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A MARKET-BASED ANALYSIS
OF ITALY'S REDENOMINATION RISK:
BETWEEN EMU LIMITS AND EUROSCEPTIC SENTIMENTS

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ABSTRACT: *Since the global financial crisis Eurozone's architectural flaws and risk segregating policies have raised an issue of euro sustainability for several member countries. This has often resulted in anti-Europeanist sentiments and rising consensus to populist parties. Italy, in particular, in recent years has experienced periodic upsurges in redenomination risk associated with a possible withdrawal from the monetary union. The present work analyzes this risk and its contribution to the country's sovereign risk since September 2014. The main findings are that redenomination risk can become an important component of government yields and is sensitive to the internal political climate and to the European solidarity towards distressed countries. In particular, in front of the 2020's pandemic shock , the orderly and decisive conduct of the Italian political leadership and the support interventions by the European institutions have kept redenomination risk under control, indicating the way forward to successfully pursue the European project.*

1. The global financial crisis (GFC) and the subsequent sovereign debt crisis have tested the resilience of the Eurozone. The best known manifestation of this has been the appearance of sovereign spreads, i.e. the yield differentials between

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government bonds issued by the various countries joining the European Monetary Union (EMU) and the consequent disintegration of the single yield curve that had characterized the single currency in its first ten years of life.

The reasons for this phenomenon are numerous and only partly attributable to the negative shock represented by the GFC. First, there are the architectural frailties of the Eurozone, starting with the loss of monetary sovereignty at the national level in favor of the European Central Bank (ECB), which is harnessed by an exclusive target in terms of inflation and by the statutory prohibition of monetary financing of member countries' deficits.

As a consequence of this peculiar structure, membership of the EMU has removed exchange rate risk and, to a large extent, inflation risk for member countries but at the price of the risk of insolvency. The value of a bond issued by a member State tends to be protected (albeit with an imperfect hedging) from the erosion resulting from rising prices but not from the risk of issuer insolvency given the lack of a Lender of Last Resort (LOLR) that exists in other currency areas and typically coincides with the central bank.

At the same time, for the EMU countries, sovereignty over national fiscal policy is increasingly a purely formal issue. The constraints established by the Maastricht treaty and subsequent integrations arrived with the revisions of the Stability and Growth Pact and with the Fiscal Compact have become increasingly anachronistic in light of the fiscal effort required to recover from the crisis. The well-known consequence has been the tragedy of austerity, which has forced most indebted countries to limit the fiscal stimulus, condemning their economies to years of subdued economic performance.

In this already difficult context, two further elements must be considered: the formation of wide competitiveness gaps between Eurozone countries due to the impossibility of readjustments of the bilateral exchange rates, and the risk segregation approach that has characterized the response to the crisis by the European institutions.

The mix of all above mentioned factors of fragility poses a threat to the

Eurozone resilience, because of the gradual divergence of the economic and financial systems of member countries, as evidenced by their macroeconomic fundamentals and the by the polarization between '*center*' and '*periphery*'. This polarization has very important implications in terms of the behavior of market operators and of capital movements across member countries, and also in terms of employment dynamics, living standards, and affection to the EMU.

Starting from 2010 (the year in which the leaders of France and Germany agreed on the principle of Private Sector Involvement at the Deauville summit), there has been talk of the possibility of a Euro break-up or a unilateral exit of one or more member States.

On the financial markets, the scenario of a possible withdrawal of a member State is assessed in relation to the so-called '*redenomination risk*' or '*convertibility risk*' or '*exit risk*'. The exit from the common currency area would in fact involve the return to a national currency with a flexible exchange rate with respect to the euro (if this survived the loss of the withdrawing member) or, in any case, with respect to other European and extra-European currencies starting from the dollar. In the case of peripheral countries, it is reasonable to assume that the new national currency would be weaker than the euro. This element, together with the incentive for the withdrawing State to convert its debt into the new (weaker) national currency, would result in a loss for bondholders. Consequently, for a decade now, yields on government bonds of several EMU countries incorporate a more or less significant component of redenomination risk premium. Given the strong interconnections existing between the economic and financial systems of the euro area countries, *a priori* it is difficult to make reliable predictions on the possible contagion effect connected to the unilateral exit decision by a single State. On a theoretical level, it can be assumed that the economic size of each country represents an important clue on the possible consequences that its exit would have on the stability of the entire euro area. But the Greek experience shows that even the smaller economies are deeply intertwined with those of the other member countries and can therefore threaten

the survival of the EMU. The segregation of risks in peripheral countries implemented from Deauville onwards has only partially reduced these interconnections, especially if the country at stake is a founding member of the EMU such as Italy or Spain.

However, in recent years, the growing consensus gained by Eurosceptic and populist political forces in some countries has favored a partial orthogonalization of the redenomination risks of the individual Eurozone States. The rise of these political forces has been in fact characterized by the adoption of a confrontational attitude towards the European institutions with the result that the country supporting Eurosceptic positions was perceived as the 'rebel member' of a monetary union in which the other States found themselves unexpectedly cohesive. This has happened in Greece in 2015 with the third public debt crisis and the arrival of the Troika[1], and more recently, in Italy with the establishment of the coalition government between Lega and Five Stars Movement in May 2018. In the Italian case, a confirmation of the progressive isolation of the countries led by Eurosceptic parties comes from the decoupling between yields on Italian sovereign bonds (BTPs) and yields on Spanish sovereign bonds (BONOs), mainly due to the significant increase in the risk of an Italexit.

Greek and Italian stories have developed similarly. After the 'isolationist' phase, at which the maximum levels of redenomination risk were recorded, the recovery of a more relaxed relationship with the European institutions has accompanied the gradual reduction of redenomination risk.

In 2020 the new semi-symmetric shock represented by the Coronavirus pandemic highlighted that the preferences of the dominant political class at the national level are not the only driver of redenomination risk. Another important driver is, in fact, the attitude of Europe and its institutions towards countries in difficulty.

In the initial phase of the Covid-19 crisis, Europe's disappointing response

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[1] The term 'Troika' or 'European Troika' is used to refer to the decision group formed by the European Commission, the European Central Bank and the International Monetary Fund.

to the needs of the countries in greatest trouble coincided with a synchronous surge in redenomination risk of several countries, even in the absence of political conflict with the European institutions.

Fortunately, Europe promptly reconsidered the seriousness of the situation and acted accordingly: this change of attitude has favored the normalization of redenomination risk that, since mid-May 2020, has continued in correspondence with the progress made in reaching an agreement on the Recovery Fund, the 750 billion euro program decided by Europe to respond to the economic emergency generated by the pandemic.

This paper analyzes redenomination risk by focusing on the case of Italy, the country with the second largest public debt within the euro area and that in recent years has repeatedly recorded the most significant peaks of redenomination risk. In certain periods, this risk has become a substantial component of Italy's sovereign risk, mirroring the country's increasingly isolated position in the European context.

The paper is organized as follows. Section 2 provides a reasoned description of the main drawbacks within the Eurozone architecture, focusing on the original flaws and on the distortions occurred following the GFC and the sovereign debt crisis in the euro area. Section 3 discusses redenomination risk for countries joining the EMU and presents the main bond-based indicators of this risk. Section 4 deals with the drawbacks of such indicators and provides a detailed explanation of the two main CDS-based indicators of redenomination risk, namely the *Quanto spread* and the *ISDA basis*. Section 5 focuses on Italy's redenomination risk with the aim of investigating, with simple linear models, its contribution to Italian sovereign yields in a comparative perspective with the other largest EMU countries (France, Germany and Spain). Section 6 concludes.

2. The Eurozone is an economic and monetary union with an intrinsic tendency to divergence between the economic and financial systems of its member countries. Some reasons of this tendency can be traced back to the

genesis of the euro area, while others have emerged following the GFC and the 2010-2012 sovereign debt crisis.

At the architectural level, Eurozone problems depend essentially on the decision to establish a union in half, delegating monetary sovereignty to the ECB and postponing the creation of a fiscal and labor markets union to a subsequent phase of the European integration project. This decision has kept for the individual member States the exercise of fiscal sovereignty, meant as autonomy in funding priorities and allocation of public spending, but – given the Maastricht constraints and the no bailout clause (Article 125 of the Treaty on the Functioning of the European Union) – the exercise of this sovereignty has been *de facto* subjected to the double judgment of the European institutions and of the financial markets.

Considering the Stability and Growth Pact (SGP) signed in 1997, the European Commission and the European Council exert an ongoing fiscal oversight on member States to ensure the maintenance and enforcement of the fiscal discipline in the EMU. Their prerogatives include the issuing of a yearly recommendation for policy actions to ensure a full compliance with the SGP, the power to request corrective action to incompliant countries through the declaration of an Excessive Deficit Procedure (EDP) and the issuing of economic sanctions to those countries that, in spite of the EDP, do not undertake adequate corrective action.

Financial markets' assessment can be even more detrimental as, for EMU members, it quickly translates in the interest expenditure on the public debt. Well before the introduction of the euro, the point was clear to many economists such as Wynne Godley [Godley, 1997] who observed that the financing of public spending exclusively on the markets, in competition with businesses, could have proved excessively expensive or even impossible for governments, particularly under conditions of extreme emergency.

Such a double exogenous control precludes member countries from implementing an independent economic and fiscal policy, especially in the presence of high levels of debt.

Another distinctive aspect of the Eurozone has been, since its origins, the asymmetric effect of the single currency on the economic performance and the growth model of member countries. The adoption of the euro has resulted in the transition to a stronger currency for some countries such as Italy, Spain, Greece and Portugal and to a weaker currency for others such as Germany, the Netherlands, Austria and Finland.

This asymmetry has caused the consolidation of growing competitiveness gaps between the two clusters of countries, favoring the polarization of the Eurozone between '*center'* and '*periphery'*. At a macro-economic level, the concrete manifestation of this polarization has been the opposite evolution of real exchange rates and current account balances of the countries belonging to the two clusters. On the one hand, core countries – most notably Germany – have enjoyed a devaluation of their real effective exchange rates together with rising current account surpluses and, on the other hand, peripheral countries have experienced a deterioration in both the two macro-economic variables [Minenna, 2020].

To some extent these diverging dynamics are tied also to the way in which the ECB inflation target is defined. In fact, the ECB price stability objective («*below, but close to 2%*») is referred to the Eurozone inflation, which is a weighted average of the inflation values of the different member countries. Consequently, it is perfectly compatible with more or less wide inflation differentials between the countries of the euro area, leading to different real exchange rates for countries that share the same currency.

Further elements have contributed to the consolidation of the dichotomy between center and periphery, including the different evolution of the relative unit labor cost [Flassbeck and Lapavitsas, 2013] and the different degree of development and pervasiveness of technological capabilities [Gräbner *et al.*, 2020].

The arrival of the GFC in Europe has accelerated the divergence between core and peripheral countries revealing the fragile foundations of the Euro block.

The sudden discovery of credit risk by the financial markets has in fact led, in the weak EMU set-up, to an equally sudden discovery of a different sovereign risk on the public debt of the member States.

The climate of optimism that had accompanied the birth of the euro had favored the alignment of the yield curves of member countries as early as the end of the 90s. At the basis of this phenomenon was the belief – supported by the transition to a common monetary policy, by the increasing integration of financial markets and by a regulation that considered the credit risk of the various member States to be homogeneous – of an implicit commitment to risk sharing between the different countries.

This belief had prompted market operators to bet on the convergence of the yields of the various member countries through convergence trades involving the sale of low-yielding government bonds (e.g. German BUNDs) and the purchase of high-yielding government bonds (e.g. Italian BTPs).

The outbreak of the crisis has dramatically revealed the falsity of this belief, prompting the financial markets to reconsider their view on the effective willingness of risk sharing by Eurozone members and on the solidity of peripheral countries. Part of the literature attributes what happened during the euro area sovereign debt crisis to the fiscal indiscipline, if not even profligacy, of peripheral countries [Sinn, 2010; Schuknecht *et al.*, 2011; Costa and Ricciuti, 2013]. But an equally authoritative line of scholars believes this is an absolutely partial and incomplete explanation of a much more complex phenomenon [Krugman, 2012, Constâncio, 2013].

The causes of the crisis have their roots in the original architecture of the euro area. Given the significant increase in the fiscal effort required to cope with the crisis, Godley's prophecy was fulfilled for the peripheral countries. With the ECB prohibition on monetary financing, the only way to finance the increase in public spending was through markets which, in order to absorb the excess supply of peripheral government bonds, began to ask for an ever-increasing risk premium.

This has brought to light the insolvency risk to which the Eurozone countries are endogenously exposed due to the abdication of monetary sovereignty and the absence of a Lender of Last Resort (LOLR)[2]. In such a '*gold standard without gold*' [Blyth, 2013] financial markets «*can force countries into a bad equilibrium characterized by increasing interest rates that trigger excessive austerity measures, which in turn lead to a deflationary spiral that aggravates the fiscal crisis*» [De Grauwe, 2015]. This specific risk is aggravated by an easy exit option provided to investors by the single currency. If, for example, a Japanese pension fund is no longer willing to hold Japanese government bonds and decides to hold US Treasuries instead, it is confronted with a currency risk. For institutional investors that are required to hold safe assets, this 'currency wall' is difficult to surmount. Within the euro area this wall has been removed so that investors can exchange domestic bonds into bonds of other member States without an exchange rate risk [Bofinger, 2018].

The same argument is shared by several authors. For instance, Kremens emphasizes that «*the distinctive feature of a currency union is that there is no exchange rate to adjust, but only bond prices*» [Kremens, 2018]. Because of this set-up, the position of national governments joining the Eurozone is often resembled to that of emerging countries that issue debt in a foreign currency, usually the dollar and that are exposed to the risk of sudden stops in capital inflows and, thus, of liquidity crises [De Grauwe and Ji, 2013].

It must be emphasized right now that monetary sovereignty and the terms of the central bank's mandate significantly affect the exposure to the insolvency risk or to the inflation risk of the States joining a given currency area. When the central bank also plays the role of LOLR (as *de facto* happens, for example, in the US), the main risk to which government bonds are exposed is that of inflation.

The LOLR, in fact, guarantees the direct or indirect public debt monetization

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[2]The LOLR is often resembled to the issuer of a put written on the price of sovereign bonds, as it establishes a floor to the bonds' price by undertaking the commitment to buy a potentially unlimited amount of bonds at a price not lower than the fixed floor.

thereby excluding the occurrence of a sovereign default but increasing the money supply and, therefore, inflation risk. On the contrary, where – as in the Eurozone – there is no LOLR but only a central bank with an inflation target, sovereign bonds are mainly exposed to insolvency risk and only secondarily to inflation risk.

In the specific case of the euro area, the potential exposure to inflation risk derives from the fact –already mentioned – that the ECB inflation target takes as reference the inflation of the Eurozone as a whole and not that of each individual member country, but is still secondary to the insolvency risk of sovereign issuers. This is also due to the deflationary (or, at least, disinflationary) bias featuring the Euro area [Altavilla and Marani, 2001; De Grauwe, 2015].

The concrete manifestation of such deflationary bias is one of the consequences of the questionable crisis management by the European institutions, marked by a steady retreat from the risk sharing climate that had permeated the pre-crisis period.

Symbolically, the watershed between the two phases (with and without risk sharing) is identified in the Deauville summit of October 2010 when France and Germany established the principle of Private Sector Involvement (PSI), providing for an adequate participation of private creditors to losses in the event of a crisis. The logic underlying the PSI is at the basis of the risk segregation paradigm that has characterized the European response to the crisis[3]. This paradigm preaches that each country must be virtuous and rely only on itself, leaving no room to fiscal transfers or effective stabilizing facilities across countries joining the same currency area. The self-reliance argument for risk segregation has been massively used by core Eurozone countries to safeguard themselves against the risks and problems that were materializing within Southern countries, regardless of their contribution to the troubles of the periphery. In this regard at least two issues need to be recalled. The first concerns competitiveness gaps allowed by the relative strength/weakness of the euro for the different national economies in the

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[3]Technically – as happened with the Greek debt restructuring in March 2012 – the PSI imposes NPV or face value haircuts to private creditors.

euro area. The second issue relates to the large credit exposures accumulated by banks in core countries (especially France and Germany) towards the periphery in the run-up of the crisis. The financial integration occurred after the introduction of the euro led to a huge increase in cross-border banking activity, with large capital flows from core countries to peripheral countries and a consistent spike in the private debt within the periphery. The subsequent outbreak of the crisis pushed lenders from core countries to promptly scale-down their exposures in the form of a massive deleveraging to the detriment of private borrowers within the periphery. The sudden stop of foreign financial inflows in turn forced peripheral governments to step in with public funds, which explains why the crisis has actually caused the transformation of huge private peripheral debts into huge public peripheral debts [Constâncio, 2013; Minenna, 2020].

Deleveraging enacted by creditors resident in core countries is only one of the ways in which the segregation of risks in peripheral countries has materialized. At same time it was put in place, Eurozone institutions have strengthened the fiscal discipline in the currency area, which forced Southern countries to harsh internal reforms with huge social and economic costs. Behind this fiscal consolidation stands the asymmetric allocation of the costs of the crisis between the center and the periphery of the euro area. In order to enhance budgetary surveillance and discipline on member countries, the European Union integrated the SGP with stricter rules and provisions on the public debt and on the government balance both in nominal and structural terms. Further provisions were added in early 2012 with the inter-governmental Treaty known as Fiscal Compact[4].

Also, monetary policy interventions during the crisis and post-crisis period have been strongly influenced by the risk segregation paradigm. Since the start of the GFC Eurosystem activities with no profit and loss sharing have been growing.

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[4]Some of the rules introduced with the revision of the SGP and with the Fiscal Compact are questionable. For example, the rule on the structural budget balance is based on the value of a theoretical quantity (the *output gap*) on whose estimation method there are strong disagreements among economists [Tooze, 2019].

This change has been mainly due to the larger resort to 'own risk' asset purchases or collateralized lending [Buiter, 2015], as these operations have been carried on by National Central Banks (NCBs) with effect on their respective balance sheets but not on that of the ECB.

Since 2008 the ECB has repeatedly revised its collateral framework, lowering the minimum rating requirement but also providing for differentiated haircuts according to the rating class. This form of collateral discrimination – which added to that of the collateralized interbank market – has contributed to the pressure on the yields of peripheral sovereign bonds. In early December 2011, at the peak of the sovereign debt crisis, the ECB has mitigated the Eurosystem collateral discrimination framework by allowing NCBs, as a temporary solution, to accept as collateral additional performing credit claims (i.e. bank loans) that satisfy specific eligibility criteria. Yet, this option was fully consistent with the risk segregation paradigm, because collateral risk would have been borne exclusively by the NCB that would have accepted that collateral [Buiter, 2015].

Albeit not explicit, risk segregation was supported also by the two exceptional 3-year Long Term Refinancing Operations (LTROs) conducted by the ECB between December 2011 and February 2012. This extraordinary liquidity injection (totaling to 1 trillion euros) was taken up mainly by peripheral banks to cope with the sharp drop in interbank funding and used to absorb the large amount of domestic sovereign bonds that banks from core countries were selling off[5]. The remaining part of this central bank money was used to settle commercial liabilities owed (again) to credit institutions located in the core countries and to face the collapse of domestic deposits, which were departing for Northern Eurozone destinations [Minenna, 2018-*a*].

The 'own risk' principle also applies to the Public Sector Purchase Programme (PSPP) launched by the Eurosystem on March 2015 and still ongoing (after a break of a few months in 2019). In fact, only the 10% (initially only the 8%)

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[5]It can be argued that the two LTROs have given a strong push to the nationalization of the public debts of peripheral countries.

of the purchases allotted to the debt of each member government is carried out directly by the ECB, whereas NCBs are appointed to buy the remaining 90% with funds borrowed from the ECB[6]. Therefore, each NCB results the only entity exposed to the default risk of its national government on purchased securities: in such an extreme scenario, it would bear the related losses while remaining obligated to repay to the ECB the full nominal amount borrowed[7].

A good thermometer of the risk segregation attitude that has featured the management of the crisis in the euro area is provided by the dynamics of the net Target2 balances of the NCBs participating in the Eurosystem. Target2 is the real-time cross-border interbank payment system for the Eurosystem. Prior the crisis, Target2 balances were essentially nil because the easy availability of interbank funding to banks to replenish shortfalls of their reserve accounts allowed an offsetting between current account and capital account [Cecchetti *et al.*, 2012]. But the crisis and the collateral discrimination policies made increasingly difficult for banks in peripheral countries to access interbank funds. As a consequence, interbank payment transactions between banks residents in different Eurozone countries began to involve their respective NCBs, which, in turn, began to experience increasing deficits in their Target2 official settlements balance with the ECB. On the other hand, NCBs of core countries began to record rising Target2 surpluses in their balance with the ECB.

Over the last decade, developments in Target2 balances have mirrored good and bad times in the EMU, with rising imbalances featuring hard periods and deflating imbalances in more quiet periods (see Figure 1).

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[6]Also the Pandemic Emergency Purchase Programme (PEPP) launched on March 2020 contains similar limited risk sharing provisions.

[7]Precisely what in finance is called *Credit Default Swap*, where, indeed, NCBs act as protection sellers of the sovereign risk of their respective country to the rest of the Eurosystem.

Figure 1– Evolution of the net Target2 balances of Eurozone core and peripheral NCBs
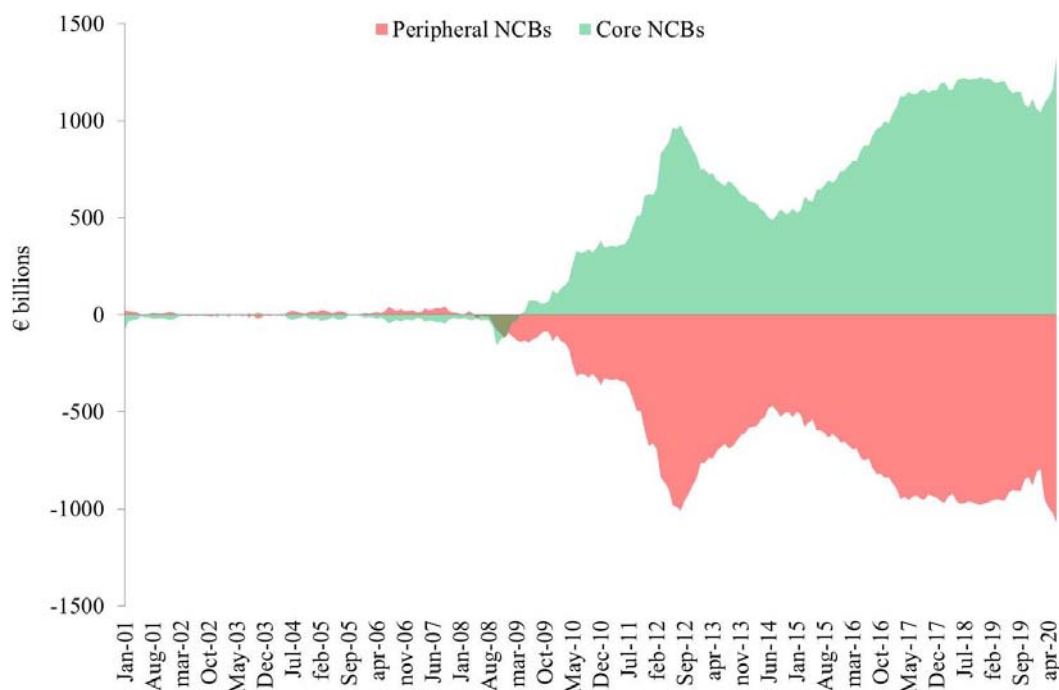
Source: ECB, supplemented with data from NCBs

A driver of these dynamics were precisely some ECB unconventional monetary policies such as the 1 trillion euro LTROs launched at the peak of the sovereign debt crisis and the PSPP. Indeed, an important side effect of both these policies were massive capital flights from the periphery to the center of the euro area, the latter being perceived (especially Germany) as a safe harbor by investors [Dosi *et al.*, 2018].

Technically, Target2 imbalances are – depending on their sign – uncollateralized perpetual claims or liabilities of the NCBs with respect to the ECB. As long as the integrity and compactness of the euro area will be preserved, these imbalances will remain accounting entries among the NCBs joining the Eurosystem. However, in case of exit by a debtor nation, its NCB may be tempted not to settle the debit balances with the rest of the Eurosystem, imposing a consequent loss on the NCBs of the other countries. Not surprisingly, in recent years the rise of Eurosceptic forces in many member countries has preoccupied

creditor countries, pushing them to elaborate various proposals to revise the Target2 system in order to get immunized from adverse events[8].

Another field where the risk segregation paradigm has driven the response to the crisis by the European institutions has been the conditioning of any financial assistance program to distressed countries upon the achievement of specific targets on their fiscal variables. The most well-known example can be found in the establishing treaty of the European Stability Mechanism (ESM), the Eurozone sovereign bailout fund. Indeed, the beneficiary country gets access to the different tranches of the ESM aid program only if it has successfully implemented a list of domestic reforms defined in a Memorandum of Understanding (MoU) it has been forced to sign [Dosi *et. al*, 2019][9].

Faced with the manifest uncooperative attitude of European supranational bodies and core countries towards the problems of the periphery, markets realized soon that Eurozone's integration was false and they could have made money betting against peripheral members. They put in place divergence trades by going short on risky bonds issued by peripheral governments and long on safe sovereign bonds from core countries.

The vicious circle arising from risk segregation and markets' speculation has led to the emergence of yield spreads among the government bonds of the different euro area countries and to the disintegration of the common yield curve

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[8]The position expressed by the ECB President in 2017 is that if a country were to leave the Eurosystem, its National Central Bank's claims or liabilities to the ECB would need to be settled in full. See: https://www.ecb.europa.eu/pub/pdf/other/170120letter_valli_zanni_1.en.pdf.

[9]Risk segregation has also inspired the management of banks' risks in peripheral countries [Minenna, 2020]. In August 2013 – after that several banks located in core countries had been rescued also thanks to interventions of their respective governments – it has entered into force the Communication of the European Commission on the banking sector that has introduced burden sharing provisions to address banking crises. Later on, in January 2016, the Bank Recovery and Resolution Directive has entered into force, whose bail in provisions have extended the plethora of private investors called to bear the losses from bankruptcy prior any public sector. Both burden sharing and bail in regulation have pushed private investors to demand larger risk premiums to fund banks, especially if located in the periphery. Meanwhile, stress tests and asset quality reviews conducted by the European banking supervision have exerted an enduring pressing for fast disposals of non-performing assets, forcing many credit institutions of the Eurozone periphery to sell troubled assets to vulture funds and suffer large impairments. Last but not least, there has been the systematic postponement of the European Deposit Insurance Scheme, despite it had to be the third pillar of the Banking Union.

featured by those countries until before the crisis (see Figure 2).

Figure 2 – 10-year sovereign yields of selected Eurozone countries: Jan. 2000-Dec. 2012

Source: Bloomberg
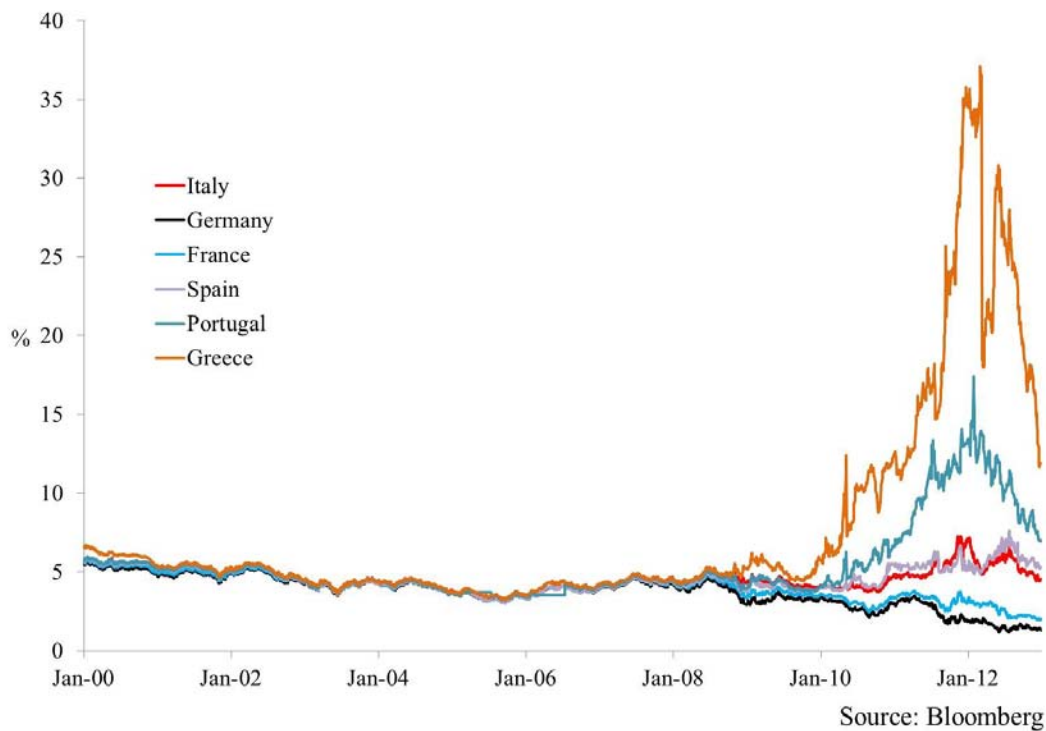
In particular, the yield spread over German Bunds – given their very high quality status – has become the benchmark to gauge the sovereign risk of the other country in the Eurozone. This spread represents a sort of '*shadow exchange rate*' between Germany and each other member country and, through spreads, it is possible to encode the bilateral shadow exchange rate between any pair of States in the euro area [Minenna, 2016].

In spite of formally sharing the same currency, EMU members had therefore resumed, at least in a financial term, a shadow-regime of flexible exchange rates whose movements were closely linked to their credit risk. Yet another proof of the close relationship between the latter and the exchange rate risk.

3. «*Historically, dissolutions of currency unions are not unusual. I use an annual panel data set covering 245 country pairs that use a common currency (of which 128 are dissolved) from 1948 through 1997 to characterize currency union exits. I find that departures from a currency union tend to occur when there is a large inflation differential between member countries, when the currency union involves a country which is closed to international trade and trade flows dry up, and when there is a change in the political status of a member. In general, however, macroeconomic factors have only little predictive power for currency union dissolutions*».

The above is the abstract of a 2004 paper written by Volker Nitsch of Free University Berlin. The paper did not consider the Eurozone, but its *incipit* is strongly impressive and represents a warning for whatever currency union.

With specific regard to the Eurozone the debate on redenomination risk and on the possibility and implications of a Euro break-up is quite old. Already in 2000 – the first year of life of the euro – some analysts of leading international investment banks had questioned the longevity of the single currency [Wiseman, 2000][10]. With the arrival of the crisis, even official institutions of the EMU – starting with the ECB [Athanassiou, 2009] – have begun the first investigations on this issue. But it was at the end of 2011, during the hottest moments of the sovereign debt crisis, that the debate on redenomination risk intensified, attracting the attention of the various stakeholders (banks, analysts, ECB, newspapers). The surge in sovereign yield spreads and the related difficulty of

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[10]Wiseman's conclusions anticipated with great insight the key points raised by a possible exit from the EMU:

«*1. The old national currencies are irrecoverable. For good or for ill, Germany cannot recover the old Deutschmark — it has been too stirred up with the other national currencies.*

2. A nation can leave EMU, by introducing a new currency. In doing so, it can leave euro obligations to be paid in euro, or it can cause varying degrees of trouble by doing something different.

3. Because governments have a lot of power over their legal jurisdictions, and over the legal definition of their own currency, both past and present, and over the definition of their former national 'IBOR', a government that wanted to cause trouble could cause a lot of it».

debt refinancing for peripheral governments made the issue extremely topical and much less theoretical than in the past[11].

In November 2011, analysts at the investment bank Nomura [Firoozye *et al.*, 2011] published a report warning about the material risk of some form of euro break-up and raising the problem of the redenomination risk with respect to euro denominated assets and liabilities. According to Nomura, three parameters need to be considered when evaluating redenomination risk, namely: the legal jurisdictions under which a given obligation belongs, the likelihood of a multilaterally agreed break up and the severity of the Eurozone break-up with respect to the survival of the single currency.

The first parameter (legal jurisdiction) is pivotal to any reasoning about redenomination risk. The reason must be sought in the *Lex Monetae*, that is the universally accepted principle saying that any jurisdiction determines its own currency. This principle – which should ensure the continuity of existing contracts also in third countries' jurisdictions – relies on the underlying assumption that money as a legal construction is subject to the power of the State [Wiseman, 2000]. Consequently, if a sovereign State changes the currency that is legal tender in that State, it is entitled to make the payments associated with its debt in this new currency.

However, the euro area represents a unique case, given that its countries share a common currency, which raises doubts on whether the *Lex Monetae* would be applicable. As such, the *Lex Monetae* principle becomes controversial when a State adopts a new national currency following exit from a common currency area, as bonds issued by the withdrawing country are subject to two competing (and conflicting) *Leges Monetae*: the one of the newly adopted national currency and the one of the currency that continues to be legal tender in the monetary union [Mediobanca Securities, 2017]. As observed by Nordvig (2015), the point is of prior relevance especially in case of partial break-up of the

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[11] For a reasoned summary of the main contributions of that period on the redenomination risk and the related issue of a possible euro break-up, see Martinez Romero, 2019.

currency union. The most agreed answer in the literature [Nordvig, 2015; Mann, 1960; Scott, 2012] is that courts should apply the law specified in the legal instrument at issue, that is the law of the contract. In turn, in many cases, the law of the contract is the national (or local) law of the withdrawing State [Scott, 2012]. This solves the problem only apparently as there are many possible different situations. The law of the contract may be unspecified, or the (foreign) judging court may refuse to apply the law of another country if considered contrary to the law of its own country.

Actually, the broad consensus in the literature is that no one can know in advance which law will be applied. In this vein, some authors [Scott, 2012] observe that a way to deal with such a crippling uncertainty would be for the withdrawing country to keep its new national currency pegged to its old common currency (that of the monetary union it belonged to) in order to set an upper limit to the losses that the withdrawing State imposes on its creditors through redenomination. More in detail, in order to make the withdrawal as less traumatic as possible, Scott recommends «*the entry of withdrawing members into the Exchange Rate Mechanism (ERM) at a pegged exchange rate with unlimited swap lines from the ECB*», the amending of the treaties with the aim of allowing the permanence in the European Union by the withdrawing members, and the establishment of a European Union, and indeed international, legal framework legitimizing redenomination which otherwise would be subject to broad and disruptive litigation.

The issue remains highly controversial. First of all, it is clear that if a member State were to decide to leave the EMU, such a decision would surely be tied – in one way or another – to the intention to fully recover its monetary sovereignty that, for the Mundell-Fleming trilemma, includes the transition to a flexible exchange rate regime. Secondly, taking into account the thorniness of the matter and the complexity of the political and economic interests at stake, the hypothesis of a modification of the European treaties aimed at regulating the exit of a Member State appears rather remote, and the same holds with regard to the

definition, by the European Union, of any legal context to regulate redenomination.

It is therefore inevitable that the materialization of a withdrawal and redenomination event would open a largely unpredictable scenario. Nevertheless, it seems reasonable to hypothesize – as done by the financial markets – some application of the *Lex Monetae* by the withdrawing State[12] or, alternatively, of the law of the contract that, as mentioned above, tends to coincide with the local law of the withdrawing State.

This hypothesis is in line with the expectation of a devaluation of the new national currency of the withdrawing country against the euro or – should this withdrawal trigger a euro break-up – against the currencies of the core countries and the dollar. This expectation is consistent with the historical precedents recorded in emerging economies (e.g. Argentina 2002), where the exit from a fixed exchange rate regime anchored to a 'hard' currency was functional to obtaining a benefit on the debt from part of the withdrawing country.

Clearly, this expectation is higher the higher the public debt of the country at stake and is therefore fairly consistent with the situation of the peripheral countries of the Eurozone that, for the reasons set out in Section 2, from 2009 onwards have experienced a significant increase in their debt-to-GDP ratios (see Figure 3).

On the other hand, it is more difficult to understand whether such a strategy (exit + debt monetization through currency devaluation) would actually be appropriate for a peripheral euro area country. In this regard, again, it is hard to make predictions which explains the opposing views that can be found in the literature. According to some economists [Tepper, 2012; Stiglitz and Guzman, 2017; Stiglitz, 2018], the pair '*withdrawal and devaluation*' would be a winning

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[12] «*Given the principle of Lex Monetae it is unlikely that local courts would ever enforce foreign judgments seeking payments in euros for local contracts. Even if foreign courts were to seek enforcement of claims in euros under the Brussels Regulation (EC Regulation 44/2001) dealing with the reciprocal enforcement of judgments, they would likely fail because the local courts in the payer's jurisdiction would be prevented by legislation from recognizing as valid or enforcing judgments which are not in its new post-euro currency*», [Tepper, 2012].

strategy, because an initial phase of instability would be followed by a phase of sustained economic expansion.

Conversely, other authors [Passacantando, 2017] argue that a euro exit and a devaluation-based debt relief would hardly result in a net benefit for peripheral countries such as Italy, because of several factors among which the high share of public debt held by resident investors, the likely isolation of the country from to the international and currency markets for a long time, the imposition of capital controls on residents and the difficulties associated with the creation of a new currency and a new payment system for interbank transactions.

*Figure 3 – Debt-to-GDP ratio in the Euro area and in its peripheral countries: 2005-2014*

Source: Eurostat
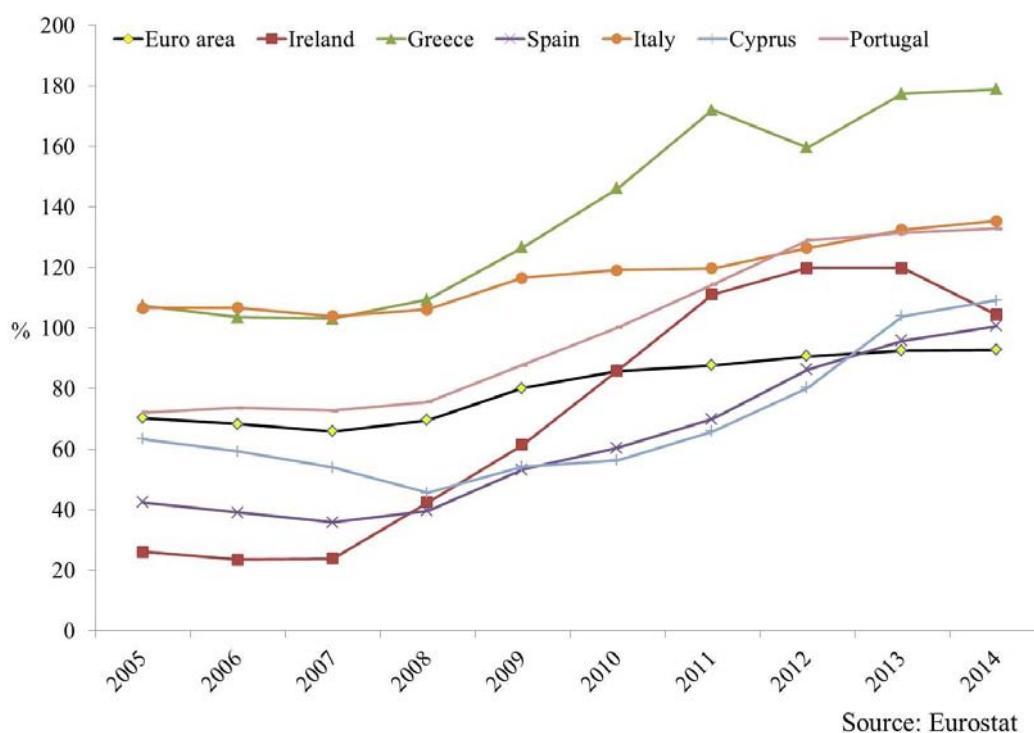
Of course, a key factor in assessing the '*exit-and-devalue*' strategy would be the extent of the depreciation/appreciation of the new national currency of the withdrawing peripheral country. There is a generally agreed expectation that withdrawal from the EMU would lead to a devaluation of the new national currency in the case of peripheral countries and a re-evaluation in the case of Germany and probably some other core country; but there is not as much

agreement on the future value of the new national currencies. Figure 4 reports a 2011 estimate by a Nomura fixed income strategist (Nick Firoozye) on the basis of the then misalignment of the real exchange rates and future inflation risk estimates [Firoozye, 2012]. The estimates refer to a medium-term equilibrium (five years forward).

Figure 4 – Fair value estimates for new national currencies in the medium term

Fair value estimates for new national currencies (PPP based, 5Y hence)
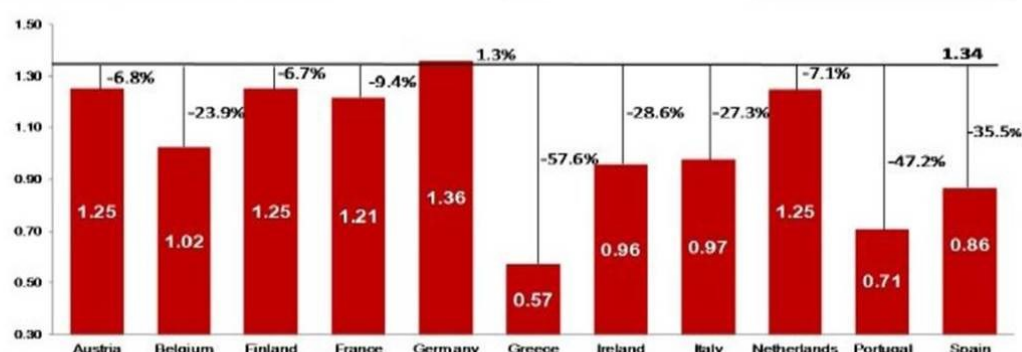
Source: Nomura

With nearly ten years gone by, Nomura's estimates must be taken with caution, but they are still indicative of the expected direction (depreciation *versus* appreciation) of the distance between the new national currencies and the euro and also of the ranking of these distances. For most member countries there would be a depreciation risk (in the order of 60% for Greece, 50% for Portugal, 35% for Spain, 30% for Italy and 10% for France), while the new German mark is expected to experience a modest strengthening (+1.3%).

With respect to the bondholders' exposure, depreciation risk is one of the factors to consider when evaluating possible losses in a redenomination scenario, while appreciation risk affects the possible gains associated with a redenomination scenario. It remains understood that – as with any assessment of the impact of a possible event in the future – the quantification of the expected loss/gain from redenomination depends on the extent of the exchange rate movements in this scenario but also on the probability that that scenario actually occurs. In turn, this probability depends not only on the occurrence or not of a

withdrawal but also on the applicability of the *Lex Monetae* by the withdrawing State and, therefore, on the specific legal features and clauses governing each individual government bond.

It follows that markets will ask for a higher risk premium on the securities most exposed to the risk of a redenomination loss and vice versa for those most exposed to an expected redenomination gain.

A confirmation in this sense comes from the fact that, *coeteris paribus*, securities issued by the same peripheral State trade at different prices depending on their governing law: being exempt from the application of the *Lex Monetae*, foreign law bonds tend to be worth more than otherwise similar local law bonds, at least when the exit probability perceived by the markets begins to become significant.

In addition, foreign law bonds issued by euro area countries are often denominated in foreign currency (typically the one that is legal tender in the foreign jurisdiction governing the bonds themselves) rather than in euros. This feature tends to strengthen the protection offered by foreign law bonds with respect to local law ones since, in the event of withdrawal from the EMU by the issuing State, these bonds would be immune from the possible devaluation of the euro following the secession of one of its members. This explains why the yield difference between a euro-denominated local law bond issued by a Eurozone country and a foreign law bond of the same sovereign issuer denominated in a foreign currency (e.g. US dollar or GB pound) is a market indicator of redenomination risk. Such difference is referred to as *Quanto-Legal basis* [Minenna, 2020] or *foreign law premium* [Chamon *et al*., 2018]. In order to properly compare bonds denominated in different currencies (and, thus, priced with respect to different inters rate curves) a standard metric is their asset swap spread, adjusted for the cross-currency basis.

Figure 5 displays the *Quanto-Legal basis* for a pair of Italian government bonds expiring in 2033: a euro-denominated Italian law BTP and a USD-denominated bond issued by the Republic of Italy under an international issuance

program and subject to New York law.

During the sovereign debt crisis, the basis has widened significantly and maintained a growing trend until the end of 2014, with peaks of over 120 basis points. From 2015, however, it began to deflate in the wake of the massive public sector purchase programme (PSPP) announced by the ECB in January 2015. A new phase of moderate widening occurred in early 2017 in conjunction with the approaching presidential elections in France where a nationalist party (Front National) had good chances of winning and was allied with an Italian nationalist party (Lega). The victory of a pro-European party (En Marche) in the French elections and the associated retreat of the nationalists have lessened redenomination risk both on French and Italian public debt, which is consistent with the subsequent narrowing of the *Quanto-Legal basis* on Italian government bonds.

Figure 5 – Quanto-Legal basis for a pair of Italian government bonds expiring in 2033 (bps)

Source: Author's calculations on Bloomberg data
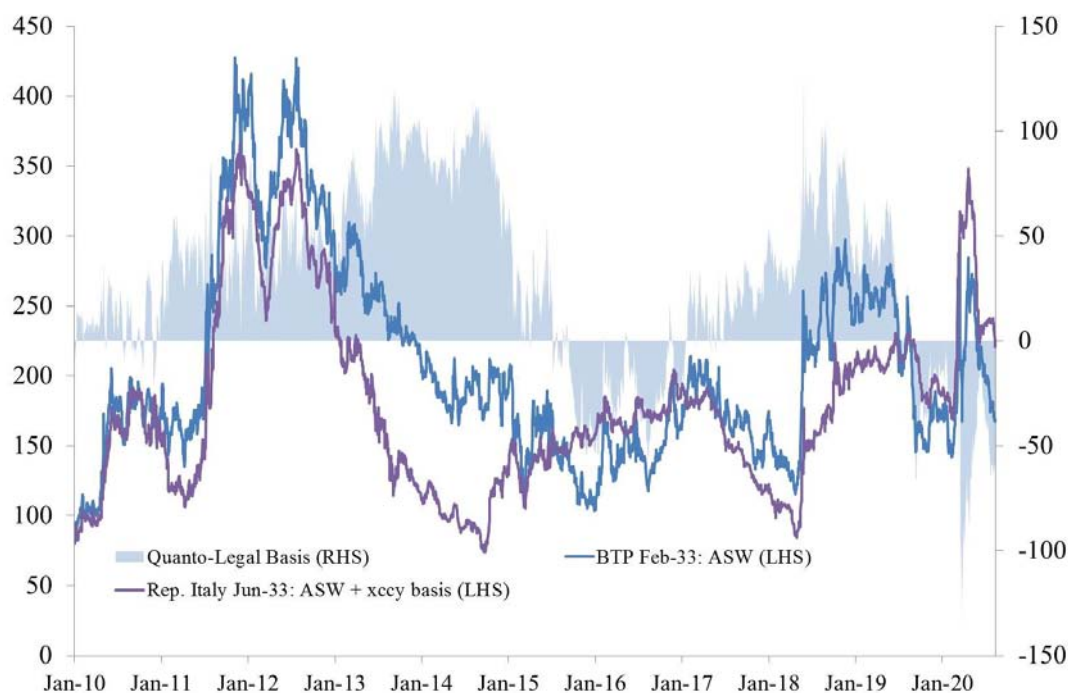
However, from the second quarter 2018 the bigger uncertainty surrounding the future of Italy as a member of the euro area has pushed investors to short the

local law government bond and go long on the Republic of Italy foreign law bond. This trade strategy continued up to Autumn 2018, then investors started to opt more and more often with the opposite strategy as the political and fiscal situation in Italy evolved overall towards conditions of greater stability that reduced the markets' estimates of the probability of an Italexit. Towards mid-2019 the *basis* was essentially nil and turned negative during the second half of the same year. Since then it has remained in negative territory, approaching zero on some occasions, including on March 17, 2020, at the height of pressures on Italian government bonds following the Covid-19 emergency and on the eve of the announcement of the Pandemic Emergency Purchase Program (PEPP) by the ECB.

Another legal feature that can affect the applicability of the *Lex Monetae* to sovereign bonds issued by EMU countries are the standardized Collective Action Clauses (CACs) that have been increasingly attached to these bonds since 2013.

The 2012 ESM establishing treaty has prescribed that, from January 2013 onwards, a growing share of the new issuances of Eurozone government bonds with maturity beyond the year would have embedded model-CACs to make it easier – after the experience of the Greek default in March 2012[13] – to unlock debt restructurings that are welcome by the Official Sector. One of the main purposes of the CACs was in fact the implementation of a majority vote binding on all debt holders with the aim of overcoming the '*holdout problem*', that is the possibility that holdout bondholders acquire a blocking minority in one bond issue to resist the restructuring of the bonds, creating disruption and negatively affecting the outcome of the operation [Mediobanca Securities, 2017].

Table 1 illustrates the qualified majorities required by euro area model-CACs to approve a modification on the bond's characteristics concerning reserved matters, that is those matters involving a change to the bond's most important

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[13] The decision on the mandatory inclusion of standardized CACs in all new euro area government securities is part of the wider set of measures intended to safeguard financial stability in the euro area that had been announced by euro area finance ministers on 28 November 2010 (a few weeks after the Deauville summit, see Section 2). This commitment was included in the ESM treaty signed on the 2 February 2012 between the euro area member States. See: https://europa.eu/efc/sites/default/files/docs/pages/final_-_cac_public_report.pdf

terms and conditions[14].

Table 1 – Quorum and approval thresholds on euro-area model-CACs

	Single Series - meeting	Cross Series - meeting	Single Series – written resolution	Cross Series – written resolution
Quorum	$66\,^2/_3\%$ of the outstanding principal amount of all bonds	$66\,^2/_3\%$ of the oustanding principal amount of all affected series	N/A	N/A
Approval Threshold	75% of the outstanding principal amount of all bonds represented at the meeting	75% of the outstanding principal amount of all affected series represented at the meeting and $66\,^2/_3$ % of the outstanding principal amount of each bond series represented at the meeting	$66\,^2/_3\%$ of the outstanding principal amount of all bonds	$66\,^2/_3\%$ of the oustanding principal amount of all affected series and 50% of each affected series

However, as observed by Morgan Stanley [Morgan Stanley, 2017], the achievement of the qualified majorities envisaged by the model-CACs can be more or less difficult depending on the type of modification that the issuing State intends to implement. Indeed, if in some cases – such as in a principal reduction event – the decision of the bondholders could be more unanimous depending on the assessment of the economic consequences of the restructuring, in other cases it is reasonable to expect a greater fragmentation among bondholders. For example, in a scenario of redenomination in another currency, domestic bondholders could be favorable and foreign ones could not. In this scenario, therefore, it seems more likely the establishment of a qualified minority of bondholders willing to hinder the potential attempt of the issuing State to redenominate in a new currency government bonds that include model-CACs [Morgan Stanley, 2017; Minenna, 2018-*b*]. This makes bonds embedding model-

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[14] With regard to the model-CACs voting procedure in case of cross-series modification, as shown in Table 1, currently a two-limb set-up is envisaged. The draft text of the reformed ESM treaty published in June 2019 provides for the switch to a single-limb voting procedure starting from 2022. With the new procedure, the consensus expressed by a qualified majority of the holders of all affected bonds would be enough to give the green light to a restructuring proposal without the need to reach also a qualified majority of the holders of each bond series involved in the restructuring project (as instead currently foreseen). See: https://www.consilium.europa. eu/media/39772/revised-esm-treaty-2.pdf. The future revision of the CACs technical features could explicitly address also redenomination risk, for example by excluding this option from the set of available choices to sovereign issuers.

CACs safer than similar bonds of the same issuer without such clauses when there is a surge in the odds of a redenomination outcome.

In addition, as observed by Morgan Stanley, the unconventional measures adopted by the ECB since 2014 (just over a year after the introduction of model-CACs) have significantly reduced yields in the euro area. Consequently, for a given sovereign issuer, it is usual to find CAC bonds paying a lower coupon than bonds issued by the same sovereign before 2013 (that is, bonds not embedding the model-CACs provided by the ESM treaty). Other things being equal, a lower coupon generates a lower loss for bondholders in case of a credit event; thus, low-coupon securities are considered less risky than high-coupon securities.

In light of the foregoing, it seems reasonable to assume that, when redenomination risk becomes significant, CAC bonds with low coupons trade higher than non-CAC bonds paying high coupons. This would be consistent with the presence of a *CAC-coupon basis* that, indeed, has been recorded on Italian government bonds at times when markets' fears of an Italexit have risen.

Figure 6 displays the behavior of the *basis* for a pair of Italian government bonds with and without CACs and with comparable expiry dates (between December 2021 and March 2022).

Figure 6 – CAC-coupon basis for a pair of comparable Italian government bonds
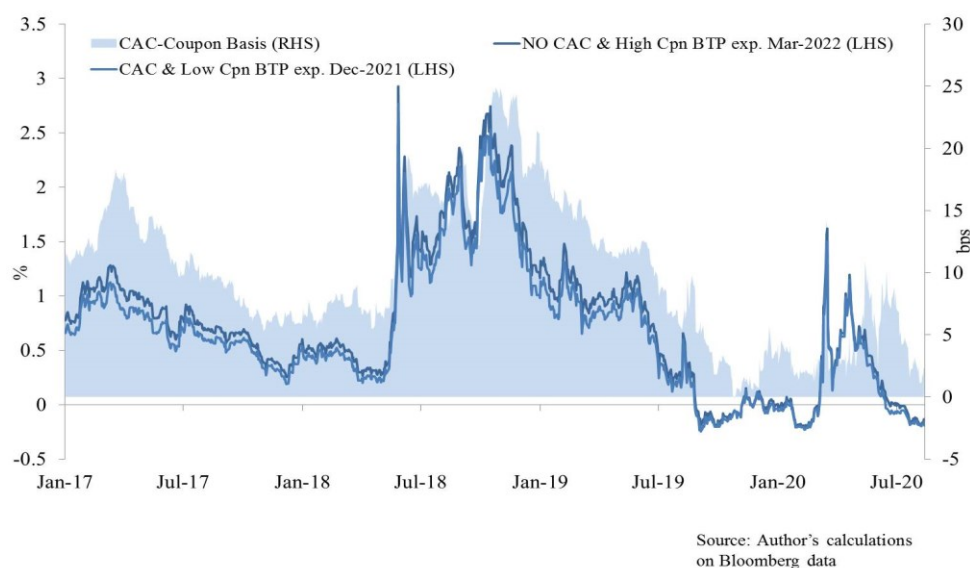
From January to March 2017, the *CAC-coupon basis* soared reflecting

investors' perception of an increased redenomination risk for Italy in response to the developments of the electoral campaign in France and the related investors perception of a contagion effect (and, hence, a strengthened redenomination risk) on Italy. The next upwards spike of the *basis* occurred in late May 2018, in sync with the new Italian government coalition between Lega and Five Stars Movement, two parties sharing similar critics and disappointment towards the European ruling class. This new period of wider values of the *CAC-coupon basis* lasted until end 2018. After the peaks reached in autumn that year – when there was a tug of war with the European Commission on the Italian budget plan for 2019 – the *basis* moved on a substantially downwards trend and, since the end of August 2019 (with the arrival of a new government welcomed by the Euro-bureaucracy), it continued to shrink.

A further increase in the *basis* occurred in the second decade of March 2020, during the escalation of Covid-19 infections in Italy, with a peak of 14.3 basis points reached on March 17, on the eve of the ECB's decision to launch the PEPP. In the following weeks, the *CAC-coupon basis* began to shrink in a volatile climate and then in a more stable way as Italy was emerging from the health emergency and Europe approaching the agreement on the Recovery Fund.

Inflation-linked government bonds (*linkers*) also embed useful information about redenomination risk perceived by the financial markets. By definition, linkers provide investors with an hedge against the inflation risk these bonds are indexed to. Therefore, the higher is the inflation risk considered, the higher is the protection offered by the linker, and the higher its value too (or, equivalently, the lower its implied yield).

Over time, some member governments have issued *linkers* indexed to the domestic inflation and others indexed to the Eurozone inflation[15]. *Coeteris paribus,* the key difference between the two kinds of bonds (in the following also

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[15] As recalled in Section 2, Eurozone inflation is a weighted average of the inflation values of its member countries; this means that, usually, none country-specific reading coincides with the Eurozone reading, but there is a more or less wide gap.

domestic linkers and *Euro-linkers*, respectively) are the different markets' expectations on future domestic and Eurozone-wide inflation dynamics. In turn, markets' expectations on future domestic inflation – and, thus, also on the future performance of *domestic linkers* – depend in some extent on the investors' assessment of the likelihood of an *exit* scenario for that specific country.

In particular, for some countries – such as Italy – expected inflation is completely different under either a *stay* or *exit* scenario: under a *stay* scenario, Italy is currently expected to experience stronger deflationary pressures than the Eurozone's average, whereas under an *exit* scenario, expectations on future Italian inflation would be dramatically reversed, as market's participants essentially believe that in such a scenario Italy would devalue its currency fueling a sustained growth in domestic prices.

Following this line of reasoning, the yield spread between a *domestic linker* and a *Euro-linker*, both issued by the Italian government and with similar time to maturity, should contain relevant information on redenomination risk perceived by investors. On the one hand, if Italy is considered a stable member of the euro area (low redenomination risk), this spread (hereinafter also *Linker basis*) tends to widen in the domain of positive numbers as the *Euro-linker* tends to over-perform compared to the *domestic linker*. On the other hand, in front of increased redenomination fears, markets' participants should price larger inflation expectations for *domestic linkers*; as a consequence, these bonds should appreciate with respect to *Euro-linkers* issued by the Italian government resulting in a narrowing pressure on the *Linker basis*, which can even turn to the negative domain.

Empirical data confirm the above insight about the pattern of the *Linker basis* for Italian linkers[16]. Figure 7 displays the *Linker basis* for a pair of Italian government bonds expiring in 2024 and linked to the domestic and to the Euro-

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[16]Italy is the largest issuer of euro area inflation-linked bonds and makes up for over 40% of the total. About a third of the total amount of linkers issued by Italy are BTP Italia, which are indexed to domestic inflation, the remaining two-thirds are linked to Eurozone inflation.

zone inflation, respectively.

Figure 7 – Linker basis for a pair of Italian government bonds expiring in 2024
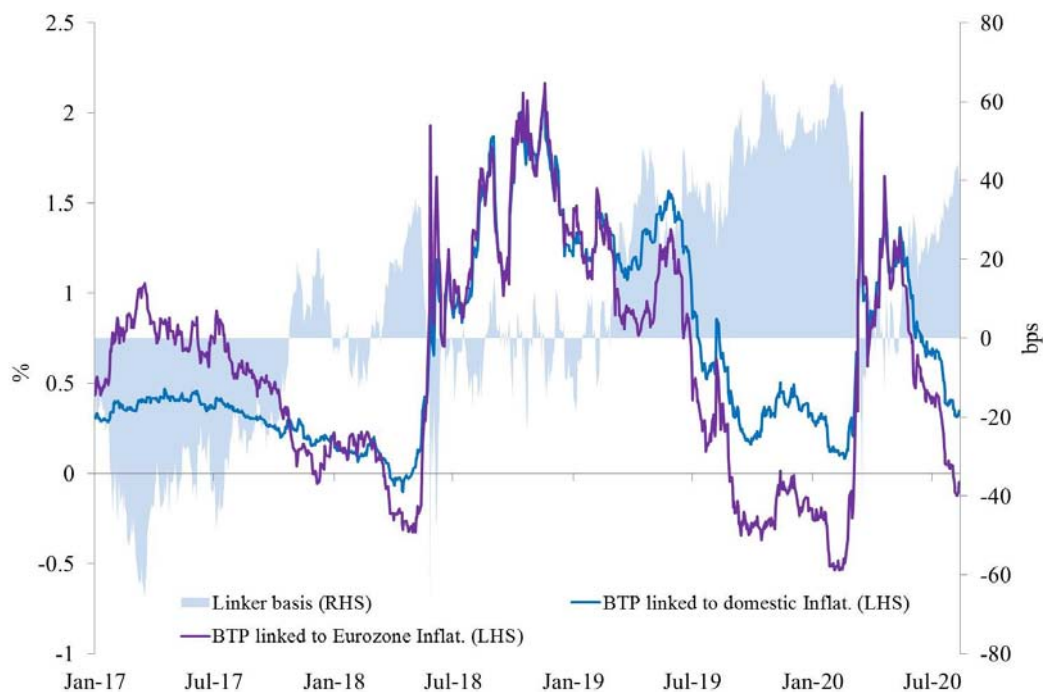
The *basis* went negative in early 2017 in conjunction with concerns about the outcome of the presidential vote in France and then began to widen again starting from the second quarter of 2017, indicating fading Italexit fears by markets' participants. The *Linker basis* started to shrink again in the first months of 2018 as the political climate overheated due to the approaching political elections in early March that year and then, after a pause of a few months, it experienced a marked narrowing at the end May 2019 (with a negative peak of -70 basis points on May 29th) in sync with the establishment of a government coalition between two populist parties. Since March 2019, the *Linker basis* has steadily returned positive but has nevertheless remained sensitive to internal political events. In particular, after a drop of around 23 basis points due to the opening of a government crisis in the first half of August 2019, it started to rise again in the second half of that month as it took shape the hypothesis of a new executive that would not have questioned Italy's membership in the Eurozone.

This new period of stability lasted approximately until the end of February 2020; in early March 2020 a new phase of turbulence began – in conjunction with the boom in Covid-19 infections recorded in Italy – with the *Linker basis* oscillating between the positive and negative sign until mid-May (the negative peak was recorded on March 18th, the same day on which, after the markets' close, the ECB announced the launch of the PEPP).

4. The previous Section has presented three indicators of redenomination risk based on the yield spread bwtween pairs of bonds issued by the same Eurozone country and displaying contractual differences with regards to specific features relevant in a scenario of exit of that country from the currency union.

However, all the three indicators are only broad metrics of the redenomination risk.

The *Quanto-Legal basis* is often used in the literature as proxy for redenomination risk. Krishnamurthy *et al*. [2017] propose a breakdown of German, French and Italian sovereign yields into five components, of which two are common to all countries within the euro area (namely, an expectations hypothesis component and a euro-term premium component), and the remaining three are country-specific: a default risk premium, a redenomination risk premium and sovereign bond market segmentation component. With regard to the measurement of the redenomination risk premium, a key assumption is that redenomination risk affects differently foreign versus local law bonds, while conventional default risk (meant as any credit event other than the change in the currency of denomination) does not. As pointed out by Kremens [2018], the second part of this assumption is questionable, because foreign law bonds are often harder to restructure than local law bonds. This implies that in highly distressed times, a widening of the *Quanto-Legal basis* can reflect not only a higher redenomination risk but also a wider conventional default risk.

In addition, the large part of sovereign bonds issued by euro area countries are under local law, while foreign law issuances represent a small minority of total

sovereign debt and often embed larger liquidity premiums than local law bonds. To deal with such problems, in assessing the foreign law premium some authors compare euro-denominated local law sovereign bonds of a given Eurozone country with foreign law bonds denominated in foreign currency that have been issued by a corporate resident in that country. In carrying out this comparison some work [Bayer et. al, 2018] provides for adjustments aimed at controlling for the different credit risk of the two issuers (sovereign and corporate) by using their respective Credit Default Swaps to directly identify the cost of the default probability, but such adjustment hardly corrects also for liquidity differences among issuances and for the harder-to-restructure feature of international bonds.

Similarly to the *Quanto-Legal basis*, also for the *CAC-coupon basis* the distinction between redenomination risk and conventional default risk can be problematic. When the credit risk of the issuing State increases, the presence of model-CACs can contribute to increase the riskiness of the bonds since these clauses make debt restructurings easier. Consequently, at times when redenomination risk and restructuring risk soar synchronously, the relative pricing of bonds with and without CACs will be the result of two opposite trends. Furthermore, with specific regard to the losses arising from a possible redenomination, CAC-inclusive bonds could result unhedged or only partially hedged, making the *basis* a biased indicator of redenomination risk. Gulati and Weidemaier [2017] note that, for example, it could be the case that the super-majority required to approve the redenomination is reached or that the sovereign issuer willing to redenominate its public debt accepts to pay a higher recovery value on these bonds than on non-CAC bonds in order to not engage in litigation with the holders of CAC-bonds[17].

The *Linker basis* deserves a separate comment. With few exceptions

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[17]For the sake of completeness, it should also be recalled that some authors argue that the CAC bonds privilege is due to the reduction of the legal uncertainty deriving from the presence of these clauses rather than implied redenomination hedge [Carletti *et al.*, 2018], whereas other authors list the redenomination hedge among the possible explanations for the lower yields observed on bonds embedding model-CACs [Picarelli *et al.*, 2018].

[Minenna 2020; Ranasinghe *et al.*, 2018], this indicator is not used in the literature to quantify redenomination risk. This is likely due to the fact that the pricing of inflation-linked bonds also depends on global macro factors (such as oil prices etc.). Furthermore, it is not necessarily true that in the event of debt redenomination and devaluation of the new national currency of the withdrawing State, that State would also experience high inflation.

In addition to the bond-based indicators examined so far, there are additional market indicators of redenomination risk that are based on the market prices of sovereign Credit Default Swaps (CDS): the *Quanto spread* and the *ISDA basis*.

4.1. CDS can be settled in different currencies. In the case of Eurozone sovereign issuers, the main denomination currencies are the US dollar and the euro with different premiums. In normal times, the spread between dollar-denominated CDS and euro-denominated CDS – so-called *Quanto CDS spread* or, simply, *Quanto spread* – is affected by the relative strength of the currencies considered. But in the case of a State withdrawing from the euro area, it is reasonable to expect that also the euro as currency would be under stress and subject to a more or less severe devaluation. This would imply that also the amount paid to CDS protection buyers as compensation for the loss given default would be worth less. Not to mention the extreme scenario in which the exit of a member State and the related contagion effects would end up in the break-up of the euro area; in such a scenario, in fact, the settlement currency of the CDS would cease to exist, creating many problems in the settlement of the amounts envisaged by the contract. Conversely, dollar-denominated CDS would be hedged against both a euro devaluation or a euro break-up. Because of this feature euro-denominated CDS trade at a discount in the countries suspected of withdrawing from the EMU. As the redenomination outcome is perceived as more likely, the *Quanto spread* tends to widen, explaining why this spread is sometimes used as

proxy for redenomination risk [De Santis, 2015; Borri, 2019; De Santis, 2019[18]].

Yet, as metric of redenomination risk, also the *Quanto spread* presents several limits.

A first issue comes from the fact that dollar-denominated CDS contracts offer a better protection than their euro-denominated peers not only in a redenomination scenario but also in case of conventional default. Indeed, also the upheaval produced by a sovereign default is likely to shake the euro and push towards its depreciation, hence causing the *Quanto spread* to widen albeit there is not a surge in redenomination risk.

A second issue relates to the legal features of the CDS contracts used to calculate the *Quanto-spread*. Worldwide, the list of the credit events whose occurrence triggers the activation of the protection provided by the CDS is provided in the ISDA Credit Derivatives Definitions, where ISDA stands for International Swaps and Derivatives Association. Up to September 2014, the ISDA Definitions in force were those established in 2003 [ISDA, 2003], in which three credit events were applicable to sovereign bonds [Martinez Romero, 2019]: (1) repudiation and moratorium of debt, (2) failure to pay the obligations, and (3) debt restructuring. The latter is the credit event ruling State insolvency and redenomination. In particular, under 2003 ISDA Definitions, a debt restructuring through redenomination into another currency activates the CDS protection if the new currency of denomination is not a '*permitted currency*', that is a currency being the legal tender of a G7 country or of a country that is member of the Organization for Economic Cooperation and Development (OECD) and whose long-term debt, at the date of the change of currency, has a AAA rating released by either Standard & Poor's, Moody's or Fitch. Within the euro area only Germany, France and Italy are G7 countries; should one of these countries leave the currency union and redenominate its debt into its new national currency, this

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[18] In order to control for the effect of the FX market expectations on the EUR-USD parity, De Santis considers the *Quanto spread* of Eurozone countries in relative terms with respect to Germany's *Quanto spread*. Given Germany's negligible credit risk, its *Quanto spread* represents a good proxy for the expected movements of the EUR-USD exchange rate.

would not trigger the protection provided by the ISDA-2003 CDS. A similar argument also holds for Eurozone countries that, albeit not being in the G7, are OECD members and have a AAA-rated long-term debt, such as Luxembourg and the Netherlands.

Therefore, for these two clusters of countries the *Quanto spread* based on CDS contracts obeying 2003 ISDA Definitions is not a good proxy for redenomination risk, whereas it is for countries comprised in the residual cluster, namely those that are not G7 members and whose long-term debt does not have a AAA rating, such as Spain, Portugal and Greece. It has been observed [De Santis, 2019] that, although in the case of G7 or OECD and AAA-rated countries debt redenomination does not trigger a credit event, if the country is economically weak, its new legal currency would depreciate and the real value of the assets would decline with effect on CDS contracts, which are based on markets expectations.

A third criticality with the *Quanto spread* is due to the progressive dismissal of euro-denominated CDS referred to Eurozone sovereign issuers. In fact, because of the limited protection offered by CDS settled in the reference currency of these issuers, following the sovereign debt crisis market participants feel more comfortable with dollar-denominated CDS when they look for protection against disruptive events. As a consequence of this phenomenon, some data providers (e.g. Bloomberg) have dismissed premiums of euro-denominated sovereign CDS for euro area countries; other data providers (Reuters) continue to report the premiums of these contracts which, however, have become illiquid.

4.2. In September 2014 the ISDA has implemented new Credit Derivatives Definitions [ISDA, 2014] that have explicitly addressed the matter of debt redenomination by Eurozone sovereign issuers. In the new Definitions, any reference to the rating and to membership in the G7 or the OECD disappears; in their place, it is established that a change in the currency of any payment of interest, principal or premium does not involve restructuring if the new currency

of denomination is the one that is legal tender in Canada, Japan, Switzerland, United Kingdom, United States or if it is the euro or «*any successor currency to any of the aforementioned currencies (which in the case of the euro, shall mean the currency which succeeds to and replaces the euro in whole)*»[19].

The clarification in brackets with regard to any successor currency to the euro is clear-cut: to exclude the occurrence of a restructuring, it must replace the euro in whole, thus it cannot be any new national currency adopted by a member State withdrawing from the EMU. Neither a new Italian lira, or French franc, or German mark, or Spanish peseta, etc..

It follows that sovereign CDS contracts under the 2014 ISDA Definitions provide protection in case of debt redenomination by whatever Eurozone country. Recalling from Section 4.1 that under the 2003 ISDA Definitions a similar protection was not provided by CDS referred to G7 members or to AAA-rated OECD members, it is straightforward that the difference between the 2014-CDS premium and the 2003-premium – so-called *ISDA basis* – is a proxy for redenomination risk of these countries [Minenna, 2017].

At the time of writing, the list of Eurozone countries for which the *ISDA basis* is an indicator of redenomination risk is: Germany, France, Italy, Luxembourg and the Netherlands.

The 2014 ISDA Definitions introduced several other new terms that, overall, improved the protections in case of a credit event on sovereign reference entities. In particular, it was introduced the Asset Package Delivery (APD), which permits the settlement of CDS for which credit events have occurred, notwithstanding the disappearance (whether by exchange or expropriation) of reference obligations or deliverable obligations. APD provisions were in part a response to Greece's 2012 debt restructuring, in which the Greek government had used a collective action clause under domestic law to exchange certain debt before an auction to settle credit default swaps could be held. As a result of the debt exchange there had

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[19] Obviously, in order to constitute a restructuring, redenomination must lead to a reduction in the rate or amount of interest, principal or premium payable.

been fewer bonds constituting deliverable obligations for purposes of the auction needed to determine the final settlement price for CDS contracts. In similar instances, the new APD provisions allow to settle the credit event by delivery of assets into which sovereign debt is converted[20].

Due to these further differences compared to the 2003 Definitions, the *ISDA basis* is not exclusively attributable to redenomination risk, as evidenced by the fact that it is different from zero even for sovereign reference entities – such as Spain, Greece or Portugal – for which 2003-ISDA CDS contracts already provided protection in the event of a change of currency.

Even with this caveat, currently the *ISDA basis* represents the best available indicator of redenomination risk for the euro area countries for which the 2003-ISDA CDS did not offer protection in the event of redenomination[21].

5. This Section is devoted to analyze redenomination risk on Italian public debt focusing on its contribution to the country's sovereign risk.

The choice of Italy among Eurozone member States comes essentially from two facts: (1) it has the second largest public debt in the euro area both in absolute values and in GDP terms[22], and (2) it is the country that in recent years has experienced the largest spikes in redenomination risk[23].

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[20]Other novelties include: the possibility to adopt a standardized reference obligation across all market-standard CDS contracts on the same reference entity and seniority level, upgraded provisions dealing with transfers of debt to successor reference entities, an extension of the scope of guarantees that can be hedged with CDS, a more rational treatment of contingent debt and guarantee obligations and adjustments to the restructuring settlement mechanism.

[21]In order to remove from the *ISDA basis* of these countries the components that are extraneous to redenomination risk, Kremens uses a difference-in-differences approach to estimate the contribution to the *basis* of the component related to the APD effect and to the different liquidity of 2014 ISDA CDS contracts compared to 2003 ISDA CDS contracts [Kremens, 2018]. The estimate of this component is carried out using non-G7 countries as a control; however, this requires numerous additional working hypotheses that risk compromising the reliability and significance of the results obtained.

[22]According to the Eurostat database, in the first quarter 2020, Italian public debt amounts to 2431 billion euros (just below the 2438 billion euro of the French one), corresponding to 137.6% of the country's GDP (only Greek debt-GDP ratio is higher, equal to 176.7%).

[23]It is worth recalling that Bank of Italy has the largest Target2 deficit within all participants in the Eurosystem: -522 billion euros as of end July 2020. In an uncooperative Italexit scenario, it could

The main driver of such risk are internal politics [Kremens, 2018; De Santis, 2018; Gros, 2018]. The establishment of a coalition government between two populist parties (Lega and Five Stars Movement) in late May 2018 has led to the all-time high in redenomination risk, as testified by all bond-based redenomination indicators (see Section 3). In fact, it was clear that the new government would have had a confrontational attitude towards the European institutions, especially with regard to the compliance with constraints on public expenditure.

As explained in Section 2, Eurozone membership has become a harder and harder issue for peripheral countries. In front of the uncooperative attitude of the European ruling class and of Central-Northern countries, the unsustainability of the euro has resulted in a rising anti-European sentiment among the citizens of peripheral countries and in a large consensus to Eurosceptic parties. Before Italy, this phenomenon had already occurred in Greece in the months preceding the referendum about the acceptance of the bailout conditions proposed by the Troika, and in France in the first months of 2017 during the electoral campaign for the presidential vote.

The Italian case is particularly impressive. From 2000 to 2019, the country has seen its share of Eurozone GDP continuously decreasing, from 18.4% to 15.1%. Years of subdued growth, high unemployment and fiscal consolidation have fueled social discontent and disaffection with Europe. The establishment of a populist government in late May 2018 was in part an inevitable consequence of this prolonged state of disease and was characterized by a leap in country's redenomination risk.

The new internal political order has also consolidated a progressive isolation of Italy within the Eurozone and, more generally, within the entire European Union. An evident sign in this sense was the acceleration of the decoupling between the yields on Italian and Spanish government bonds, which

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refute to settle all or part of its 'debt' with the Eurosystem, imposing a huge loss on the other NCBs.

had started in late 2016 after years of aligned performances [Minenna, 2020].

At the end of August 2019 it began a phase of normalization of redenomination risk on Italian debt, a signal of newfound harmony with Europe also confirmed by the narrowing of the yield spread between BTPs and BONOs.

However, since the end of February 2020 the outbreak of Covid-19 has again threatened this delicate equilibrium. In particular, between March 9, 2020 – when all of Italy was entering the lockdown – and May 15, 2020, new fibrillations of the risk of an Italexit were recorded albeit without ever reaching the peaks seen in the previous two years. This time markets' jitters were not triggered by the confrontational attitude of the Italian political leadership, but rather by the disappointing initial response of the European institutions to the Covid-19 emergency, such as the first statements of the ECB President about the fact that *'closing the spreads'* is not the ECB's job and the initial hesitations of the EU Commission on easing the fiscal constraints established by Brussels.

Given the risk segregation attitude that had characterized the management of the sovereign debt crisis by the European institutions, the markets immediately interpreted these first episodes as a signal that, even in the face of the shock produced by Covid-19, Europe would have again preached the self-reliance of individual member States and that it would not have intervened to help the most affected countries such as Italy.

Fortunately – in front of the rapid escalation of the health emergency across the continent and its devastating economic effects – European institutions promptly reconsidered the seriousness of the situation and acted accordingly already in the second half of March. On 18 March, the ECB announced the launch of the PEPP with an overall envelope of 750 billion euros and a few days later suspended the issuer/issue limit on its bond purchases. Meanwhile, the European Commission and the Finance Ministers of the European Union have agreed to activate the general safeguard clause of the SGP in order to allow member countries to increase their fiscal spending to counter the crisis without having to worry about an excessive deficit procedure (see Section 2).

Europe's change of attitude has materialized in a series of decisions and interventions to repair the economic damage brought by the coronavirus pandemic: a temporary support to mitigate unemployment risks during the emergency (SURE), a ESM pandemic crisis support that allows governments to borrow funds for medical and healthcare expenses, and a 750 billion euros Recovery Fund to kickstart the recovery. The latter instrument, in particular, represents an important novelty in Europe's crisis management policies because for the first time it is envisaged a mix between grants (52%) and loans (48%). It is therefore a significant step forward towards the transition to a solid institutional contest characterized by a fairer balance between rules and conditionality on the one hand, and risk sharing on the other.

The markets enthusiastically welcomed Europe's solidarity turnaround demanding a lower risk premium for holding bonds issued by peripheral countries, as testified, for Italy, by the reduction in redenomination risk compared to the values seen in the first months of the pandemic.

5.1. In order to examine the contribution of redenomination risk to sovereign risk, the *ISDA basis* will be used as indicator of redenomination risk. This is because – in light of what exposed in Section 4.2 – the *ISDA basis* appears to be the best available market indicator of the risk in point for the Eurozone countries belonging to the G7 or the OECD (in the latter case provided that their long-term debt has a AAA rating).

The analysis spans the period from September 22, 2014 (first implementation day of 2014 ISDA Credit Derivatives Definitions) to July 31, 2020. The long time period considered allows to cover the main episodes of surge in Italy's redenomination risk after the Eurozone sovereign debt crisis, including the latest peaks recorded in conjunction with the boom of Covid-19 infections in Europe where Italy was the first country to be severely hit by the pandemic.

To assess the impact of Italy's redenomination risk on the country's sovereign risk, the explanatory power of two different linear models of daily yields

on government bonds were compared. In the first model, the explanatory variables are the euro area risk-free interest rate (namely, the overnight indexed swap rate or OIS rate) and the conventional credit risk (net of the redenomination risk), measured by the premium on CDS contracts compliant with 2003 ISDA Definitions. The second model includes, as a further explanatory variable, redenomination risk as measured by the *ISDA basis*.

The two models are described by the following equations, respectively:

$$y_t^{IT} = \gamma_0 + \gamma_1 OIS_t + \gamma_2 CDS\_03_t^{IT} + \varepsilon_t \tag{1}$$

and:

$$y_t^{IT} = \gamma_0 + \gamma_1 OIS_t + \gamma_2 CDS\_03_t^{IT} + \gamma_3 ISDA\_basis_t^{IT} + \varepsilon_t \tag{2}$$

where y_t^{IT} denotes the daily return on 5-year Italian government bonds, γ_0 is the intercept, OIS_t denotes the daily 5-year overnight indexed swap rate in the euro area, $CDS\_03_t^{IT}$ denotes the premium on 5-year US dollar-denominated Italy sovereign CDS according to 2003 ISDA Definitions, $ISDA\_basis_t^{IT}$ denotes Italy's 5-year *ISDA basis*, and ε_t is the error component. The choice to consider data referring to a 5-year maturity stems from the fact that this is the most traded maturity for CDS contracts.

In order to properly study the relevance of redenomination risk in Italy, the same pair of models was estimated also for the other three largest Eurozone countries, namely Germany, France and Spain[24]. Thus, Eq. [1] and [2] can be generalized, respectively, as follows:

$$y_t^i = \gamma_0 + \gamma_1 OIS_t + \gamma_2 CDS\_03_t^i + \varepsilon_t \tag{3}$$

and:

$$y_t^i = \gamma_0 + \gamma_1 OIS_t + \gamma_2 CDS\_03_t^i + \gamma_3 ISDA\_basis_t^i + \varepsilon_t \tag{4}$$

where *i* = Italy, Germany, France or Spain.

Input data for models in Equations [3] and [4] were downloaded from

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[24]With specific regard to Spain, the meaning of the *ISDA basis* variable in Eq. [4] has to be interpreted with caution, recalling that – as seen in Section 4.2 – Spain is one of the euro area countries for which also CDS compliant with the 2003 ISDA Credit Derivatives Definitions provide protection in case of debt redenomination.

Bloomberg. Regressions were run in first differences, namely estimating the coefficients of the following equations:

$$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \varepsilon_t \qquad 5]$$

and:

$$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \beta_3 \Delta ISDA\_basis_t^i + \varepsilon_t \qquad 6]$$

Both models were estimated on the full sample period (September 22, 2014 – July 31, 2020) and on three distinct sub-periods:

a. September 22, 2014 – July 31, 2016

b. May 1st, 2018 – September 30, 2018

c. February 20, 2020 – July 31, 2020.

Sub-period *a.* is relevant as a control period. This time frame was relatively quiet for the euro area with no large shocks, apart from the third Greek debt crisis that, however, in the end was managed in line with the guidelines of the European institutions. Furthermore, during this sub-period the ECB has launched its quantitative easing, of which the largest share was represented precisely by government debt securities, hence favoring a broad easing of markets' assessment on the sovereign risk of Eurozone member States.

Sub-period *b.* is relevant as it essentially covers the first months of the coalition government between two populist parties (Lega and Five Stars Movement) in Italy. Officially this government has been in office since 1st June 2018, but the previous weeks were characterized by a convulsive climate that fueled the investors' risk aversion. During the negotiations that led to the formation of the government, the two leading parties worked on a contract containing what should have been the key points of their government action. One of the drafts of this contract envisaged the introduction of specific technical procedures for single States to leave the Eurozone and regain monetary sovereignty[25].

Sub-period *c.* is relevant as it basically coincides with the outbreak of Covid-

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[25]See Huffington Post Italy, May 15, 2018 (https://www.huffingtonpost.it/2018/05/15/un-comitato-di-conciliazione-parallelo-al-consiglio-dei-ministri_a_23435353/).

19 in Europe with different degrees of harm across member countries. Thus, unlike sub-period *b.*, it represents a semi-symmetric and exogenous shock, which however has temporarily raised redenomination fears, albeit to a lesser extent than in previous episodes.

5.2. Figure 8 plots the *ISDA basis* for Italy, France, Germany and Spain over the full sample period (2014-09-22 - 2020-07-31).

At a glance, it can be observed that from 2017 onwards, Italy's *ISDA basis* embarks on a new phase characterized by significantly higher values than in the previous period, greater volatility and levels significantly higher than those of the other countries considered. Also for the other countries 2017 marks the start of a period of greater volatility in the *ISDA basis* and of generally higher levels.

Figure 8 – ISDA basis for Italy, France, Germany and Spain – Full sample period
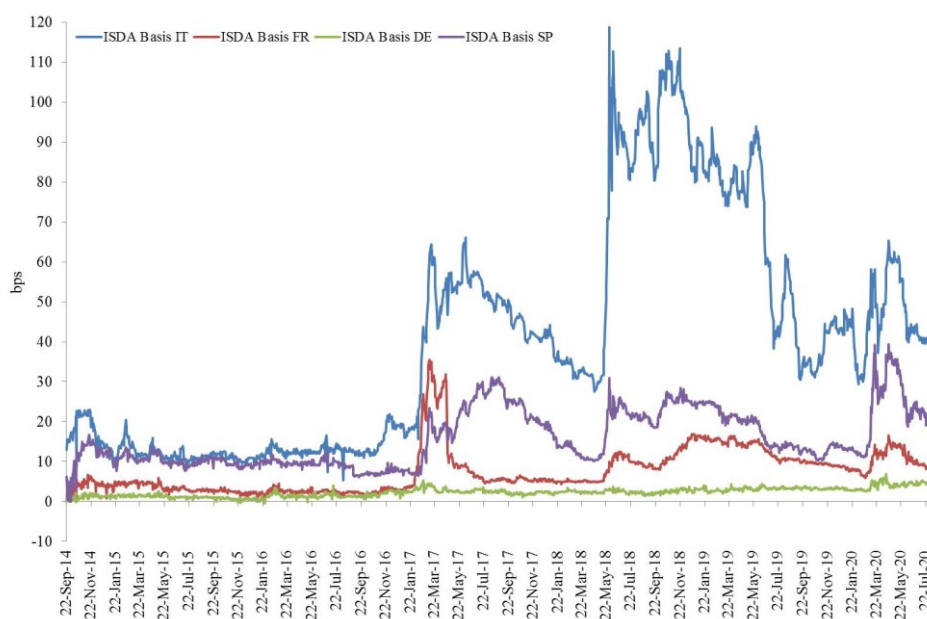
Source: Bloomberg

A special mention deserves Germany's *ISDA basis*, which remains below 10 basis points over the entire period. This behavior is consistent with the markets' expectation that, in the event of Germany's withdrawal from the Eurozone, the exchange rate of the new mark against the main global currencies would be stronger than the exchange rate of the euro against the same currencies. Therefore, any redenomination of German debt into new marks would not entail

losses for the bondholders who could rather make capital gains.

Tables 2/A and 2/B report the results of the time series regressions corresponding to the models of Eq. [5] and [6], respectively.

Table 2/A: full sample period (1477 days) - Eq. [5]

	IT	FR	DE	SP
$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \varepsilon_t$ *i= IT, FR, DE, SP*				
Country	**IT**	**FR**	**DE**	**SP**
intercept	0.000157772 −0.1220	−7.99475e-06 −0.01803	−0.000126348 −0.3686	−0.000188062 −0.2564
d_OIS	1.08506 (***) 17.12	1.06923 (***) 50.15	1.13328 (***) 69.25	0.822454 (***) 23.23
d_CDS03_LOC	1.24698 (***) 48.5	0.658521 (***) 13.73	−0.215352(***) −3.654	0.743535 (***) 30.77
R^2	0.617947	0.634093	0.768574	0.464452

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5%
significance (*)=10% significance.

Comparing the regression outputs in Tables 2/A and 2/B, it emerges that, over the full sample period, the *ISDA basis* has a relevant explanatory power of Italy's sovereign yields with an estimated coefficient of 1.2113 and an associated t-ratio above 21. The inclusion of this explanatory variable involves a significant improvement in the R^2 of the regression (from 0.617947 to 0.708417). In addition, its coefficient is higher than the one of the 2003 ISDA CDS, which indicates that, over the entire time interval between September 2014 and July 2020, redenomination risk overall influenced yields on BTPs more than Italy's conventional credit risk.

$$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \beta_3 \Delta ISDA\_basis_t^i + \varepsilon_t$$

$i = IT, FR, DE, SP$

Country	IT	FR	DE	SP
intercept	−0.000212407	−1.86171e-05	−0.000124450	−0.000215415
	−0.1879	−0.04259	−0.3630	−0.2959
d_OIS	1.11091 (***)	1.07061 (***)	1.13281 (***)	0.826083 (***)
	20.06	50.94	69.18	23.5
d_CDS03_LOC	0.943092 (***)	0.640392 (***)	−0.224920 (***)	0.714902 (***)
	35.47	13.52	−3.753	28.92
d_ISDA_basis_LOC	1.2113 (***)	0.330981 (***)	−0.0733763	0.320594 (***)
	21.38	6.619	−0.8837	4.78
R^2	0.708417	0.644661	0.768696	0.47263

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5% significance (*)=10% significance.

The picture is different in the other countries. French and German sovereign yields are mainly driven by OIS dynamics, with a certain impact of conventional credit risk and (to a lesser extent) redenomination risk in the case of French yields, whereas Germany's credit risk has a negligible impact on the yields of its government bonds, and the *ISDA basis* is not a significant driver. The situation in Spain appears to be intermediate compared to Italy and France: credit risk contributes significantly to explaining the evolution of yields on Spanish government bonds, while the *ISDA basis* has a minor contribution also because, the 2003 ISDA CDS already provides protection against the risk of public debt redenomination.

Figure 9 plots the *ISDA basis* for the four countries considered during sub-period *a*. (2014-09-22 - 2016-12-31).

Figure 10 – ISDA basis for Italy, France, Germany and Spain – Sub-period a.
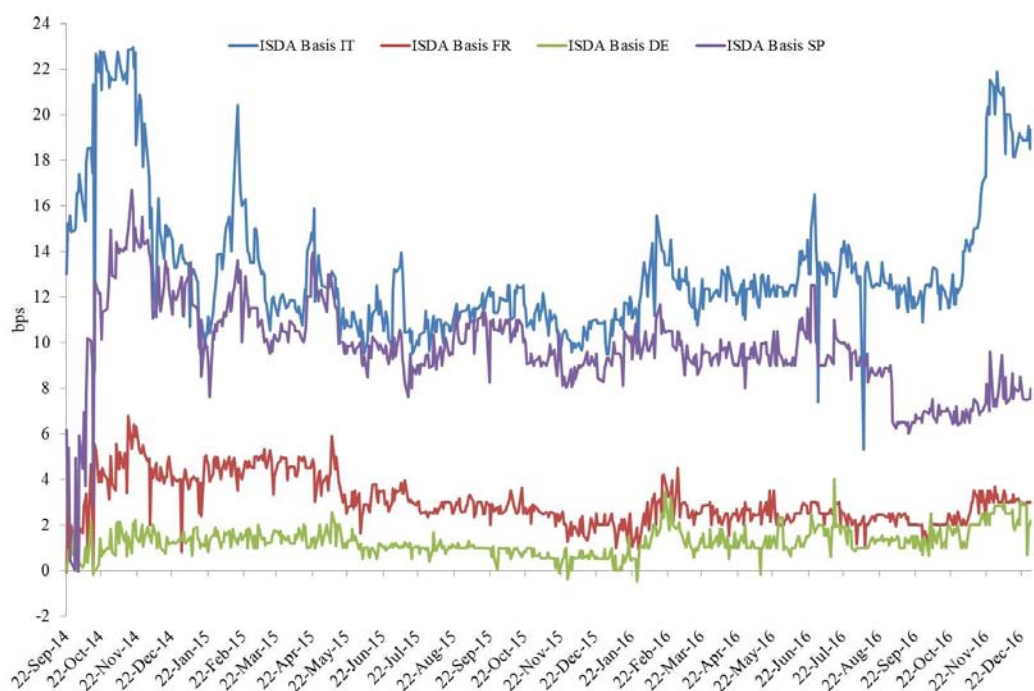
Source: Bloomberg

The low values of the *ISDA basis* for all countries confirm that the period spanning from September 2014 to December 2016 was relatively quiet for the euro area. The markets' perception of redenomination risk was very low also due to the internal political situation of the four countries, all governed by relatively pro-European political forces. In addition, during this period the ECB launched the PSPP, which guaranteed an abundant exceptional demand for euro area government bonds and supported a generalized drop in their yields.

Tables 3/A and 3/B report the results of the time series regressions corresponding to the models of Eq. [5] and [6], respectively, for this sub-period.

Table 3/A: Sub-period a. (575 days) - Eq. [5]

$$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \varepsilon_t$$

$i = IT, FR, DE, SP$

Country	IT	FR	DE	SP
intercept	−0.000922383	−0.000116858	−0.000672504	−0.000369880
	−0.8098	−0.1974	−1.550	−0.2913
d_OIS	0.971998 (***)	0.998562 (***)	1.0337 (***)	0.874501 (***)
	18.57	37.67	53.38	14.94
d_CDS03_LOC	0.719436 (***)	0.501926 (***)	−0.0677033	0.816437 (***)
	26.28	8.892	−1.058	21.91
R^2	0.591329	0.713744	0.836754	0.49509

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5%
significance (*)=10% significance.

The comparison between the two regression outputs highlights that in none of the four countries the *ISDA basis* had a significant influence on government bond yields during this sub-period. For Italy this variable has an estimated coefficient of -0.0670096, dramatically lower than the estimated coefficient over the full sample period. Conventional credit risk remains a driver of BTPs' yields, although reduced compared to the full observation period. Only yields on OATs show a poor sensitivity to redenomination risk of French government bonds, with a negative estimated coefficient but still low in absolute terms and only 5% of statistical significance.

Table 3/B: Sub-period a. (575 days) - Eq. [6]

$$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \beta_3 \Delta ISDA\_basis_t^i + \varepsilon_t$$

i= IT, FR, DE, SP

Country	IT	FR	DE	SP
intercept	−0.000918955	−0.000109366	−0.000673447	−0.000371698
	−0.8065	−0.1856	−1.551	−0.2926
d_OIS	0.969616 (***)	1.00267 (***)	1.03372 (***)	0.872535 (***)
	18.48	37.93	53.34	14.86
d_CDS03_LOC	0.720895 (***)	0.504787 (***)	−0.0664431	0.813609 (***)
	26.26	8.982	−1.035	21.57
d_ISDA_basis_LOC	−0.0670096	−0.174886 (**)	0.0262855	0.0586399
	−0.7586	−2.512	0.2874	0.4921
R^2	0.591741	0.716872	0.836778	0.495304

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5%
significance (*)=10% significance.

Figure 10 plots the *ISDA basis* for the four countries considered during sub-period *b*. (2018-05-01 - 2018-09-30).

The dynamics of Italy's *ISDA basis*, with a leap around mid-May 2018 – when Lega and Five Stars Movement were working on a programmatic government contract – reflect the high uncertainty on the Italian political framework and on Italy's position in the Eurozone during this sub-period. Between May and June 2018, the *basis* rose by around 90 basis points, equivalent to an increase of 300%. In the following months it remained at high levels, in a range 80 and 115 basis points, indicating the persistence of a high redenomination risk. Another leap of about 20 basis points was recorded in September 2018, in conjunction with a new escalation in tensions between the Italian government and Europe in relation to the definition of the economic policy program that the government intended to include in the update document to the draft budgetary

plan for the following year.

Figure 10 – ISDA basis for Italy, France, Germany and Spain – Sub-period b.
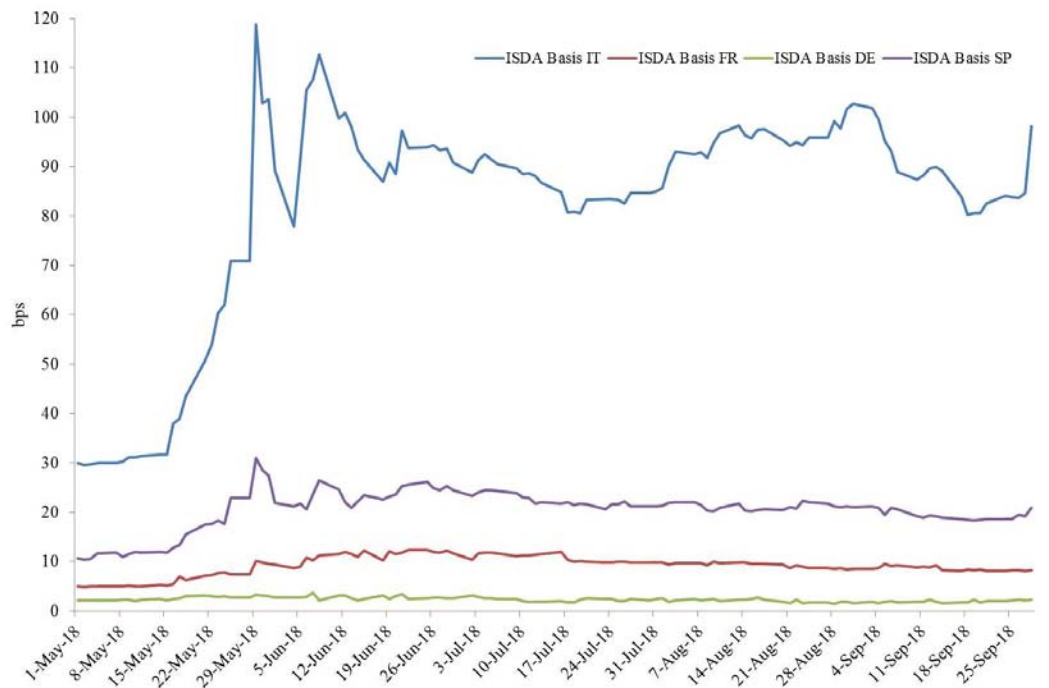
Source: Bloomberg

The surge in Italy's *ISDA basis* has had limited spill overs on the other countries: French *ISDA basis* increased by a few basis points and that of Germany remained essentially unchanged. The reaction of Spain's *ISDA basis* was slightly more significant in the initial phase of the time interval considered (with an increase in the order of 20 basis points), but overall modest.

Tables 4/A and 4/B report the results of the time series regressions corresponding to the models of Eq. [5] and [6], respectively, for this sub-period.

$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \varepsilon_t$ *i= IT, FR, DE, SP*				
Country	**IT**	**FR**	**DE**	**SP**
intercept	−0.000487792 −0.06365	0.000851839 0.4027	−0.000790900 −0.5431	0.0010946 0.3942
d_OIS	0.575272 1.32	1.21828 (***) 10.45	1.45567 (***) 19.52	0.629195 (***) 4.006
d_CDS03_LOC	2.0556 (***) 21.1	0.0176839 0.057	−0.310265 −0.4896	1.08873 (***) 9.136
R^2	0.836668	0.552575	0.7894	0.440637

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5%
significance (*)=10% significance.

During this sub-period redenomination risk was, together with conventional default risk, the main driver of Italian sovereign yields. Movements in the *ISDA basis* were mirrored with a one-to-one proportion in those of BTPs yields (with an estimated coefficient of 1.07731) and, with respect to the full sample, there is a significant improvement in the explanatory power of the model: in fact, the R^2 is equal to 0.869023 against a R^2 of 0.708417 over the entire period from September 2014 to July 2020. Unlike Italy, in other countries the contribution of the *ISDA basis* to the performance of yields on government bonds was low or absent. For both France and Germany neither conventional credit risk nor redenomination risk have significantly affected the evolution of yields.

As for Spain, the two risk factors contributed to defining movements in yields on BONOs during the sub-period considered, but to a more modest extent than in Italy as indicated by the lower value of the estimated coefficients. It is worth observing that if, on the one hand, it could be objected that, in the case of Spain, the *ISDA basis* is not a good proxy for redenomination risk, on the other hand, it can also be argued that, for this country, both the 2003 ISDA CDS

premium and the *ISDA basis* embed an unobservable component related to redenomination risk, which could have contributed to the statistical significance of the two variables reported in Table 4/B. In any case, Spain appears to be the country that has suffered from the deterioration of Italy's sovereign risk profile, but to a limited extent.

Table 4/B: Sub-period b. (109 days) - Eq. [6]

	IT	FR	DE	SP
$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \beta_3 \Delta ISDA\_basis_t^i + \varepsilon_t$				
$i = IT, FR, DE, SP$				
Country	**IT**	**FR**	**DE**	**SP**
intercept	−0.00201838	0.00078116	−0.000791958	0.000742558
	−0.2924	0.3672	−0.5419	0.2715
d_OIS	0.553097	1.22458 (***)	1.45616 (***)	0.779325 (***)
	1.41	10.41	19.46	4.601
d_CDS03_LOC	1.39984 (***)	0.0503284	−0.394127	1.00187 (***)
	8.986	0.1583	−0.5989	8.086
d_ISDA_basis_LOC	1.07731 (***)	0.1843	−0.198898	0.532571 (**)
	5.093	0.5051	−0.4957	2.156
R^2	0.869023	0.55366	0.789892	0.464359

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5% significance (*)=10% significance.

This is consistent with the acceleration in the decoupling between yields on BTPs and BONOs occurred during the sub-period under consideration [Minenna, 2020]. For a long time, since the start of the Eurozone sovereign debt crisis, BTPs and BONOs had displayed very similar performances. Italy and Spain – the two largest economies on the periphery of the Eurozone – had important similarities, for example in terms of overall debt that was equal to around 300% of GDP in both countries, although with a different contribution of the public sector and the private one. However, as early as the second half of 2016, yields on Italian government bonds had begun to move away from the Spanish ones, and in 2017

the yield spread between 5-year BTPs and 5-year BONOs had averaged 45 basis points. As of May 2018, the decoupling between Italian and Spanish yields skyrocketed, peaking over 250 basis points on May 29, 2018, and remained above 100 basis points until August 2019 when the populist government ended and the prospect of a new government closer to Europe calmed the markets.

Figure 11 plots the *ISDA basis* for the four countries considered during sub-period *c*. (2020-02-20 - 2020-07-31).

Figure 11 – ISDA basis for Italy, France, Germany and Spain – Sub-period c.
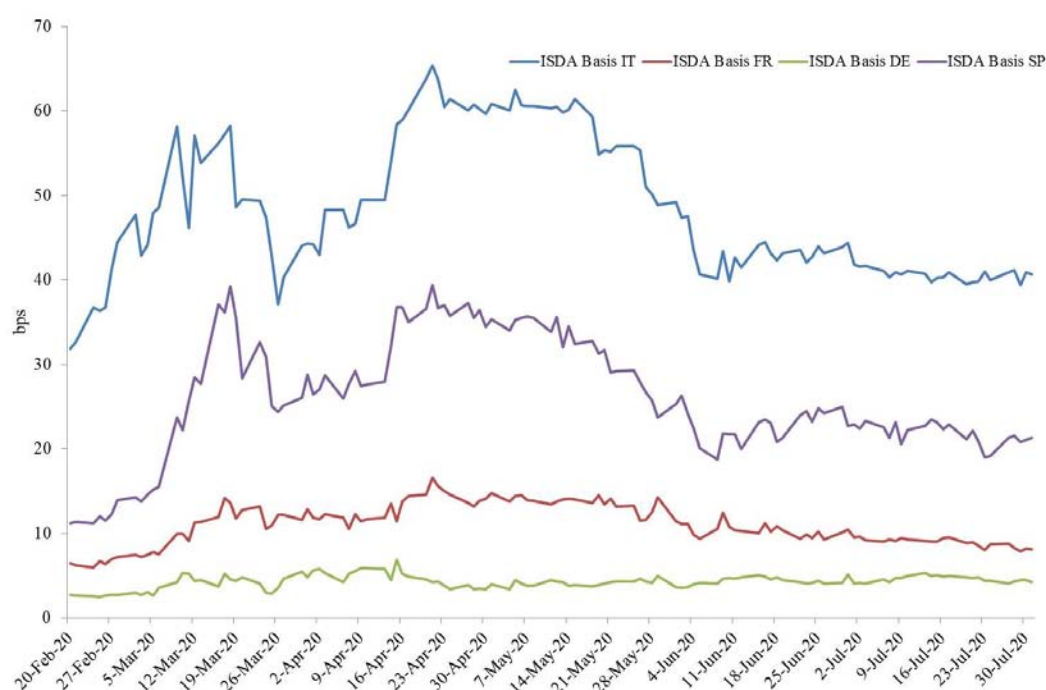
Source: Bloomberg

The first thing that stands out from the comparison between this Figure and Figure 10 is that in sub-period *c*. – characterized by the outbreak of Covid-19 in Europe – the behavior of the *ISDA basis* is more similar across the four countries. In all countries there was a more or less significant widening of the *basis* mainly concentrated in the initial phase (from March to mid-May), followed by a narrowing from the second half of May.

At the end of February 2020 – the beginning of the sub-period represented in Figure 11 – Italy's *ISDA basis* was substantially on the same level as at the

beginning of May 2018, when the coalition government between Lega and Five Stars Movement was forming. However, unlike then, the widening of Italy's *basis* in the face of the shock due to the pandemic was more limited, just over 30 basis points. In contrast, this time the other countries experienced a greater increase (especially in percentage terms) in their *ISDA basis* because of the more symmetric nature of the shock. Overall, the reaction of the *basis* in the four countries was synchronous and positively correlated, signaling Italy's recovery of a more solid position as a member of the Eurozone.

Tables 5/A and 5/B report the results of the time series regressions corresponding to the models of Eq. [5] and [6], respectively, for this sub-period.

Table 5/A: Sub-period c. (117 days) - Eq. [5]

	$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \varepsilon_t$			
	$i= IT, FR, DE, SP$			
Country	**IT**	**FR**	**DE**	**SP**
intercept	−0.00187456	−0.000269723	9.41776E-05	−0.000570096
	−0.3350	−0.1258	0.05245	−0.1664
d_OIS	1.30344 (***)	1.34811 (***)	1.39569 (***)	1.12364 (***)
	6.084	16.53	20.4	8.531
d_CDS03_LOC	1.08348 (***)	0.852238 (***)	−0.445849 (***)	0.558472 (***)
	21.57	7.07	−2.673	10.65
R^2	0.815936	0.749	0.79485	0.66806

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5% significance (*)=10% significance.

Also in this sub-period Italy remains the only country where the *ISDA basis* affects significantly sovereign yields: the estimated coefficient for this explanatory variable is close to 1 with a t-ratio of 3.016. Although to a lesser extent than in sub-period *b.*, the risk of debt redenomination participates – together with the OIS rate and conventional credit risk – in explaining the trend in BTP yields during the pandemic: the R^2 of the regression is 0.830358, well above that of the same model estimated over the full sample period. Conversely, in the other countries the *ISDA*

basis continues to be of little use in explaining yields on government bonds: the estimated coefficient is poorly significant only for Spain, for which country, however, the *basis* is not a reliable indicator of redenomination risk. However, since – as already observed – in the case of Spain both the 2003 ISDA CDS and the *ISDA basis* enclose a component related to redenomination risk, it cannot be excluded that this risk may have affected to some extent the performance of the BONOs during the health emergency.

Table 5/B: Sub-period c. (117 days) - Eq. [6]

$\Delta y_t^i = \beta_0 + \beta_1 \Delta OIS_t + \beta_2 \Delta CDS\_03_t^i + \beta_3 \Delta ISDA\_basis_t^i + \varepsilon_t$				
i= IT, FR, DE, SP				
Country	**IT**	**FR**	**DE**	**SP**
intercept	−0.00176916	−0.000271431	0.000192857	−0.000670679
	−0.3278	−0.1260	0.1074	−0.2009
d_OIS	1.40703 (***)	1.3458 (***)	1.38391 (***)	1.15961 (***)
	6.717	16.28	20.04	8.986
d_CDS03_LOC	0.901196 (***)	0.856147 (***)	−0.474324 (***)	0.486738 (***)
	11.63	6.988	−2.817	8.392
d_ISDA_basis_LOC	0.972476 (***)	−0.0493215	−0.378637	0.446412 (**)
	3.016	−0.2096	−1.150	2.608
R^2	0.830358	0.749103	0.797355	0.687901

For each independent variable, the table displays the estimated coefficient and the t-ratio.
The suffix 'LOC' attached to a variable indicates that the variable is relative to the country indicated in column
Stars inside the round brackets indicate the statistical significance of the estimated coefficient: (***)=1% significant, (**)=5% significance (*)=10% significance.

As regards France, it should be noted that – unlike the sub-period *b.* – in this sub-period conventional credit risk as measured by the premium on CDS compliant with 2003 ISDA Definitions helps to explain the trend in yields on government bonds.

In addition, unlike what happened between May 2018 and August 2019, the economic consequences of Covid-19 have hit the economies of all the member countries more or less severely, causing that change of course of the European institutions mentioned above. The extraordinary measures implemented by Europe have deflated the credit risk premium on bond issued by various States,

preventing surges in redenomination risk of some countries and favoring the gradual decline of this risk for Italy.

6. The GFC and the sovereign debt crisis brought to light the frailties of the Eurozone and its weak institutional architecture, fostering economic and financial divergence between center and periphery.

In this difficult set-up, the reaction of peripheral countries has oscillated between the attempt to remain compliant with European rules and an anti-Europeanist sentiment, which – after the Greek experience at the time of the third public debt crisis in 2015 – has spread to other member countries, fueling fears of a possible exit from the EMU.

Italy, with its very high public debt, is the country where in recent years there have been the most significant and prolonged peaks in redenomination risk and, in parallel, its position in the European context has resulted increasingly iso-lated.

The most emblematic episode occurred with the establishment of a coali-tion government between two populist and Eurosceptic parties in mid-2018. In this period, Italy's confrontational attitude towards the European institutions in-flated redenomination risk perceived by the markets, pushing investors away from Italian government bonds.

The analysis, with linear models, of the contribution of redenomination risk – measured by the *ISDA basis* – to the sovereign yields of the main Eurozone countries has shown that, in periods of heightened fears of a withdrawal, this risk factor has significantly contributed to the dynamics of Italy's sovereign risk.

The internal political climate, however, is not the only variable that affects redenomination risk. As seen in the recent crisis prompted by the Covid-19 pan-demic, the occurrence of severe negative shocks in countries that have abdicated monetary sovereignty and are constrained by strict fiscal rules tends to increase both the risk of conventional default and redenomination risk, resulting in a higher cost of public debt under conditions of extreme emergency.

Vulnerability to such vicious circles represents a constant threat to all member States and to the same survival of the EMU. Given the strong economic and financial interconnections between the countries joining the euro area, the unilateral withdrawal of a country would represent a more or less harmful event for the other countries as well. In the extreme scenario, there could be the dissolution of the currency union and the failure of a project that has been going on for decades.

The only antidote to such scenarios is an effective reform of the European institutional framework in the direction of a better balance between constraints and rules on the one hand and risk sharing on the other. The change of course shown by the European institutions in dealing with the economic emergency prompted by the pandemic is a first step in the right direction. The next objectives should be the transition to a true fiscal union, with stabilization facilities for countries in difficulty, the definitive zeroing of sovereign yield spreads through the shift to a single European public debt, the unification of the labor market and the completion of the banking union and of the capital markets' union. Only this way the European project can be successful, and Europe can become a federation of States.

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