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Stabilising market expectations through a market tool: a proposal for an enhanced TPI

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Abstract

This paper puts forward a proposal to complete the ECB Transmission Protection Instrument (TPI) with the aim of making it more effective in anchoring the yields of European sovereign debts to Member States' fundamentals. We use a model in which yields fluctuate within bands, which we specify following two alternative approaches: stochastic and deterministic. The resulting fluctuation's interval represents the range of yields that can be seen as justified by Member States' fundamentals; yields outside the band would instead trigger the ECB intervention as foreseen by the TPI. The proposal minimizes the risk of moral hazard, as the fluctuation bands vary as each country's creditworthiness changes. Moreover, the proposal is directly implementable with existing Treaties.

Keywords TPI · European debt agency · Safe asset · Eurobonds · Public debt · Financial stability

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1 Introduction

In July 2022 the European Central Bank introduced the TPI, the Transmission Protection Instrument (ECB 2022a). The TPI is meant to avoid the fragmentation of eurozone sovereign debt markets, as the ECB commits to intervene to curb fluctuations in yields not justified by fundamentals; this intervention is conditional on the compliance of the Member States (MS) to the existing rules and commitment to sound macroeconomic policies.

This paper proposes a tool intended to give operational guidance to the European Central Bank in using the TPI, by determining an interval of yields that could be considered as "normal" as justified by the fundamentals of Member States. Such a tool would:

1. Replace structurally the ECB's emergency interventions, as they have developed since 2015
2. Allow the ECB to implement a forward guidance strategy, which could reduce the need of an actual intervention on the markets

As the ECB engaged in the normalization of monetary policy after a decade of emergency interventions, the TPI was explicitly intended to counter the formation of multiple (bad) equilibria, due to self-fulfilling expectations not in line with MSs' fundamentals. As we can read in the press release of July 2022 (ECB 2022a), "subject to fulfilling established criteria, the Eurosystem will be able to make secondary market purchases of securities issued in jurisdictions experiencing a deterioration in financing conditions not warranted by country-specific fundamentals, to counter risks to the transmission mechanism to the extent necessary. The scale of TPI purchases would depend on the severity of the risks facing monetary policy transmission. Purchases are not restricted ex ante".

While necessary, the latter clause is dangerous: the TPI is introduced in order to preserve "the singleness of the Governing Council's monetary policy", that in turn "is a precondition for the ECB to be able to deliver on its price stability mandate". Nevertheless, using the TPI can in principle get in the way of the ECB mandate if the quantitative dimension of a one-sided intervention leads to a balance sheet size incompatible with the inflation target.[1] Especially in the current situation of price

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[1] High inflation in Europe was not the effect of and not of the size of the central bank's balance sheet, but mainly the result of supply bottlenecks, rising commodity costs, and readjustments of production chains that followed the pandemic and the Russian-Ukrainian conflict. Add to this the need to respond to the tightening of monetary policy in the US. For sure, at a time of restrictive monetary policies, a massive use of the TPI could undermine the ECB's effort to lower inflation if its intervention is not defined within a precise framework, since the risk of a de anchoring of expectations is high. Nevertheless, the tool we are proposing is intended not be used in a massive way, but precisely to govern market expectations, in order for the ECB not to intervene with its balance sheet.

pressures, there is a potential for a goal conflict (between reducing fragmentation and pursuing the statutory mandate of inflation targeting). The emergence of this trade-off is made more probable by the lack of an explicit methodology for determining "excessive yields" that would allow markets to anticipate ECB action. How to avoid this (potentially unmanageable) trade-off?

To identify a suitable methodology, we can refer to the eligibility criteria, that can be summarized as follows: the yield of MSs' bonds should be in line with their fundamentals, which in turn should be compatible with the existing rules. Even if the eligibility to the TPI requires criteria "to be dynamically adjusted to the unfolding risks and conditions to be addressed", these criteria must be safely anchored in a clear benchmark to precisely assess the "deterioration in financing conditions not warranted by country-specific fundamentals".[2] Therefore, this benchmark should provide a target measure for the bonds' yield which must be dynamically in line with each MS's fundamentals, no matter whether from below or above the benchmark. Indeed, as we shall discuss later, even if TPI looks only in the direction of purchase interventions, it is logically compatible with symmetric intervention.[3] The current TPI configuration lacks such a benchmark, and this might make it unusable, or inefficient, in case of need.

The mechanism we propose to determine the benchmark is rooted in the analysis of the problems that, since the introduction of the euro, have emerged in managing Member States' access markets in the institutional context of a single monetary policy, entrusted to the ECB, and fiscal policy that remains entrusted to the Member States.

The paper is structured as follows: the next section will show how recent developments highlight the increased risk of market segmentation and explain why the ECB felt compelled to introduce the TPI. Section 3 re-reads the history of European public debts in light of the safe asset problem. Section 4 presents the technical details of our proposal to modify and enhance the operational modalities of the TPI, while Sect. 5 concludes.

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[2] The criteria set out in the ECB paper (2022a) are 4: "(1) compliance with the EU fiscal framework: not being subject to an Excessive Deficit Procedure (EDP) or not having been judged unable to take effective action in response to an EU Council recommendation under Article 126(7) of the Treaty on the Functioning of the European Union (TFEU); (2) absence of severe macroeconomic imbalances not being subject to an Excessive Imbalance Procedure (EDP) or having been judged unable to take the recommended corrective action in relation to an EU Council recommendation under Article 121(4) TFEU; (3) fiscal sustainability: In ascertaining that the trajectory of government debt is sustainable, the Governing Council will take into account, where available, the debt sustainability analyses of the European Commission, the European Stability Mechanism, the International Monetary Fund and other institutions, together with the ECB's internal analysis; (4) sound and sustainable macroeconomic policies: compliance with the commitments presented in the consolidation and resilience plans for the Consolidation and Resilience Instrument and the European Commission's country-specific recommendations in the fiscal area in the context of the European Semester." Our proposed tool could easily be compliant with these criteria.

[3] One should not forget that during the sovereign debt crisis negative yields for some of the MSs debt was, on top of excessive spreads, a source of instability and distorted incentives.

Table 1 HCIP inflation HICP—monthly data *Source*: Eurostat

Time	2021–12	2022–04	2022–08	2022–09	2022–11
Eurozone	5.0	7.4	9.1	10.0	10.0
Belgium	6.6	9.3	10.5	12.0	10.5
Germany	5.7	7.8	8.8	10.9	11.3
Estonia	12.0	19.1	25.2	24.2	21.4
Ireland	5.7	7.3	9.0	8.6	9.0
Greece	4.4	9.1	11.2	12.1	9.0
Spain	6.6	8.3	10.5	9.3	6.6
France	3.4	5.4	6.6	6.2	7.1
Italy	4.2	6.3	9.1	9.5	12.5
Cyprus	4.8	8.6	9.6	9.0	8.3
Latvia	7.9	13.1	21.4	22.4	21.7
Lithuania	10.7	16.6	21.1	22.5	21.4
Luxembourg	5.4	9.0	8.6	8.8	7.3
Malta	2.6	5.4	7.0	7.3	7.2
Netherlands	6.4	11.2	13.7	17.1	11.2
Austria	3.8	7.1	9.2	11.0	11.1
Portugal	2.8	7.4	9.3	9.8	10.3
Slovenia	5.1	7.4	11.5	10.6	10.8
Slovakia	5.1	10.9	13.4	13.6	15.1
Finland	3.2	5.8	7.9	8.4	9.0

2 The return of sovereign debt markets' segmentation

In the current situation, the introduction of the TPI is dictated by the economic woes of the eurozone due to the growing uncertainty brought about by the Russian-Ukrainian conflict and by the potential for this conflict to spread unchecked (OECD, 2022). The rising cost of energy, and subsequently of energy-intensive products, as well as the redefinition of global value chains and the persistence of supply bottlenecks, have quickly pushed inflation to levels that most European economies did not witness since the late 1980s. Table 1 shows the annual growth of the harmonised consumer price index. It is worth noting that the eurozone doubled its level, estimated at 10% in September, with peaks of over 20% in the Baltic States and 17% in the Netherlands.

The ECB's response to rising prices, as well as to the Fed's hiking of US interest rates, was to raise key interest rates by 250 bps over the course of 2022 (ECB, 2022b). Nevertheless, the rise in European interest rates has been lower than the corresponding rise in American and British interest rates: the Federal Reserve (Fed, 2022) increased by 425 bps and the Bank of England (BoE, 2022) by 325 bps. On the other hand, in December 2022 the ECB controversially announced that tightening would continue until the summer of 2023, in spite of easing inflationary pressures (especially on energy markets). Restrictive policies came on top of increased geopolitical and economic uncertainty and contribute to explain the

Table 2 Debt-to-GDP ratio of eurozone countries and their variation (2019–2021) *Source*: Eurostat

Time	2019	2020	2021	Δ
Euro area	83.8	97.2	95.6	11.8
Belgium	97.7	112.8	108.2	10.5
Germany	58.9	68.7	69.3	11.3
Estonia	8.6	19.0	18.1	9.5
Ireland	57.2	58.4	56.0	− 1.2
Greece	180.7	206.3	193.3	12.6
Spain	98.3	120.0	118.4	20.1
France	97.4	114.6	112.9	15.5
Italy	134.1	155.3	150.8	16.7
Cyprus	91.1	115.0	103.6	12.5
Latvia	36.7	43.3	44.8	8.1
Lithuania	35.9	46.6	44.3	8.4
Luxembourg	22.3	24.8	24.4	2.1
Netherlands	48.5	54.3	52.1	3.6
Austria	70.6	83.3	82.8	12.2
Portugal	116.6	135.2	127.4	10.8
Slovenia	65.6	79.8	74.7	9.1
Finland	59.6	69.0	65.8	6.2
Slovakia	48.1	59.7	63.1	15.0
Malta	40.7	53.4	57.0	16.3

reduction of the estimated growth from 3.4% in 2022 to 0.5% in 2023 (European Central Bank ECB, 2022).

In an environment of low growth and high(er) interest rates, the burden of sovereign debt may be difficult to bear. Table 2 shows the debt-to-GDP ratio of eurozone countries at the end of 2021. It shows that there is a group of countries with values above 100 per cent (Belgium, Greece, Cyprus, Italy, France, Spain and Portugal), flanked by another with values below 70 per cent (Germany, Estonia, Ireland, Latvia, Luxembourg, the Netherlands, Finland, Slovakia and Malta) and only a few countries with values in between (Austria and Slovenia). This leads to a polarisation effect affecting the singleness of European monetary policy.

Before the pandemic, only three countries (Greece, Italy and Portugal) showed a debt of more than 100%. The post-pandemic environment greatly reduces the degrees of freedom of economic policy and the risk of the eurozone experiencing stagflation is high. The trade-offs for policy makers are therefore multiple.

First, the eurozone recovery depends on the ability of Member States to implement expansionary fiscal policies, which, however, would be hardly sustainable by the group of high debt countries in a scenario where the cost of servicing debt (r) may become higher than the growth rate of the economy (g) in the next years.

Secondly, the divergence of debt levels between the two groups of countries, and the ensuing growing risk of moral hazard, makes it even less likely the creation of a European fiscal capacity (Buti & Messori, 2022), which would be entitled to make fiscal transfers but would imply a mutualisation of risks. The issuing of Eurobonds

is certainly not taboo for the European Commission. Eurobonds have been used in multiple emergency situations since 1973 (Horn et al., 2020), in particular, in terms of size, with the Next Generation EU program, which required the issuance of EUR 144.75 billion since 2021 out of €750 billion total amount. (European Commission, 2022). Nevertheless, the prospect of issuing Eurobonds based on a common, large-scale taxation in non-emergency contexts does not seem plausible at the moment.

Thirdly, the option of simply letting inflation run free to reduce the debt service burden could also clash with the stability goal, given the obvious possible redistributive effects of inflation.

In conclusion, the combination of high (and heterogeneous) debt level, of inflationary pressures, a more uncertain macroeconomic and geopolitical environment, and more restrictive monetary policies, might in the near future build up pressure on eurozone sovereign debt, creating the risk of segmentation that was hidden in the recent past by the ECB activism. The issue of providing safe assets to markets and of ensuring the stability of the financial system will come, once again to the fore.

However, the lack of a common European debt makes two problems endemic to the eurozone difficult to solve: the scarcity of safe assets in the European financial system (Golec & Perotti, 2017; etc.) and the doom loop mechanism (Alogoskoufis et al. 2020; etc.). In order to solve these intricate economic policy problems, we believe that a first best solution would be provided by the creation of a European debt agency (EDA), as proposed by Amato et al (2021), Amato et al (2022) and Amato and Saraceno (2022). The EDA has the potential to reduce the cost of refinancing member countries in a non-mutualistic way, while producing the quantity of safe European assets that can meet demand and eliminate the 'doom loop' mechanism at its root. EDA's main objective is, in fact, to align the cost of public debts with their credit risk, filtering out all other types of risk, but at the same time maintaining only that part of market fragmentation that is justified by differences in fundamentals.

As the EDA is a structural solution, whose implementation, while not requiring a treaty change, would take time, we believe that the EDA framework could provide the TPI with an indication of the benchmark, as well as relative bandwidths around it, that could guide ECB's selling and purchasing activity in secondary markets. A TPI with a safe benchmark based on the EDA logic could be a first step towards the creation of a Eurobond.

3 A short history of the European safe asset

Within the financial system, the public debt of advanced countries performs the essential function of a 'safe asset'. Gorton (2017, p. 1) synthesizes the characteristics and functions of this type of asset quite effectively:

> *A "safe asset" is an asset that is (almost always) valued at face value without expensive and prolonged analysis. That is, by design there is no benefit to producing (private) information about its value. And this is common knowledge. Consequently, agents need not fear adverse selection when buying or selling*

safe assets. Safe assets can easily be used to exchange for goods or services or to exchange for another asset. […] Short-term safe assets are money or money-like. A long-term safe asset can store value over time or be used as collateral. Human history can be written in terms of the search for and production of safe assets.

Indeed, Gorton's definition does not discriminate according to the nature of the issuer, but only on the basis of performance: safe is an asset with respect to which, 'almost always', expectations about its value are stable. But this characteristic has historically been a prerogative of the debts of public issuers, explainable by their specific resilience and by their perpetual nature (see Amato & Saraceno, 2022).

the most prevalent, privately-produced short-term safe assets— bank debt, are subject to runs and this has important implications for macroeconomics and for monetary policy.

Said differently, the concept of safety is highly endogenous, and financial history has extensively shown how even assets regarded as 'safe' in normal times changed in nature as a result of shocks of various kinds, and in particular as a consequence of systemic shocks.

To determine a safety threshold, Golec and Perotti, (2017) introduce a finer classification, distinguishing between 'safe assets' and 'quasi-safe assets'. By the former, we must mean assets issued or guaranteed by governments that are considered very stable. In this perspective, the notion of stability is quite specific: it concerns the governments' ability to meet their financial obligations even in the presence of systemic crises. By the latter, i.e., assets issued by private economic agents (bank and market intermediaries), we must instead understand assets that have a high probability of fulfilling their financial obligations, but are just as likely *not to do so* when systemic events occur. But this boils down to saying that "quasi" is never enough, and quasi safe assets are not safe at all. Gorton et al., (2012) showed that in the United States, the share of the combined sum of 'safe' and 'quasi-safe' assets to GDP has remained essentially stable over time and roughly equal to 33%. Considering OECD countries, Barro et al., (2022) quantify this sum as 37% of total financial assets, and interpret the raise of public safe assets during turmoil as a crowding out of private safe assets.

Determining the share of safe assets in a financial system is crucial for identifying its degree of efficiency. Indeed, safe assets are used daily as collateral by financial players, serve to balance the level of risk of a wide range of institutional players, are used as benchmarks to price riskier assets, and finally they play a crucial role in the implementation of monetary policy.

Turning to the euro area, a glance at its history shows that the share of safe assets in GDP has practically halved over the last twenty years, with an accelerated decline since the sovereign debt crisis. If we define as "safe" all assets all public assets rated triple A,[4] Table 3 shows how their share of total debt decreased over time.

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[4] Although from a practical and regulatory point of view even public assets rated double A can be considered as high-quality liquid assets, the probability of these assets to jump from double A to triple BBB

Table 3 Share of assets on outstanding debt

Rating	Share 2021 (%)	Share 2020 (%)	Share 2019 (%)
AAA	25	25	24
AA	34	32	32
A	13	15	15
BBB	25	25	26
BB	3	3	3
Total	100	100	100
	2012 (%)	2007 (%)	2002 (%)
AAA	54	61	54
AA	5	34	43
A	23	5	3
BBB	12	0	0
BB	3	0	0
B	0	0	0
CCC	3	0	0
Total	100	100	100

At the end of 2002, the share of safe assets in the European sovereign debt market was about 54% of outstanding public debt, accounting for about 37% of euro area GDP, well above that of other advanced economic areas.

Although the differences among eurozone economies were still marked, financial markets were confident that the convergence process among European economies was on a stable path. The large current account imbalances between countries, instead of causing great concern, were rather seen as an accelerator of this convergence dynamics. The underlying idea was that financial markets would efficiently transfer private resources from economies with high capital stock to economies with low capital stock and thus characterised by higher marginal returns, as 'a physiological effect' of a catching-up process (Blanchard & Giavazzi, 2002; Giavazzi & Spaventa, 2010). The building up of imbalances (mostly external debt), according to this interpretation, was "benign" and bound to be reabsorbed at a later stage.

However, against the theoretical prediction, instead of focusing on financing productive investments, financial markets in those years channelled resources towards unproductive fiscal spending, real estate bubbles and private consumption. This was mainly due to inadequate macroprudential policies and insufficiently counter-cyclical fiscal stances (Lane, 2012). On the one hand, there were no effective mechanisms to limit the growth of private debts in countries such as Spain and Ireland. On the other hand, market discipline proved ineffective in correcting these imbalances (Manganelli & Wolswijk, 2009), narrowing spreads excessively in the first phase, so

Footnote 4 (continued)

rating is not zero. This would result in higher debt financing costs that could push a country into a bad equilibrium.

much so that by 2007 the share of AAA-rated public assets had even increased to 61 percent of outstanding debt, or about 41 percent of euro area GDP.

The financial crisis of 2007–09 did not immediately impact the public debt market of the euro area countries. This was due to the fact that the most vulnerable economies (Spain and Ireland) did not exhibit high indebtedness levels. As Lane (2012) notes, the biggest problems in this context concerned the banking system, which, to obtain liquidity from the central bank, fed the demand for national public debts to use them as collateral. This exacerbated the phenomenon of the 'doom loop', i.e., the overexposure of a national banking system to its public debt, with all the pro-cyclical effects that this entails (e.g. Mody & Sandri, 2012; Alogoskoufis et al., 2020).

In order to alleviate these problems, the ECB decided to enlarge the pool of collaterals that could be used in refinancing operations, in order to 1) fully accommodate liquidity requests from banking system at fixed interest rate, 2) expand provision of liquidity in foreign currencies, 3) lengthen maturities for liquidity granted to banks and 4) implement outright purchases of euro-denominated covered bonds issued in the eurozone. In this context, the outbreak of the Greek scandal acted as a detonator accelerating the fleeing of private capital from the periphery to the core countries. Fears of a eurozone break-up led to a sharp widening of the spread between the debt yields of the so-called PIIGS countries (Portugal, Ireland, Italy, Greece and Spain) and those of the German bund (Fig. 1 a).

And even in this case, market discipline proved anything but rigorous, with an abrupt shift from a systematic underestimation of risks to an erratic overestimation thereof. Amato et al., (2022) show the extent of market over (or under) estimation of country risk. Figure 1.b shows how markets systematically mispriced the debt of EMU peripheral countries in good as well as in bad times. Just as the convergence of spreads preceding the Great Financial Crisis and the sovereign debt crisis was not justified by economic fundamentals, neither was the divergence after 2009. The markets overreacted to the emergence of idiosyncratic risk (e.g. Favero, 2013; Favero & Missale, 2012; Paniagua et al., 2017), which was only finally alleviated with ECB President Mario Draghi's speech on 23 July 2012, which paved the way for systematic ECB intervention in the financial markets of eurozone sovereign debt.

The austerity policies jointly imposed on several countries in the eurozone periphery during a period characterized by negative output gap and secular stagnation (De Grauwe and Ji, 2013; Summers, 2014), as well as the inability of financial markets to align yields with credit risk, caused the European economy to enter a long period of stagnation, which threatened to characterize it structurally. The ECB's response has been to use a vast armamentarium of unconventional monetary policy instruments. In early 2015, the ECB implemented an expansion of its asset purchase program. To complements the asset-backed securities and covered bond purchase programs that were launched in September 2014, the ECB introduced a public sector securities purchase program (PSPP).

The sovereign debt crisis showed how fragile the European institutional architecture was and how the transition from a good to a bad equilibrium can be determined by a sudden change in market sentiment unjustified by fundamentals (e.g. De Grauwe and Ji, 2013). The graph above shows that while the average portfolio does
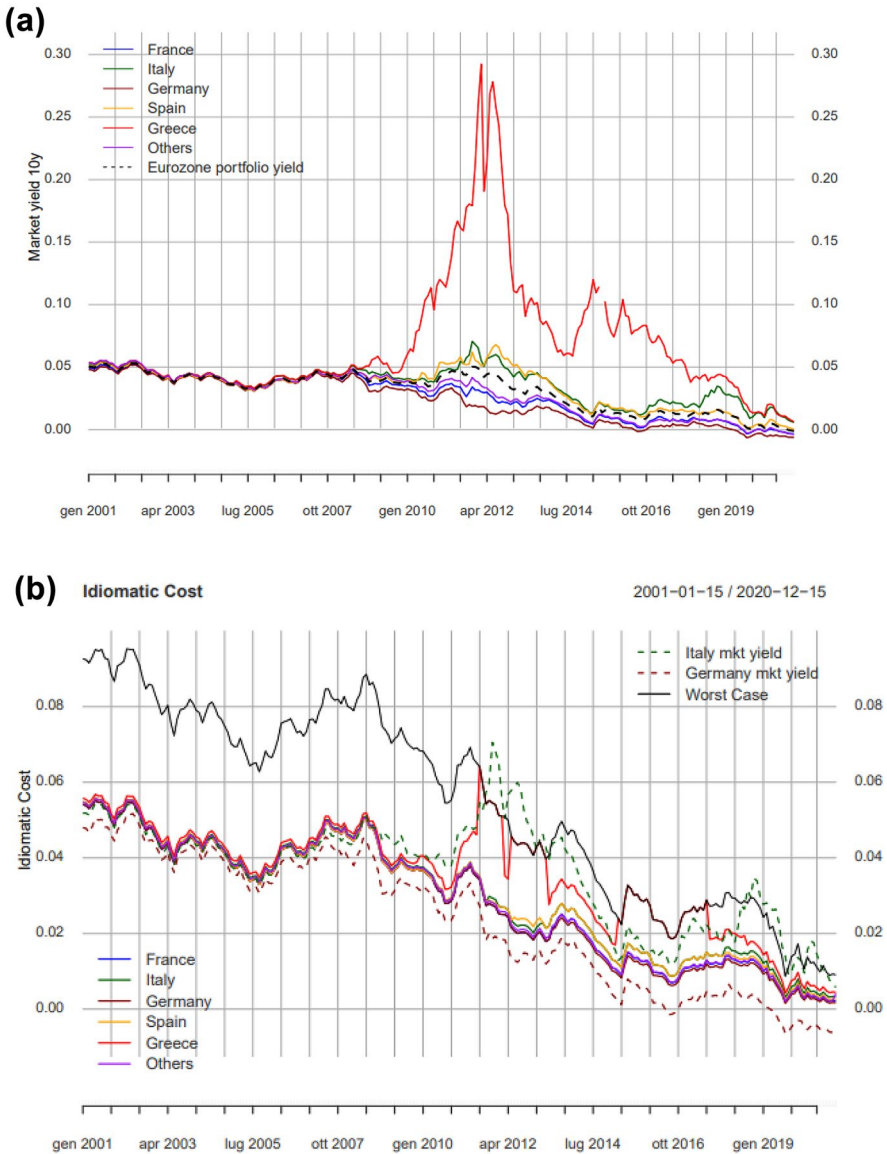
(a)

(b)

Fig. 1 **a** Historical series of Yields (DE, FR, IT, SP, Euro-Others, Synthetic Yield. **b** Idiomatic cost, DE, FR, IT, SP, Euro-Others; YieldIT, YieldDE

not undergo any major changes, and indeed simply follows the trend of the directorial rates imposed by the ECB's monetary policy, volatility has literally exploded, upwards as well as downwards (flight to quality, exacerbated by the ECB's application of the capital key rule (Amato, 2020)), with a dynamic only minimally attributable to the deterioration in fundamentals. On the contrary, we can say that, in
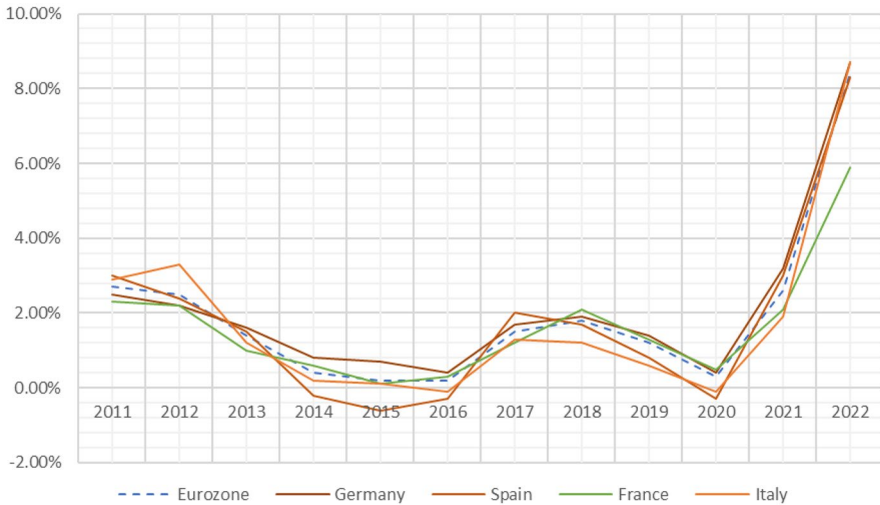
Fig. 2 HCIP Inflation HICP—Yearly data. *Source*: Eurostat

accordance with the logic of the bad equilibrium, the worsening financing conditions were the cause and not the effect of the worsening of government budgets in many periphery countries.

By the end of 2012, the share of high-quality liquid assets had declined significantly. In fact, Triple A public bonds had fallen to 54% of total eurozone debt, and even more remarkable was the almost complete disappearance of the AA class (4%). From the sovereign debt crisis onwards, the eurozone has been suffering from three interrelated problems:

1. High fragmentation of the sovereign debt market
2. Doom loop
3. Scarcity of safe assets

Sovereign debt yields reflect, among other factors, the ability of states to refinance their debts. From 2009 onwards, financial markets generated very different expectations for different member states, with a marked increase in yield variance relative to the average portfolio. Excessive deviation of yields from the average, either up or down, is a problem for everyone: both for countries 'under attack', which are forced to refinance themselves by incurring high costs, and for countries 'benefiting' from the flight to quality, where yields on public debt are negative or close to zero (and in some cases and for some asset classes even negative). In such countries, institutional investors (insurances and pension funds) face long-term financial stability problems.

Following the sovereign debt crisis, the eurozone entered a period of stagnation until 2017. This slowdown exerted downward pressure on inflation (Fig. 2). However, inflation remained low even if the economy had grown faster (Gerrit et al., 2021).

Figure 2 shows the development of the consumer price index of the major European and eurozone economies. In particular, it shows that in 2014–2016 and 2019–2020 the inflation rate was below 2% and, in some cases, negative. Despite the implementation of unconventional monetary policies, with an illusory recovery in 2017–2019, the lack of coordination of monetary and fiscal policy resulted in the inability of the eurozone economies to break out of stagnation and realign the misalignments of agents' expectations (e.g. Constâncio, 2018; Fracasso & Probo, 2017; Gobbi et al., 2019).

In this context, the share of high-quality liquid assets in GDP declines from 50% in 2012 to 21% in 2019. During the pandemic, the share of safe assets to GDP and to outstanding debt remained constant at 24% and 25%, respectively.

Between 2019 and the end of 2021, the ECB's balance sheet grew from 4671 to 8564 billion. Considering securities held for monetary policy, these increased from 2632 to 4713 billion. This increase was mainly due to the introduction of the Pandemic emergency purchase program (PEPP) for 1581 billion and the growth of the public sector purchase program (PSPP) from 2103 to 2487 billion. The intervention of the ECB made the amount of safe assets available to financial operators even more minute.

Since 2012, the debate on the creation of mechanisms to increase the share of safe assets in the European financial system, has become paramount, and has largely passed through a discussion on the feasibility of a common European bond (Amato et al., 2021; Amato & Saraceno, 2022; Beck et al, 2011; Brunnermeier et al., 2011, 2017; De Grauwe & Moesen, 2009; D'Amico et al., 2021; Delpla & von Weizsacker, 2010, 2011; Dosi et al, 2018; Giudice et al., 2019; Gros & Micossi, 2009; Micossi & Avgouleas, 2021; Juncker & Tremonti, 2010; Leandro & Zettelmeyer, 2018; Monti, 2010; Ubide, 2015). A Eurobond would in fact solve the three aforementioned problems simultaneously.

A eurozone debt collaboratively managed through the gradual replacement, in full or in part depending on the proposal, of national bonds with a common bond, would help reduce volatility, bringing fragmentation back to its physiological level, where it would reflect, as it should, differences in fundamentals and not differences in refinancing costs related to expectations about bonds' liquidity. At the same time, a Eurobond would be able to break the vicious ties between national debts and their respective banking systems. Finally, if we take into account that the rating of assets issued by European institutions, or institutions that can benefit from a common guarantee, has always proven to be high, this characteristic would also apply to Eurobonds.

As we saw in Sect. 2, there was a sharp increase in public debt and inflation rates due to the pandemic and the rising cost of energy. The downward revision of GDP growth rates for 2022 and 2023 is bound to raise concerns about the resilience of national fiscal systems, despite the easing in real terms of the value of their debts. The uncertainty hanging over the Russian-Ukrainian conflict and the hysteresis effects it causes will also negatively impact the long-term growth of eurozone countries. It is therefore of paramount importance that the TPI works effectively, as it may be, waiting for the Godot of a Eurobond, the only tool available to limit market fragmentation and instability.

4 Making the TPI work

The TPI is de facto a commitment of the ECB to intervene in markets to curb excessive yields that are not justified by the fundamentals or by countries' fiscal profligacy. The weak spot of the proposal, nevertheless, is the opacity of the determination of what yields are justified. This risks creating arbitrariness and difficulties in providing markets with forward guidance.

We believe that the pricing mechanism that we designed to be used with our proposed European Debt Agency may be of help, as it allows to determine a dynamic yield corridor capturing idiosyncratic risk and filtering out liquidity risk. As such, it could be adopted by the ECB to provide a transparent algorithm to determine deviations from fundamentals and hence justify intervention.

4.1 The EDA framework

Our European Debt Agency Framework (EDA) proposes a reference methodology for identifying a suitable benchmark, conceived as an "idiomatic cost" applied to each MS's debt and computed as the fair price of a perpetual annuity granted by EDA to each MSs, considering its relative riskiness as reflected in a transition matrix (TM) built on assessments issued by the rating agencies and compliant with MS's macroeconomic fundamentals. This "idiomatic cost" reflects MS's fundamentals because, by its very intertemporal nature, it is able to filter market liquidity and refinancing risks, which EDA can structurally avoid by gradually substituting MSs' bonds on market with perpetual loans, continuously repriced to align their cost "to the unfolding risks and conditions to be addressed".

EDA finances itself by issuing bonds to finance Member States with loans that comes in the form of an irredeemable mortgage scheme, priced by EDA by computing the present value of an infinite stream of payments using its own bonds' yield as a discount rate. Future payments are not deterministic, they occur only if states are not in "default". The probability with which a given country enters the state of default in each future period is computed by:

- Assigning each MS to a specific credit risk class j,
- Assuming that a country defaults only when it reaches state D, and modelling the transition from one state to the other via a transition matrix that depends on the state of the economic cycle,
- Due to stationarity of the business cycle, the predicted point-in-time transition matrix at each period in the future converges rapidly to a constant through-the-cycle transition matrix.

Once country specific cumulated probabilities of default are computed, the idiomatic cost of the perpetual loan is obtained adjusting the EDA bonds' yield by the MS's specific rating term structure of cumulated probabilities of default resulting from the deterministic projection of an assigned constant "through-the-cycle"

transition matrix TM, which provides the transition probabilities from one credit risk class to the other and does not depend on the state of the economic cycle.

The main source of uncertainty for the pricing scheme is then related to the uncertainty on the EDA bonds' yield. Such uncertainty can be modelled to generate stochastic simulations.

As the pricing of loans is only based on fundamentals but it is affected by uncertainty, we propose to construct bounds around the price of the irredeemable mortgage scheme to be used as trigger points for TPI interventions. Can the pricing mechanism provided by this framework strengthen the effectiveness of the Transmission Protection Instrument (TPI) as sketched by the reference document of the ECB and be able to inspire necessary interventions to thwart the formation of multiple (bad) equilibria, due to expectations not in line with MSs' fundamentals?

4.2 Applying the EDA framework to TPI

As we hinted above, the first remark that needs to be made is that a TPI tool should look not only in the direction of purchase interventions, being logically compatible with symmetric intervention, since a turmoil caused by expectations not in line with a MS's fundamentals could generate unjustified "flights to quality effects" towards other MSs' bonds.

The second point worth being made is that an effective TPI tool should also be "ex ante informative", providing markets with timely information regarding the direction and magnitude of a possible Central Bank intervention, hence functioning at first as a "forward guidance tool" allowing the markets to self-regulate and adjust their expectations in line with MS's fundamentals. Therefore, this feature should help to prevent speculative security trading taking advantage of divergent price fluctuations unduly exacerbating fiscal imbalances through an increased cost of debt servicing.

The aforementioned methodology can be used for TPI purposes even without an operational EDA to fulfil these two important requirements.

Based on existing MS's creditworthiness assessments issued by the main rating agencies and reported in a TM built upon the time series of rating transition frequencies among credit risk classes for public debt securities, the methodology allows for the determination of a "fluctuation band" established around a long-term time varying reference rate used as discount factor. For each specific credit risk class, the band's lower and upper limit can be interpreted respectively as the minimum and the maximum yield swing allowed in the market for the price of outstanding MS's debt securities, according to its fundamentals.

For example, with reference to a specific interest rate curve tenor, when the current yield approaches and eventually breaches the upper(lower) limit, this situation would signal the need for the Central Bank to intervene to buy(sell) securities for the corresponding tenor that are under to market's pressure, in order to restore price courses in line with fundamentals. Furthermore, the availability of a public information source monitoring in real time yield's movements not in line with fundamentals, would in addition help market's agents to adjust their trading strategy and so
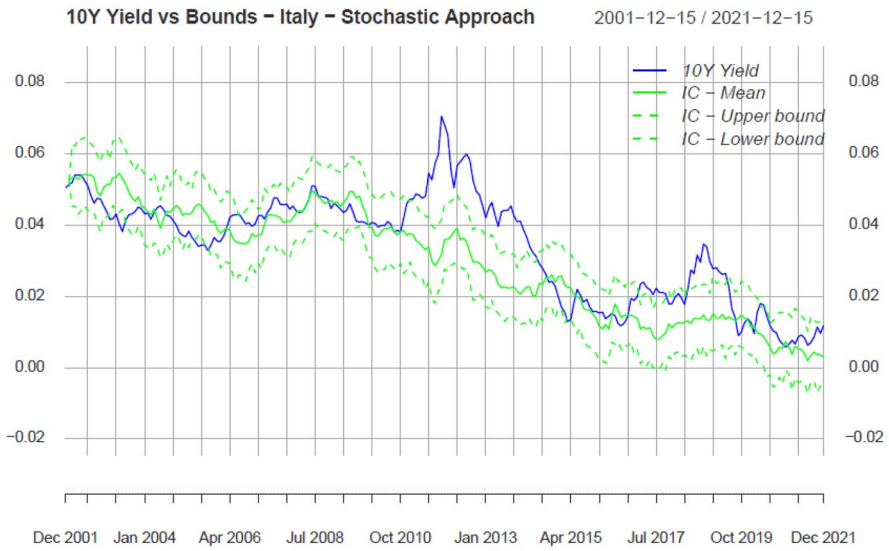
Fig. 3 Simulation of stochastic approach

contributing to drive market price in line with MSs fundamentals, helping to crowd out two distinct opposite risks: i) avoiding the establishment of unfair financing conditions for the MSs likely to worsen its financial position; ii) preserving market discipline in order to prevent moral hazard, allowing to adjust yields in line with the effective MS's creditworthiness.

To accomplish these goals, we suggest the TPI facility should provide itself with a suitable public benchmark, updated on a real time basis, in order to measure the distance between a reference yield of a specific MS's issuance (for example, determined on the ten years interest rate curve tenor) and the upper and lower limits as described. Ideally, in order to compute these bands, for the same tenor, the reference interest rate used as discount factor in the suggested methodology can be represented by the current weighted yield of a diversified portfolio built on MS's Debt of the Eurozone, where the weights are represented by market outstanding volumes of the public securities for the same tenor.

In fact, our methodology allows for two different (but not mutually exclusive) specifications of using the "fluctuation bands model". The first one allows for stochastic simulations of the bands around the reference portfolio yield as described above, the second one use deterministic lower and upper limits.

i)   Stochastic approach

In this approach upper and lower bounds for intervention would be given by the upper and lower bounds of the 95 per cent confidence interval around each MS "idiomatic cost" (Fig. 3). To exemplify the scheme, we report below time series of the band's limits for the Italian 10 years bond: the blue line represents the actual yield registered on the market, while the solid green line represents the yield of
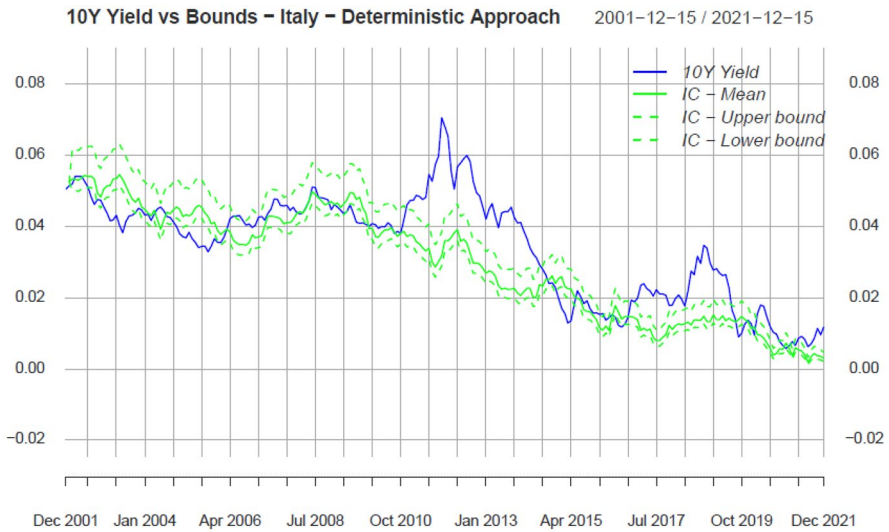
Fig. 4 Simulation of deterministic approach

the reference portfolio on the same tenor; the dotted lines represent respectively the lower and upper limits. As we can see, during the periods 2010–2013 and 2016–2018, the presence of the benchmark would have required the Central Bank to intervene decidedly toward a price adjustment to eventually complement its QE strategy.

ii) Deterministic approach

In this case bounds pertaining to the appropriate credit risk class, can be obtained by using as limits the "idiomatic cost" of the MS's adjacent credit class, where the upper limit would be the one of the class two notches below and the lower the one of the class two notches above (Fig. 4).

Again, we exemplify the scheme for the case of the Italian 10 years bond: the blue line represents the actual yield registered on the market, while the solid green line represents the yield of the reference portfolio on the same tenor; the dotted lines represent respectively the lower and upper limits.

5 Conclusions

In this paper we have analysed the possibility of modifying the TPI to make it more effective. We believe that in the current context the TPI is an important instrument that could help support Europe's financial stability and economic growth. However, the integration of our EDA framework could improve the TPI, allowing the instrument to be based on a transparent benchmark and the ECB to intervene only when market yields exceed the upper (lower) limit by buying (selling) bonds.

Transparency of the benchmark, and of the methodology thereof, could also have a forward guidance effect, providing market participants with a basis for forming their expectations, thus potentially reducing ex ante the scope of the intervention.

This potential reduction of the scope of intervention, together with the possibility of operating both sales and purchases (according to the actual market price of MSs' bonds), could make more compatible the goals of normalizing ECB monetary policy (price stability mandate) and of governing the fragmentation on government bond markets.

The existence of a benchmark able to capture the relative riskiness of each MS would allow the TPI to adapt to the actual fundamental credit riskiness of each MS, thus avoiding any form of (politically unpalatable) risk mutualisation.

Therefore, the ECB's commitment to act according to clearly defined rules would be to simultaneously reassure both, financial markets and MSs governments.

It has been said that "the nature of inflation uncertainty implies that forward guidance on the future path of short-term interest rates becomes less relevant" (Schnabel, 2022). However, abandoning forward guidance on rates does not imply that the logic inherent in this monetary policy stance should be abandoned in general. A forward guidance oriented towards controlling fragmentation might not only be feasible, but also increase the effectiveness of the ECB's monetary policy.

This would allow to distinguish between a "physiological" fragmentation, due to the different MSs' macroeconomic situations and an excessive ("pathological") fragmentation, due to the prevalence of market expectations not in line with fundamentals. By orienting expectations, this forward guidance tool could accompany and support more expansionary fiscal policy choices, in a context in which the reduction of fiscal spaces could be an own-goal that Europe cannot afford.

To sum up, the strengths of our proposal are essentially two.

The first lies in its immediate implementability with existing treaties, such as the current TPI.

The second, and more relevant, is that the modified TPI, through the effect generated by the bands, is able to signal to the markets the fundamental value of MSs' public debts. At the same time, since the fluctuation bands vary as each country's creditworthiness varies, it tends to strongly mitigate the moral hazard problem, while leaving market discipline the space it deserves.

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