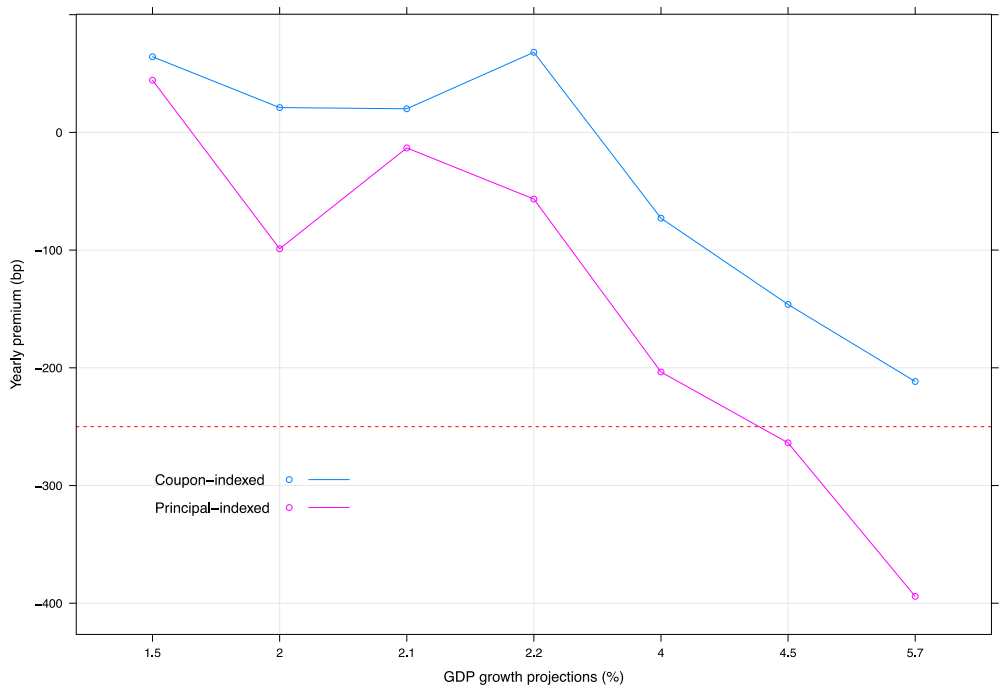
Box 2: Pricing and the risk premium for GDP-linked bonds and Sovereign CoCos

Risk premium estimation for UK and the USA

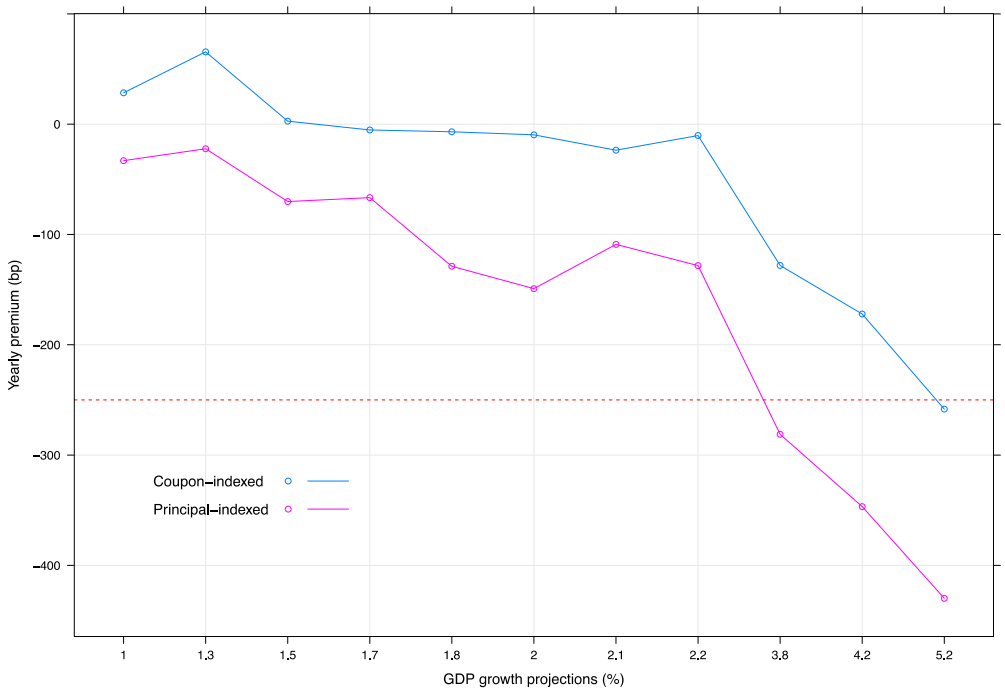
(Consiglio and Zenios, 2018)

(The authors use negative premium for bonds sold at a discount, which are then more expensive for sovereigns. For positive premium the bonds are sold above par and the sovereign benefits in today's price in expectation of higher future payments.)

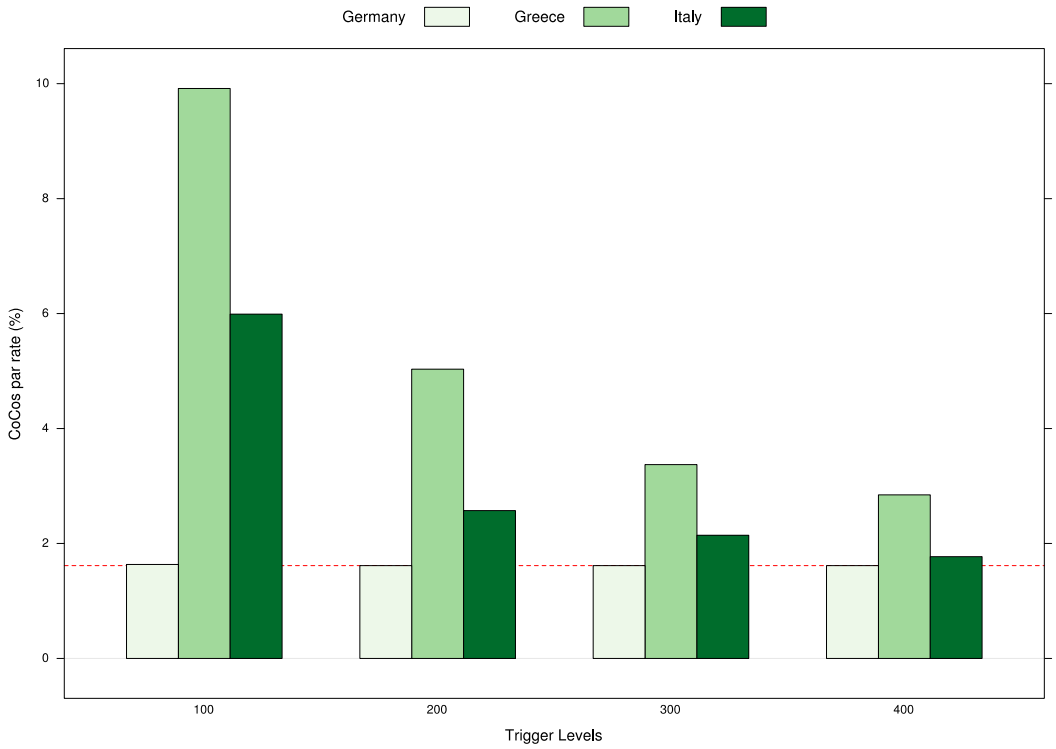
UK



USA



Par pricing of euro-area sovereign CoCo for different trigger thresholds
(Consiglio, 2016)
(Horizontal line is the calibration risk free rate for the German bund.)



5.2 First mover and a role for European Monetary Fund

Currently, the ESM provides funding to euro-area countries when they lose market access. It raises capital from the markets, borrowing at lower rates since it is capitalised by all euro-area countries, and lends to a programme country at a small spread to cover its costs. The principle of solidarity applies, but not of actuarial fairness. The programme country pays lower rates than if it were funded on its own from the market. Since all ESM costs are covered there is no direct transfer, but we have risk sharing of the programme country with the ESM shareholders. They ultimately suffer losses if a programme country were to default, but otherwise there are no transfers. Conditionality attached to such lending is designed to maximise the probability of full recovery.

The ESM, or possibly a future European Monetary Fund (EMF), could make the first move for state contingent instruments without altering the degree of risk sharing it exercises today. It will introduce risk sharing with the markets, without increasing risk sharing among ESM member states.

The EMF could test the waters and raise capital by issuing GDP-linked bonds, linked to euro-area GDP growth. By linking to a pooled GDP, the volatility of business cycles is reduced, thereby reducing the risk premium. The premium will still pass on to the programme country as part of the EMF borrowing rates, but now the programme country stands to benefit during recessions as we described earlier, and pays higher rates during an upswing. A potential problem is what to do if the programme country cycle is out of sync with the rest of the euro area. For instance, the start of Greece's downturn was synchronised with the rest of the euro area at the start of the crisis, but it has been much prolonged and much deeper and has not kept up with the euro-area recovery. In such situations a formula can be worked out whereby the programme country pays according to its own GDP growth during a downturn

but pays above its own GDP growth during the upturn to make up for the losses. The sustainability principle will apply during the recession, and the actuarial fairness principle will be restored during upswings. Such an arrangement does not entail, in the long run, more risk sharing than ESM provides right now when it borrows with the collective security of its shared capital at lower rates and passes its costs to the programme countries. However, objections could be raised even for actuarial fairness in the long run as creditor countries might demand that actuarial fairness is always binding. In this eventuality, the programme country can be charged the average borrowing rate, which is the rate corresponding to the expected euro-area growth of the GDP-linked bond, plus costs.

To summarise:

It is possible to design EMF GDP-linked bonds to overcome coordination problems and kick-start a market, without additional risk sharing among euro-area countries.

S-CoCos could be the instrument to implement maturity extension for countries entering an ESM programme[8]. If this extension policy is adopted, the ESM could request all countries covered by its mandate to issue S-CoCos, and this would promote these instruments in the euro area.

There are potential problems with automatic extensions, such as the risk of 'bear raids', and market signals are not fool-proof. Hart and Zingales (2011) argue for the role of a regulator to mediate the automatic triggering of bank contingent debt. In the case of euro-area sovereigns, the EMF could play this role. If the threshold is breached, the ESM will carry out a debt sustainability analysis, as already prescribed in ESM Treaty Article 13 1.b. If the analysis determines that debt is sustainable, and the breach is not justified, the EMF would not activate the standstill and would commit some resources to prove its confidence in the sovereign. This would reassure the markets. The commitment should be unconditional and *pari passu* with existing financial debt to avoid EMF forbearance. The interest rate on the committed financing should be lower than the prevailing financing rates for the sovereign, but not much lower, so the sovereign has an incentive to correct any imbalances and benefit from re-accessing the market at lower rates.

If the analysis determines that the breach is justified, the standstill will be activated and the country will enter an adjustment programme with EMF seniority funding under strict conditionality. This staged approach is automatically triggered avoiding delays, which is one of the justifications for S-CoCos. It avoids bear raids since the EMF sustainability analysis and commitment to funding could reduce spreads and impose losses on the raiders. It is also consistent with the policy suggestions for risk sharing between ESM and the markets. Since the official sector does not need to pay-out existing bond holders, it can support a more gradual economic adjustment path. Finally, we do not preclude additional measures (eg a haircut) at the end of the grace period in the case of insolvency. However, because of the automatic standstill, more private creditors will be available and any haircut burden will be carried by more shoulders.

[8] As discussed, for example, by former German Minister of Finance Wolfgang Schäuble, and the German Council of Economic Experts (Andritzky *et al*, 2016). Buchheit *et al* (2013) also suggested modifications to the ESM treaty to make debt restructuring a pre-condition for assistance.

6 Conclusions

Sovereign contingent debt is a financial innovation with the potential to strengthen the financial system. It is not without challenges, and, following the lead of G20, the debate to understand potential pitfalls is ongoing in international organisations and central banks. We have argued that sovereign contingent debt can provide insurance for euro-area countries against future debt crises. It loosens the bank-sovereign doom loop from the sovereign's side, complementing existing and proposed policies for loosening the loop from the banks' side. Current institutional arrangements – ESM or a future EMF – could benefit from the introduction of sovereign CoCos with a potential payment standstill or maturity extension, and could play a catalytic role in launching GDP-linked bonds. Simple simulations have shown that the potential for insurance protection is significant, but we have also discussed the major challenges that lie ahead.

Our discussion adds the notion of risk-sharing with the markets to the Franco-German debate on risk-sharing among states versus system-wide risk-reduction. This is a constructive way to move the debate forward, since risk-sharing with the market implies system-wide risk reduction. This is a financial innovation solution to the debate, and it is a practical euro-area reform that does not require major institutional reforms or Treaty changes. However, coordination is needed, as would be an amendment to the ESM (or possibly future EMF) mandate.

Three conclusions are drawn from our analysis.

First, the potential of these instruments will materialise only if they capture a significant share of the sovereign debt market. They do not have to replace all sovereign debt. Actually a diversity of instruments is key for broadening the investor base and building the resilience of the system. But sovereign contingent debt instruments cannot be relegated, as they have been so far, to a few boutique issues in the context of debt restructuring.

Second, and following on from the above, is the need for coordination. This would overcome first-mover disadvantage, encourage the development of standardised products and pricing models, and create liquid markets with depth. Coordination does not imply risk sharing between countries. Every country pays premiums commensurate with its own risks and risk-sharing is **only** with the markets. The benefits for the euro area speak in favour of potential coordination, and institutional arrangements are in place to facilitate the process.

Finally, a significant open question is the treatment of these instruments by the regulators. Will they be considered as eligible Tier I capital? To the extent that the designs guarantee capital at maturity, then they should receive the same regulatory treatment as standard sovereign debt. The premium received by a bank buying these instruments could provide guidance for incremental capital requirements.

References

Andritzky, J., Feld, L., Schmidt, C., Schnabel, I., & Wieland, V. (2016) 'Creditor participation clauses: Making orderly sovereign debt restructuring feasible in the Eurozone', www.voxeu.org, 21 July

Benford, J., Ostry, J., & and Shiller, R. (2018) *Sovereign GDP-Linked Bonds: Rationale and Design.* London: CEPR Press

Borensztein, E., & Mauro, P. (2004) 'The case for GDP-indexed bonds', *Economic Policy*, April: 165-216

Brooke, M., Menses, R., Pienkowski, A., & Santor, E. (2013) *Sovereign default and state-contingent debt.* London: Bank of England

Buchheit, L. (2011) 'Six Lessons From Prior Sovereign Debt Restructurings', paper prepared for *Resolving the European Debt Crisis*, a Peterson Institute for International Economics and Bruegel conference, 13-14 September, Chantilly, France

Buchheit, L., Gelpern, A., Gulati, M., Panizza, U., di Mauro, B., & Zettelmeyer, J. (2013) *Revisiting Sovereign Bankruptcy.* Washington DC: Committee on International Economic Policy and Reform, Brookings

Consiglio, A., & Zenios, S. (2015) *The Case for Contingent Convertible Debt for Sovereigns.* Philadelphia: The Wharton Financial Institutions Center, University of Pennsylvania

Consiglio, A., & Zenios, S. (2018) 'Pricing and hedging GDP-linked bonds in incomplete markets', *Journal of Economic Dynamics and Control* vol 88, March

Consiglio, A., Tumminello, M., & Zenios, S. (2016) *Pricing Sovereign Contingent Convertible Debt,* The Wharton Financial Institutions Center. Philadelphia: University of Pennsylvania

Gennaioli, N., Shleifer, A., & Vishny, R. (2012) 'Neglected risks, financial innovation, and financial fragility', *Journal of Financial Economics* 104(3): 452-468

Hart, O., & Zingales, L. (2011) 'A New Capital Regulation for Large Financial Institutions', *American Law and Economics Review*, 13(2): 453-490

IMF (2017) *State-contingent debt instruments for sovereigns*, Washington DC: International Monetary Fund

Kamstra, M., & Shiller, R. (2009) *The case for trills: Giving the people and their pension funds a stake in the wealth of the nation,* Cowles Foundation for Research in Economics, New Haven: Yale University

Mody, A. (2014) 'Making Argentina's Debt Debacle a Rarity', *Bruegel Blog*, 29 October, available at http://bruegel.org/2014/10/making-argentinas-debt-debacle-a-rarity/

Pisany-Ferry, J. (2016) 'The Eurozone's Zeno paradox and how to solve it', www.voxeu.org, 10 April

Reinhart, C., & Rogoff, K. (2009) *This Time Is Different: Eight Centuries of Financial Folly*, Princeton: Princeton University Press.

Véron, N. (2017) 'Sovereign Concentration Charges: A New Regime for Banks' Sovereign Exposures', *Bruegel Blog*, 17 November, available at http://bruegel.org/2017/11/sovereign-concentration-charges-a-new-regime-for-banks-sovereign-exposures/

Zenios, S. (2013) 'The Cyprus debt: Perfect crisis and a way forward', *Cyprus Economic Policy Review*, 7(1): 3-45

Annex: Table 5: Fiscal space created for EU28 countries during 2002-2017 using GDP-linked bonds

	2002S2	2003S1	2003S2	2004S1	2004S2	2005S1	2005S2	2006S1	2006S2	2007S1	2007S2	2008S1	2008S2	2009S2	2010S1	2010S2	2011S1	2011S2	2012S1	2012S2	2013S1	2013S2	2014S1	2014S2	2015S1	2015S2	2016S1	2016S2	2017S1
EU (28 countries)	-0.41%	-0.25%	-0.40%	-0.86%	-0.56%	-0.48%	-0.88%	-1.16%	-1.05%	-1.02%	-0.87%	-0.48%	0.93%	1.00%	-1.08%	-0.89%	-0.90%	-0.13%	0.48%	0.32%	0.25%	-0.42%	-0.73%	-0.68%	-0.98%	-0.85%	-0.71%	-0.76%	-0.99%
Eurozone	-0.41%	-0.05%	-0.27%	-0.94%	-0.63%	-0.46%	-0.86%	-1.30%	-1.33%	-1.26%	-0.93%	-0.52%	0.88%	1.00%	-1.30%	-0.94%	-1.08%	-0.10%	0.63%	0.43%	0.45%	-0.35%	-0.69%	-0.56%	-1.01%	-0.87%	-0.76%	-0.87%	-1.11%
Belgium	-1.50%	0.39%	-0.31%	-2.24%	-1.85%	-0.68%	-0.83%	-1.08%	-1.32%	-1.85%	-1.39%	-0.74%	1.23%	-0.94%	-1.69%	-1.00%	-1.05%	-0.37%	0.06%	0.35%	0.39%	-0.51%	-0.69%	-0.39%	-0.77%	-0.43%	-0.70%	-0.63%	-0.81%
Bulgaria	-0.92%	-0.68%	-0.61%	-0.80%	-0.89%	-0.77%	-0.53%	-0.49%	-0.60%	-0.54%	-0.44%	-0.37%	-0.21%	0.41%	0.18%	-0.02%	-0.05%	0.10%	0.20%	0.28%	0.22%	0.11%	0.13%	0.08%	-0.19%	-0.27%	-0.33%	-0.26%	-0.24%
Czech Republic	-0.01%	-0.25%	-0.39%	-0.46%	-0.67%	-0.92%	-0.91%	-1.03%	-0.99%	-0.76%	-0.73%	-0.41%	0.18%	1.09%	-0.16%	-0.30%	-0.19%	0.21%	0.64%	0.91%	0.93%	0.26%	-0.18%	-0.59%	-1.23%	-1.00%	-0.32%	0.02%	-0.77%
Denmark	0.14%	0.02%	-0.20%	-0.88%	-0.80%	-0.57%	-0.58%	-0.96%	-0.72%	-0.02%	-0.21%	-0.18%	0.52%	0.93%	-0.34%	-0.90%	-0.62%	0.10%	0.03%	-0.10%	-0.12%	-0.37%	-0.25%	-0.64%	-0.65%	-0.06%	-0.37%	-0.61%	-0.53%
Germany	-0.08%	0.46%	0.20%	-0.36%	0.06%	0.02%	-0.55%	-1.20%	-1.55%	-1.22%	-0.81%	-0.68%	0.67%	1.51%	-2.06%	-1.60%	-1.81%	-0.85%	-0.12%	-0.07%	0.13%	-0.54%	-0.88%	-0.51%	-0.49%	-0.53%	-0.66%	-0.63%	-0.79%
Estonia	-0.08%	-0.09%	-0.07%	-0.06%	-0.06%	-0.06%	-0.08%	-0.08%	-0.08%	-0.06%	-0.01%	0.04%	0.06%	0.04%	0.04%	-0.05%	-0.08%	-0.07%	-0.04%	-0.02%	0.00%	0.00%	-0.01%	-0.01%	0.00%	0.01%	0.01%	-0.01%	-0.02%
Ireland	-0.95%	0.11%	-0.38%	-1.28%	-0.55%	-0.67%	-0.73%	-0.56%	-0.54%	-0.79%	-0.14%	1.13%	1.32%	2.03%	0.42%	-0.64%	-0.53%	0.25%	1.01%	0.84%	1.31%	-1.24%	-3.27%	-2.16%	-1.26%	-1.16%	-0.72%	-1.59%	-1.34%
Greece	-2.19%	-3.52%	-3.41%	-3.38%	-2.31%	0.07%	-1.73%	-4.53%	-3.37%	-2.51%	-1.78%	-0.52%	0.50%	-1.46%	3.39%	4.81%	5.40%	3.96%	2.31%	1.88%	0.93%	0.25%	-0.56%	-0.45%	-0.22%	0.18%	-0.03%	-0.25%	-0.46%
Spain	-0.55%	-0.81%	-0.79%	-0.71%	-0.76%	-0.84%	-0.89%	-0.95%	-0.92%	-0.84%	-0.71%	-0.42%	0.42%	1.21%	0.04%	0.09%	0.59%	0.97%	1.47%	1.73%	1.24%	0.39%	-0.14%	-0.84%	-1.41%	-1.63%	-1.38%	-1.21%	-1.29%
France	-0.29%	-0.08%	-0.37%	-1.07%	-0.87%	-0.48%	-0.57%	-1.05%	-0.85%	-0.84%	-0.84%	-0.23%	0.79%	0.33%	-0.95%	-0.97%	-1.23%	-0.47%	0.14%	0.05%	-0.09%	-0.43%	-0.34%	-0.47%	-0.42%	-0.33%	-0.63%	-0.34%	-0.86%
Croatia	-1.31%	-1.40%	-0.88%	-0.76%	-0.80%	-0.83%	-1.08%	-0.96%	-0.94%	-1.38%	-0.62%	-0.48%	-0.01%	1.11%	0.42%	0.21%	0.14%	0.20%	0.94%	0.85%	-0.04%	0.39%	0.32%	-0.10%	-0.74%	-1.03%	-0.85%	-1.21%	-1.31%
Italy	-1.19%	-0.43%	-0.54%	-1.60%	-1.06%	-0.77%	-1.69%	-1.69%	-1.68%	-1.71%	-0.47%	-0.91%	1.98%	-0.61%	-1.72%	-1.83%	-1.61%	0.83%	1.11%	1.08%	0.66%	-0.48%	-0.94%	-0.55%	-1.43%	-1.25%	-1.51%	-1.14%	-1.94%
Cyprus	-0.46%	-0.40%	-0.97%	-1.54%	-1.37%	-1.07%	-1.15%	-1.46%	-1.29%	-1.25%	-1.51%	-1.07%	-0.49%	0.83%	-0.29%	-0.47%	-0.14%	0.49%	0.89%	1.80%	1.49%	1.57%	0.56%	0.31%	-0.31%	-0.67%	-0.57%	-0.84%	-0.94%
Latvia	-0.47%	-0.57%	-0.52%	-0.47%	-0.49%	-0.55%	-0.81%	-0.65%	-0.53%	-0.53%	-0.24%	0.09%	0.41%	0.53%	0.46%	0.19%	-0.22%	-0.60%	-0.29%	-0.09%	-0.19%	-0.08%	-0.01%	0.12%	-0.10%	-0.15%	0.26%	0.16%	-0.67%
Lithuania	-0.56%	-1.07%	-1.04%	-0.62%	-0.39%	-0.60%	-0.83%	-0.67%	-0.61%	-1.06%	-1.07%	-0.34%	0.40%	1.25%	0.40%	-0.23%	-0.97%	-0.83%	-0.13%	-0.54%	-0.31%	-0.17%	-0.53%	0.00%	0.21%	0.02%	0.14%	-0.07%	-0.52%
Luxembourg	-0.02%	0.04%	-0.02%	-0.02%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	0.00%	0.00%	0.09%	0.14%	-0.22%	-0.25%	-0.09%	0.02%	0.28%	0.22%	-0.20%	-0.24%	-0.26%	-0.58%	-0.31%	0.17%	0.05%	-0.30%	-0.13%
Hungary	-1.15%	-0.87%	-1.23%	-1.62%	-1.48%	-1.49%	-1.57%	-1.53%	-1.25%	0.18%	0.29%	-0.75%	1.02%	2.01%	-0.31%	-0.12%	-0.57%	-0.26%	1.27%	0.81%	-0.54%	-1.30%	-1.83%	-1.29%	-1.29%	-1.05%	-0.44%	-0.82%	-1.68%
Malta	0.11%	0.26%	-0.76%	1.63%	0.15%	-1.05%	0.55%	0.22%	0.21%	-1.25%	-0.35%	-0.50%	-0.49%	0.89%	-1.03%	-0.54%	0.32%	0.63%	-0.10%	-0.65%	-1.47%	-0.84%	-2.96%	-2.90%	-1.90%	-2.29%	-1.24%	-1.51%	-2.13%
Netherlands	0.06%	-0.07%	0.06%	-0.51%	-0.56%	-0.31%	-0.94%	-1.14%	-0.91%	-0.93%	-1.07%	-0.75%	0.15%	0.95%	-0.52%	-0.53%	-0.90%	0.00%	0.59%	0.51%	0.39%	-0.31%	-0.39%	-0.58%	-1.02%	-0.54%	-0.55%	-0.94%	-1.09%
Austria	-0.42%	-0.08%	-0.29%	-1.04%	-0.77%	-0.66%	-0.95%	-1.40%	-1.48%	-1.60%	-1.23%	-0.74%	0.89%	0.49%	-0.51%	-1.30%	-1.75%	-0.40%	-0.13%	0.00%	0.61%	-0.29%	-0.34%	-0.09%	-0.30%	-0.43%	-0.53%	-0.45%	-1.39%
Poland	1.75%	0.76%	0.80%	0.86%	0.86%	-0.24%	-0.60%	-1.02%	-1.40%	-1.57%	-1.28%	-0.79%	0.14%	-0.28%	-0.19%	-0.75%	-1.00%	-0.84%	0.03%	0.83%	0.59%	0.06%	-0.26%	-0.30%	-0.39%	-0.50%	-0.08%	-0.10%	-0.76%
Portugal	0.26%	0.38%	-0.37%	-1.03%	-0.68%	-0.54%	-0.44%	-0.72%	-1.15%	-1.16%	-1.31%	-0.62%	0.35%	-0.27%	-1.86%	-0.85%	0.64%	1.14%	1.36%	1.77%	0.38%	-0.92%	-0.65%	-0.74%	-1.37%	-1.06%	-0.78%	-1.59%	-1.97%
Romania	-0.20%	-0.22%	-0.21%	-0.32%	-0.43%	-0.14%	-0.05%	-0.20%	-0.18%	-0.17%	-0.17%	-0.30%	-0.19%	0.89%	0.32%	0.45%	0.29%	0.16%	0.26%	0.48%	0.05%	-0.46%	-0.11%	-0.12%	-0.33%	-0.33%	-0.56%	-0.45%	-0.83%
Slovenia	-0.58%	-0.32%	-0.31%	-0.51%	-0.59%	-0.69%	-0.72%	-0.85%	-1.14%	-1.28%	-0.94%	-0.76%	0.15%	1.37%	-0.03%	-0.38%	-0.33%	0.49%	0.98%	1.36%	1.09%	-0.10%	-1.15%	-0.79%	-0.55%	-0.34%	-0.87%	-1.83%	-2.15%
Finland	-0.42%	-0.26%	-0.75%	-1.02%	-1.06%	-0.79%	-0.43%	-0.99%	-1.03%	-1.08%	-1.26%	-0.42%	0.42%	1.00%	-0.92%	-1.10%	-0.94%	-0.34%	0.45%	0.89%	0.49%	-0.06%	0.42%	0.29%	0.10%	0.04%	-0.61%	-0.79%	-1.17%
Sweden	-0.26%	-0.39%	-0.50%	-0.89%	-0.85%	-0.40%	-0.57%	-1.17%	-1.13%	-0.62%	-0.53%	0.07%	1.06%	1.01%	-1.04%	-1.47%	-0.60%	0.08%	0.26%	0.28%	0.08%	-0.16%	-0.34%	-0.50%	-0.70%	-1.03%	-0.63%	-0.18%	-0.30%
United Kingdom	-0.42%	-0.55%	-0.61%	-0.51%	-0.22%	-0.40%	-0.88%	-0.69%	-0.13%	-0.34%	-0.65%	-0.25%	1.31%	0.89%	-0.67%	-0.64%	-0.39%	-0.24%	-0.30%	-0.63%	-0.61%	-0.90%	-1.34%	-1.31%	-0.92%	-0.72%	-0.63%	-0.57%	-0.53%

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