The European Redemption Fund: A Comparison of Two Proposals

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Abstract: This paper proposes a redemption fund for the euro zone countries alternative to that recently proposed by Doluca et al. (2012a) – *The European Redemption Pact: an Illustrative Guide*, GCEE Working Paper No.2, February – and in coherence with a previous proposal of one of the author. In doing so, we envisage a country-specific amortization scheme in which the sovereign debts exceeding the 60% ceiling of GDP is redeemed in 30 years. The paper shows that our redemption scheme is cheaper and less constraining than that proposed by Doluca et al. (2012a). Also, the paper shows that fiscal "brakes" – such as those required by the Fiscal Compact – are not necessary for the complete redemption of the Fund.

Keywords: Sovereign debt crisis, Public debt, Amortization schedule, European redemption fund

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1. Introduction

One of the most remarkable effects of the great financial crisis 2007-08 has been the dramatic increase of fiscal deficits and public debts in all developed countries. To prevent recession from turning into depression, governments have been forced to adopt fiscal stimulus and bail-out packages in order to support domestic demand and to prevent the propagation of a full-blown global banking crisis. In addition, budget balances have been further deteriorated by the operation of the automatic stabilizers producing reduction in tax revenue and increasing in social expenses. Thus, the public debt of many countries has increased in the past few years by 20, 30 or 40 GDP points.

No doubt that when the crisis will finally over, it will be necessary to deal with such an amount of extra-debt.

While the traditional reaction and the financial orthodoxy suggests that tight fiscal policies – i.e. increases of taxations and/or reduction of expenses – are indispensable (indeed the only way) to reduce the existing stocks of public debt, we must recognize that the process of liquidation of big sovereign debt has followed over history quite different paths (see Reinhart and Sbrancia, 2011 and IMF, 2012 ch.3). Even though the most favorable solution is, of course, a long period of sustained growth, quite often the tools of reducing the public debt have been different: debt repudiation, or governments default; debt monetization (i.e. the exceptional increase of inflation to either reduce or cancel-out a given stock of debt); Financial repression (i.e., the introduction of portfolio constraints for banks and financial institutions, interest rate control, limitations in capital mobility, etc.); Debt restructuring.

In 2010, one of the authors– Visco (2010a, b) – posed the problem of how to relax the fiscal budget constraint of the countries affected by the financial crisis so as to prevent them from falling into a long-lasting stagnation path. To solve this problem, the creation of a special (global) fund in which all the extra debt produced by the financial crisis could be transferred and redeemed over a long period of time was proposed. At that time, then, the proposal was simply that of a (partial) restructuring of the existing stock of debt with joint (global) liability.

Later on, a revised and more realistic version of this proposal limited to the reduction of the debt of the EZ countries was presented– see Visco (2011a, b). In its new version, the proposal specified the creation of a common fund into which EZ countries could transfer their debt exceeding the 60% of GDP – which is the critical threshold fixed by the Maastricht Treaty. In order to ensure the whole redemption of the stock of debt transferred to the fund, the proposal also foresaw that all involved countries would earmark a share of their taxation proceedings – proportional to the size of the debt transferred - to be transferred to the Fund in annual installments.

The main objective of this proposal was (and still is) to solve the sovereign debt crisis helping, at the same time, the recovery of the EZ countries.[1]

Recently, the German Council of Economic Experts (GCEE) presented a very similar proposal – see GCEE (2011) and Doluca et al. (2012 a, b) – in which a redemption fund for the European debt was proposed. Though some motivations of these papers are different than those of Visco (2010a, b; 2011a, b), both approaches rely on the same instruments and lead towards similar conclusions.

In this paper we propose a restatement and a refinement of the original Visco's proposal. In doing so, we take the ERF proposal by Doluca et al. (2012a)[2] as a benchmark and show that some working hypothesis of their paper, such as those concerning the adoption of the fiscal "breaks" (e.g. the Fiscal Compact), can be harmlessly skip aside without damaging the objective of permanently reducing the stock of public debt. Also, the paper provides a numerical application to the case of the Italian sovereign debt and provides a straightforward comparison between our results and those found by Doluca et al. (2012a) in their simulation analysis.

In evaluating the contribution of our paper, it is noteworthy that our objectives crucially differ from that of Doluca et.al.. While Doluca et al. (2012a) main objective is to provide a redemption mechanism able to shrink the debt-to-GDP ratio as fast as possible, our objective is to create an alternative redemption mechanism in which the converging path of the debt-to-GDP ratio is compatible with a non-stressing, medium term fiscal policy scenario.

We find that the debt amortization scheme proposed in this paper is cheaper than the redemption mechanism proposed by Doluca et al. (2012a). Also, we find that fiscal "brakes" are not necessary to accomplish the mission of permanently reducing the stock of public debt below the 60%-threshold of GDP. In particular, for the Italian economy we find that the average saving in interest expense adds up to about 34 billion Euros per year – about 2.2% in terms of 2012 GDP – and that the average primary surplus required to redeem the debt within the duration of the Fund is no higher than 2.6 instead of 4.5 GDP points.

The remainder of the paper is organized as follows. Section 2 briefly describes the GCEE proposal and provides an updated simulation exercise of their redemption plan for Italy. Section 3 introduces a refinement of the basic idea of Visco's proposal and describes the main functioning mechanism of its alternative redemption scheme. It also provides a numerical exercise based on the Italian

[1] It is noteworthy that Visco's proposal is quite different, indeed it is just the opposite - from the proposals presented by other economists - see, among others, De Greuwer and Moeslen (2009) and Delpla and Von Weizsaker (2010) – in which eurobonds are issued to cover a stock of debt up to the 60% of GDP – the so-called "blue-bond" enjoy the joint liability of all the involved countries. Actually, Visco's bonds - as GCEE's bonds - would not be eurobonds since each single state would keep the responsibility of redeeming its own share.

[2] Doluca et al. (2012b) updates the numerical analysis of the redemption scheme introduced in their previous paper and analyze the macroeconomic impact of the proposal is illustrated using the multi-country model NiGEM. Since the basic ideas of the ERF do not change with respect to Doluca et al. (2012b), our simulation analysis only relies on the GCEE working paper for data construction and comparisons.

economy in which some crucial details of the proposal are carefully spelled out. Based on our simulation results, Section 4 compares the results of the two proposals, while Section 5 provides a possible measure for the economic impact of Visco's proposal with respect to a baseline scenario in which no redemption plan is adopted. Finally, Section 6 concludes.

2. The GCEE proposal

The European Redemption Pact (ERP) is a redemption plan proposed by the GCEE in November 2011 – see GCEE (2011) - and then refined by Doluca et al. (2012a) in February 2012 with the introduction of the European Redemption Fund (ERF). According to this proposal, all EZ member countries are allowed to split their public debt into two parts: a part that is compatible with the debt threshold of 60 % of GDP - hereinafter *national debt*- and a part exceeding the 60 % ceiling. According to the proposal, the part of the debt exceeding the threshold of 60 % of GDP - hereinafter *extra-debt*- can be transferred to an ad-hoc fund – the ERF – for which all the EZ members are jointly and severally liable.

The main objective of the ERP is to incentivize and encourage debt-redemption rather than debt accumulation and it is thought of an alternative debt instrument that could help EZ countries to refinance themselves at an affordable cost.

To join the ERF, excessively indebted countries are required to fulfill participation criteria. These criteria change from country to country, depending on whether countries are currently running a structural adjustment program or not. In particular:

a. If a country is currently running a structural adjustment program, it can join the redemption pact immediately, but its debt can be transferred to the ERF only after the successful conclusion of the respective adjustment program (in this moment, the countries that are running a structural adjustment program are: Cyprus, Greece, Portugal and Ireland);
b. If a country is not running a structural adjustment program, it can opt to take part to the redemption pact immediately provided that its debt-to-GDP ratio exceeds the 60 %-ceiling (in this moment in time, the countries with a debt-to-GDP ratio higher than 60% not running a structural adjustment program are: Austria, Belgium, France, Germany, Italy, Malta, the Netherlands, and Spain).[3]

As emphasized by Doluca et al. (2012a) – see also footnote 3 -, the ERF is not a Eurobonds proposal. The main differences from this proposal and the idea of Eurobonds lie in:

- **The limited duration for the ERF**: no longer than 25 years;

[3] Notice that at the end of 2011 only 5 countries out of 17 - Finland, Estonia, Luxemburg, Slovenia and Slovakia - do not have a debt-to-GDP ratio exceeding the 60% of their GDP.

- **A series of strings and constrains attached to the ERF participation as:** *(i)* The adoption of fiscal "brakes", particularly those required by the Fiscal Compact (FC); *(ii)* The transfer of the revenue of a designated tax for fulfilling the redemption of the extra-debt (for example the VAT) through *annual payment/obligations*; [4] *(iii)* The deposit of collaterals – e.g. gold and other forms of collateral - up to 20 % of the transferred debt and an obligation to commit to consolidation and structural reforms.

Annual payment/obligations are the key element of the whole proposal because they determine the true financial cost for each country. They are designed to depend on both the volume of the debt to be transferred to the Fund and the interest rate on the ERF bonds and are pegged to GDP through the so-called *annual payment key*. The annual payment key is a pro-rated interest payment to the redemption fund on the transferred debt. The rate applied to the annual payment key is given by the interest rate – fixed to 4% in GCEE proposal –, plus a *redemption surcharge* equal to 1% of the transferred debt. If a country decides to transfer the excessive debt into the ERF, it automatically endorses the commitment to:

1. Maintain the national debt below the level of 60 % of GDP - to this end, debt brakes would be introduced in all participating countries;
2. Maintain the budget deficit below the level of 0.5 % of GDP;
3. Adopt fiscal brakes at a constitutional level;
4. Redeem the extra-debt within 25 years;

It is noteworthy that to redeem the extra-debt in 25 years the countries transferring more debt have to bear higher annual payment-obligations, whose amount is related to the volume of the debt transferred and is expressed as a constant fraction of GDP. Note also that the endorsement of such commitments implicitly implies the respect of the deficit and debt rules of the FC. Indeed, the commitment to maintain the national debt below the 60%-ceiling of GDP corresponds to maintaining budget deficit below the level of 0.5 % of GDP. Likewise, the commitment to redeem the extra-debt within 20 to 25 years corresponds to an annual debt reduction of 1/20th of debt exceeding the target level of 60% of GDP. If a member country fails to honor this commitment, the transfer of the extra-debt to the Fund is immediately stopped and the collateral lost.

[4] For the sake of truth, the presence of the earmark in the GCEE ERF proposal is a bit ambiguous. While it is present and widely discussed in the Council annual report of November 2011 – see GCEE (2011) –, it is not clearly mentioned in Doluca et. al (2012a). However, in Doluca et. al (2012a) the participation to the ERF foresees the payment of a 1% participation fee taking the form of a *redemption surcharge* similar to the *solidarity surcharge* introduced in Germany to finance the reunification of the Country.

An application to Italy

In this section we apply the GCEE proposal to Italy. In our simulation, the transfers to the ERF starts being effective at the beginning of 2013 (instead that in 2012) and completes after four years of roll-in. For the baseline scenario, we adopt the following basic data:[5]

1. Nominal GDP 2012: 1,564.4 billion Euros (source: Italian Government forecasts);
2. Expected nominal growth: 3.0% (source: Doluca et al., 2012a);
3. Public Debt 2012: 1,977.4 billion Euros (source: Italian Government forecasts);
4. Interest rate on national debt: 5.0% (source: Doluca et al., 2012a);
5. Debt-to-GDP ratio: 126.4% (source: Italian Government forecasts);
6. Interest burden in 2012 as % of GDP: 5.5% (source: Italian Government forecasts);
7. Interest rate on ERF: 4.0% (source: Doluca et al., 2012a).

According to the proposal, Italy is allowed to transfer to the Fund up to 1,038.8 billion Euros of its national debt (i.e. 66.4% of its national debt). Straightforward computations lead to an annual key payment of 3.3% of GDP.[6] Given the large financial demand of Italy, the roll-in phase is spread over four years, such that 422 billion Euros are transferred in 2013, 234.8 billion in 2014, 211 billion in 2015 and, finally, 171 billion in 2016.[7]

Expected economic growth is set to 3 percentage points per annum. Since the lifespan of the simulation exercises covers 25 years, the rate of growth reported in the table can be thought of as the average economic growth, where 2 percentage points are due to increases in GDP deflator and 1 percentage point is due to real growth.

The interest rate on national debt is set to 5%, while that on the ERF is 4%. This rate is the same used by Doluca et al. (2012a) for the case of Italy. Here it is worth noticing that the expected long-term interest rate reported by DEF (2012) – which is around 5.4% – is not far from the interest rate adopted by the GCEE. In comparison with the ten-year bund, the interest rate used by the Italian Government accounts for an interest rate spread of about 440 basis points, while the spread resulting from Doluca et al. (2012a) analysis is slightly lower and amounts to about 360 basis points. Before the financial crisis the BTP-bund spread was steadily lower than 100 basis points.

To implement the ERF, the Italian Government must commit to adopt the FC rules. Consequently, in our simulations the following working assumptions are adopted:

[5] The level of nominal GDP, the stock of public debt and interest burden on the Italian public budget are taken from the last *Documento di Economia e Finanza* (DEF, 2012a) and *Nota di Aggiornamento del Documento di Economia e Finanza* (DEF, 2012b) -, which forecasts a level of nominal GDP close to 1,564.4 billion Euros and a Debt-to-GDP ratio close to 126.4% for 2012. The remaining data – i.e. the expected growth and the interest rates on national debt and ERF - are the same data used by Doluca et. al (2012a) in their numerical simulations.

[6] For the technical details of the GCEE proposal, interested readers are referred to Doluca et. al (2012a).

[7] It is worth noticing that in our simulations initial data – e.g. the debt-to-GDP ratio, the sequence of sovereign debt transmissions to the ERF as well as the size of the Italian sovereign debt to be transferred to ERF – are far different from those used by Doluca et. al (2012a) in their simulation analysis. This is so because we use 2013 as the starting year instead of 2012.

1. During the roll-in phase, no excessive borrowing policy is allowed, so that the ratio between budget deficit and GDP is always equal to 0.5 GDP percentage points.
2. After the roll-in phase - and provided that the debt-to-GDP ratio is steadily lower that the ceiling of 60% of GDP -, excessive borrowing is allowed provided that such policies do not violate the usual Maastricht constraints (i.e. deficit-to-GDP ratio and debt-to-GDP ratio lower than, respectively, 3% and 60% of GDP).

Figure 1 summarizes the simulation results.[8] Moving clockwise, the first chart depicts the dynamics of the primary surplus (histogram) and the budget deficit (the full line). The second chart shows the composition of the interest burden bore by Italy. The third chart shows the time evolution of the composition of the sovereign debt of the Italian economy as percentage of GDP. Finally, the fourth chart displays the dynamics of the ERF account balance of Italy.

Figure 1: GCEE proposal: Simulations results. Chart (a): The dynamics of the primary-surplus-to-GDP and deficit-to-GDP ratios; Chart (b): The composition of the interest-expense-to-GDP; Chart (c): the composition of the public debt; Chart (d): the ERF account balance (end of the year).

Chart (a) **Chart (b)**

Chart (c) **Chart (d)**

As is easy to verify – see Chart (c) –, the share of national debt on total debt decreases because of the roll-in (red histogram), while the share of the ERF on total debt initially increases because of the debt transfers and then decreases because of the annual payment/obligations (blue histogram).

[8] See Appendix A for the numerical details as well as the computations of the four charts of Figure 1.

According to the simulation, the extra-debt would be fully redeemed after 23 rather than 25 years – i.e. 2035 instead of 2037. In the meanwhile, fiscal brakes cause the stock of national debt to converge towards the threshold of 60% and the budget-deficit-to-GDP ratio to stabilize around 1.7 percentage points – see the full line in Chart (a).

Observe that the value of 1.7% for the budget-deficit-to-GDP ratio is in sharp contrast with the 0.5% threshold dictated by the FC. However, if the fiscal policy was set in line with the indications of the FC, the ratio between the stock on national debt and GDP would not stabilize around the 60% threshold of GDP; rather, it would further decrease over time and eventually (asymptotically) reach the long-term/equilibrium value of 0%. In fact, with a growth rate of 3% per year, the unique deficit-to-GDP ratio compatible with a debt-to-GDP ratio of 60% is equal to 1.7%. Values of the deficit-to-GDP ratio below the 1.7% threshold of GDP inevitably lead to a steadily reduction of the debt-to-GDP ratio towards 0, and, consequently, towards the complete redemption of the whole sovereign debt of the country.

In our view this result depicts a kind of policy overshooting, in the sense that the over-austerity induced by the combined effect of the ERF and the FC is not necessary to maintain the long-run debt-to-GDP ratio close to the 60% of GDP. Consequently, in what follows we decided to not include any form of fiscal breaks in our redemption scheme except those dictated by the Maastricht Treaty.

The result that the complete redemption of the extra-debt occurs in less than 25 years needs a comment because it is in sharp contrast with what found by Doluca et al. (2012a). It can be explained by the higher annual payment key used by our simulation exercise – 3.3% Vs. 2.9% used by Doluca et al. (2012a) -, which is, in turn, due to the higher initial debt-to-GDP ratio adopted by our computations – 126.4% Vs. 123.4% used by Doluca et al. (2012a). Moreover, this result emphasizes the sensitiveness of the GCEE proposal to changes in the initial conditions, which leads to the paradoxically situation in which more indebted countries are forced to shorten their redemption path through higher annual payment-obligations. In Section 4 we will mention this characteristic of the redemption scheme described by Doluca et al. (1992) as the main drawback of their approach.

As regards the composition of the interest expense, the weight of the interest payment on national debt is initially larger in comparison with that of the ERF. However, as time goes by, the size of each annual payments-obligations increases because of economic growth and the cost of national debt decreases because of the reduction in the ratio between national debt and GDP. Overall, the financing cost generated by the GCEE proposal approaches 6.2 GDP points, where 3.1 percentage points can be attributable to the interest pay on national debt and 3.1 percentage points are due to the interest pay on the ERF bonds. As we will show in Section 5, the medium term scenario

proposed by the Doluca et al. (2012a) represents an improvement – however small – with respect to a baseline scenario in which no debt-reducing intervention is undertaken.

3. The Visco's proposal: A restatement

This section provides a refinement of the European redemption scheme proposed by Visco (2010a, b; 2011a, b). Technically speaking, this redemption scheme consists in a dynamic, country-specific amortization schedule. The specificity of each amortization plan stems from the fact that each borrower country can tailor its own redemption plan so as to take into account both its financial need and its past macroeconomic performance.

With respect to the GCEE proposal, the main points of departures are basically three, listed below with their reasons:

1. **The duration of the Fund and the redemption mechanism.** In line with the original Visco's proposal, the duration of the Fund is foreseen in 30 years.
2. **The redemption plan consists of a sequence of annual payments or installments**. Each installment includes both an annual interest payment linked to the outstanding debt and a chunk of the principal balance. The sequence of the principal payments follows a growing amortization path, which makes countries pay less principal at the beginning of the redemption. The size of the first principal balance can differ from country to country and can be negotiated by the borrowing countries according to their financial and macroeconomic needs. As time goes by, however, larger portions go towards paying down the principal, with the result that the size of each installment tends to increase over time.
3. **The FC is not applied.** As shown in Section 2, the FC is not necessary for the redemption of the extra-debt because the Fund appears to be an alternative to the FC. During the roll-in phase, in fact, the pace of reduction of the debt-to-GDP ratio exceeds the benchmark of one twentieth (5%) per year required by the FC. Consequently, forcing governments to set the budget deficit lower than 0.5% of GDP during the roll-in phase would create a random variability of the primary surplus of the country – see Chart a) of Figure 1. As the next numerical simulation will make it clear, the non-adoption of the FC rules does not compromise the successful redemption of the extra-debt, while its adoption it considerably increases the primary surplus requirements during the first 5 years of life of the Fund.
4. **Ear-marking and collaterals.** An appropriate proportion of the tax revenues is earmarked to the coverage and the funding of the annual installments. This element was already present in the original Visco's proposal. As regards the possibility of providing real collaterals to balance each country-specific financial risk, in our view they are not necessary because of the presence of the ear-marked proceeds. Nevertheless, if the adoption of such extra

collaterals is considered to be essential for the adoption of a redemption scheme, they can be harmlessly included into our proposal since their implementation does not represent an issue for our amortization scheme. Still, it is worth noting that the addition of real collaterals can generate seniority issues with respect to the share of debt not transferred to the ERF, particularly for Italy in which ex-post variations of the seniority status of the sovereign debt is forbidden by the law.

5. **The surplus liquidity generated by the flow of annual payments is invested in risk-less financial assets**.[9] The sequence of installments generates growing liquidity, which, in fact, is given by the difference between the annual payments accruing to the Fund in a certain year and the interest pay due to the market. Instead of keeping the surplus liquidity not used, our proposal suggests to invest it in instruments with high liquidity and low risk.

The amortization calculator

In this Section we describe how annual payments are figured out. Let us consider a representative EZ country whose sovereign debt is initially larger than the 60%-ceiling of GDP. For the sake of simplicity, let us suppose that the level of both the outstanding sovereign debt and GDP of the representative country is equal to 1000 billion Euros. The debt-to-GDP ratio is thus equal to 100%, so the share of sovereign debt to be transferred to the ERF is equal to 400 billion Euros.

The flow of transfers of the extra-debt to the ERF – i.e. the so-called *roll-in* phase – differ from country to country and depend on the financing needs of the joining country. Specifically, in our proposal the roll-in phase consists on a transfer plan in which all sovereign bonds with maturity date close to the beginning of ERF are gradually transferred to the Fund. Let us suppose, for example, that the maturity schedule of the representative country's sovereign bonds foresees the following financing needs: 150 billion on 2013, 200 billion on 2014 and 170 billion on 2015. A possible roll-in agreement can then be represented by a sequence of three annual transfers equal, respectively, to 150, 200, and 200 billion Euros.

Once that the extra-debt to be transferred to the Fund and the details of the roll-in phase have been established, the next step consists of building a country-specific amortization schedule in which the portions of the principal balance in each annual payment (installment) follows a linear profile. Thus, given a share of sovereign debt transferred to the Fund, the sequence of annual payments is assumed to depend crucially on:

1. The duration of the Fund;

[9] This is a change with respect the original proposal – see Visco (2010a, b) –; where the Fund was supposed to freely operate in the financial markets with the objective of making profits.

2. The initial principal payment (which is left to negotiation and can vary from country to country);
3. The interest rate applied to the Fund.

The sequence of principal balances is given by the following amortization calculator:

$$D = \sum_{j=1}^{N} [\alpha + (j-1)\beta] = N\alpha + \frac{N(N-1)}{2}\beta \qquad (1)$$

where *D* denotes the extra-debt transferred to the ERF, *N* is the duration of the Fund, α is the initial principal balance negotiated by the borrowing country and β is the share of the principal balance that must be added to each annual payment year after year.

If we denote the portion of the principal balance of the *j*th annual payment by $P_j = \alpha + j\beta$, the sequence of principal reimbursements is summarized by Table 1, where the last row of the table displays an application to case of Italy.

As said, for Italy the total amount of the extra-debt to be transferred to the ERF adds to 1038.8 billion Euros. By choosing an initial portion of the principal balance α equal to 5 billion Euros and an overall duration of the Fund, *N*, of 30 years, the previous formula gives:

$$\beta = \frac{2(D - N\alpha)}{N(N-1)} \qquad \Rightarrow \qquad \beta \approx 2.0431.$$

Consequently, the sequence of the principal payments is given by the sequence of principal repayments displayed in the last row of Table 1.

Table 1: The principal balances – For the case of Italy: *N*=30 and $\beta = 2.0431$

	j	**1**	**2**	**3**	**4**	….	***N-1***	***N***	**Total**
P_j	*Representative country*	α	$\alpha+\beta$	$\alpha+2\beta$	$\alpha+3\beta$	….	$\alpha+(N-2)\beta$	$\alpha+(N-1)\beta$	*D*
	Italy (billion Euros)	5.0	7.0	9.1	11.1	….	62.2	64.3	1038.8

An application to Italy

Having determined the sequence of the principal balances, the next step consists in determining the sequence of the annual payments. In doing so, we need to specify one of the most important variables of every redemption scheme: the interest rate.

To project the interest rate on ERF, the GCEE takes the yields of existing bonds guaranteed by European countries - particularly bonds issued by the *European Investment Bank* or the *European Financial Stability Facility* (EFSF) - and the liquidity level of the bonds issued by the *Kreditanstalt*

für Wiederaufbau, as natural benchmark for the ERF bonds. They then conclude that the financing costs of the ERF can be expected to range from 3 to 3.5%, and eventually to reach 4% after the normalization of the financial markets. Thus, in their simulation exercise the interest rate on the ERF was set to 4%, while that on the national debt was supposed to be slightly higher and fixed to 5%.

In our proposal, we take the interest rate currently paid by the ESFS on the EU-bonds as a benchmark, particularly the last EFSF placement of the 25-year bond maturing on 3 April 2037, whose implied reoffer yield for investors was 3.42%.[10] Moreover, to project the financing cost on the national debt, we envisage a future scenario in which the interest rate spread between national bonds and EU bonds are close to those paid before the beginning of the financial crises between the ten-year national bonds and the German Bund. For example, before the bankruptcy of the Investment Bank Lehman Brothers, the ten-years Bund-BTP spread was around 40-50 basis points. As a result, a good guess for the interest rate on the Italian national debt is 3.9%. This assumption is perfectly coherent with the logic of the redemption fund, whose main effect should be to highly reduce, or even eliminate, the spreads across countries.[11]

Let r_{ERF} denote the interest rate on ERF bonds. According to Table 1, the first principal balance is equal to $P_{2013} = 5.0$. Consequently, the total amount of the first installment is given by the following formula:

$$A_{2013} = P_{2013} + I_{2013},$$

where $I_{2013} = 422.0 * r_{ERF}$ is the pro-rated interest payment.

From 2014 on, annual payments modify to take into account both the new debt transfers accruing to the Fund and the proceedings of the investment of the principal payments. As time goes by, indeed, the portions of the principal balance accruing to the Fund generates a stock of liquidity which must be used, at the end of the Fund, to redeem the debt. In our proposal the cumulated flow of principal balances is invested in risk-less assets. In particular, we assume that the interest rate on surplus liquidity (denoted by r_L) is constant and equal to 3%, and that the proceedings of the investment are

[10] Alternatively, our choice of the level of the interest rate to be applied to the ERF can be seen as an extension to the ERF of the bond pricing procedure adopted by ESFS, according to which the interest rate on EU bonds is made up of a 25-years Mid-swaps plus a risk premium measured in basis points. Since in this moment in time (15th November 2012) the level of the 30-years Mid-swap is equal to 2.47%, the resulting risk premium attached to the Italian ERF bonds amounts to 95 basis points.

[11] A possible drawback of all redemption schemes, including that of Doluca et. al (2012a), is that for some countries, notably Germany and The Netherlands, the cost of funding the national debt would likely increase because of the fund. To cope with this disadvantage, Visco (2011b) envisaged an internal mechanism through which highly-indebted countries are supposed to refund (via monetary transfers) the core countries any increase in the interest rate due to implementation of the Fund.

then used to reduce the size of each installment.[12] In 2014, the surplus liquidity equates the principal payment of the previous year, which is equal to 5 billion Euros.

At the end of the year, thus, the proceeding of investing this surplus liquidity is equal to $I^{L}{}_{2014} = 5.0 * r_L$, so as the second annual payment is obtained according to the following formula:

$$A_{2014} = P_{2014} + I_{2014} - I^{L}_{2014},$$

where $P_{2014} = 7.0$ (see Table 1, last column) and $I_{2014} = (422.0 + 234.8 - P_{2013}) * r_{ERF}$.

By iterating forwardly up to time *t*, it is easy to show that the general formula describing the composition of the *t*-th installment is given by:

$$A_t = P_t + D_{t-1} * r_{ERF} - L_t * r_L$$

where D_t denotes the balance of the Fund at the beginning of the year and $L_t = \sum_{j=1}^{t-1} P_j$ is the amount of surplus liquidity accumulated up to time *t*.

Table 2 shows the composition of each annual payment and the principal balance. Notice that at the end of the redemption time, the overall gain due to the proceedings of investing the surplus liquidity adds to 314.1 billion Euros, while the interest pay bore by Italy adds to about 667.7 billion Euros. This means that the net interest pay is 353.6 billion Euros, which gives an average interest saving of 8.4 billion Euros per year.

Fiscal Policy implications

Once shown how the ERF does work, in this section we turn to the fiscal policy implications of our proposal. Basic textbooks in economics usually summarize the dynamics of a country's debt-to-GDP ratio through the following difference equation:

$$\Delta d_t = p_t - (i_t - g_t) d_t$$

where $d_t \equiv D_t / GDP_t$ denotes the debt-to-GDP ratio, $\Delta d_t = d_{t+1} - d_t$ is the change in the debt-to-GDP ratio, p_t is the primary-surplus-to-GDP ratio and i_t is the average nominal interest rate paid on the outstanding stock of public debt at time *t*.

[12] The level of the interest rate to be paid on the surplus liquidity basically takes into account two main considerations: *(a)* the paper issued by the ERF is assigned an AAA rating; *(b)* After the implementation of the ERF, financial markets stabilize around values close to those characterizing the global economy before the bursting of the subprime financial crisis.
The first consideration implies that the interest rate paid by risk-less bonds (i.e. AAA/Aaa rated bonds) cannot be too far from that paid by ERF bonds. The second consideration, instead, accounts for both prices and risk premia characterizing the world economy before the bankruptcy of Lehman Brothers – notably from January 2002 to October 2007. During this time frame, indeed, both the yields on the 10y German Bund and US Treasury Bond were far higher than 3% and they both ranged between 3 and 5.5%. Consequently, our choice of setting r_L to 3% is descriptive of a medium term scenario in which interest rates on safe assets approach the bottom of the range.

Table 2: The amortization schedule for the Italian extra-debt (billion Euros). Initial transfer: 422 billion Euros.

t	ERF Balance	P	I	I_L	A
	(*)	(a)	(b)	(c)	d= (a)+(b)-(c)
2013	417.0	5.0	14.4	0.0	19.4
2014	644.7	7.0	22.3	0.2	29.2
2015	846.6	9.1	29.3	0.4	38.0
2016	1,006.5	11.1	34.8	0.6	45.3
2017	993.3	13.2	34.4	1.0	46.6
2018	978.1	15.2	34.0	1.4	47.8
2019	960.9	17.3	33.5	1.8	48.9
2020	941.6	19.3	32.9	2.3	49.8
2021	920.2	21.3	32.2	2.9	50.6
2022	896.8	23.4	31.5	3.6	51.3
2023	871.4	25.4	30.7	4.3	51.8
2024	843.9	27.5	29.8	5.0	52.3
2025	814.4	29.5	28.9	5.8	52.5
2026	782.8	31.6	27.9	6.7	52.7
2027	749.2	33.6	26.8	7.7	52.7
2028	713.6	35.6	25.6	8.7	52.6
2029	675.9	37.7	24.4	9.8	52.3
2030	636.2	39.7	23.1	10.9	52.0
2031	594.4	41.8	21.8	12.1	51.5
2032	550.6	43.8	20.3	13.3	50.8
2033	504.7	45.9	18.8	14.6	50.0
2034	456.8	47.9	17.3	16.0	49.1
2035	406.8	49.9	15.6	17.5	48.1
2036	354.9	52.0	13.9	19.0	46.9
2037	300.8	54.0	12.1	20.5	45.7
2038	244.7	56.1	10.3	22.1	44.2
2039	186.6	58.1	8.4	23.8	42.7
2040	126.5	60.2	6.4	25.6	41.0
2041	64.3	62.2	4.3	27.4	39.2
2042	0.0	64.3	2.2	29.2	37.2
Total	**…**	**1,038.8**	**667.7**	**314.1**	**1,392.3**

To calibrate our amortization plan we set $i_t = 3.9\%$ and assume the same growth prospect envisaged by the GCEE: $g = 3\%$. Figure 2 shows the policy implications of our proposal.[13] Specifically, Chart (a) shows the time paths of the primary surplus and the deficit-to-GDP ratio compatible with the goal of redeeming the Italian debt in 30 years.[14] Chart (b) displays the composition of the interests to GDP ratio, while Chart (c) shows a similar picture for the public debt. Finally, Chart (d) shows the time evolution of the principal balance of the ERF.

[13] Readers interested in the numerical details of the four charts of Figure 2 are referred to Appendix B

[14] As is customary, in our simulations we assume that all the exogenous variables of the model are time invariant, so that no external effects prevent the model to converge to their equilibrium values.

Because of the transfers to ERF, the stock of the national debt initially falls, while the stock of the extra-debt increases – see Chart (c). After the completion of the roll-in phase, the national debt approaches its reference level of 60% of GDP – see the red histogram of Chart (c) –, while the total amount of debt transferred to the ERF reaches the peak in 2016 – see the blue histogram of Chart (c) or, alternatively, the whole histogram of Chart (d).

After the roll-in, each government must setup its fiscal policy strategy so as to guarantee the double goal of redeeming year after year its extra-debt and maintaining the level of the national debt steadily below the 60%-ceiling of GDP. On this respect, our proposal adopts for the budget deficit the 3% rule of the Maastricht Treaty. More specifically, in our simulations, during the roll-in phase the deficit-to-GDP ratio cannot exceed the ceiling of 3% of GDP initially. After the roll-in phase, though, the paramount rule for the government is the maintenance of the level of the national debt steadily below the threshold of 60% of GDP.

Figure 2: Visco's proposal: Simulations results. Chart (a): The dynamics of the primary-surplus-to-GDP and deficit-to-GDP ratios; Chart (b): The composition of the interest-expense-to-GDP; Chart (c): the composition of the public debt; Chart (d): the ERF account balance (end of the year).

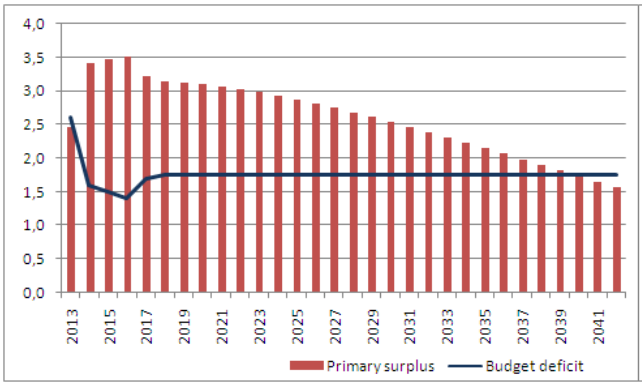


Chart (a)

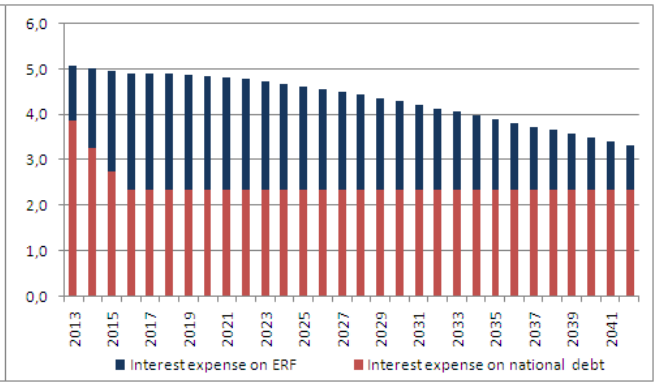


Chart (b)

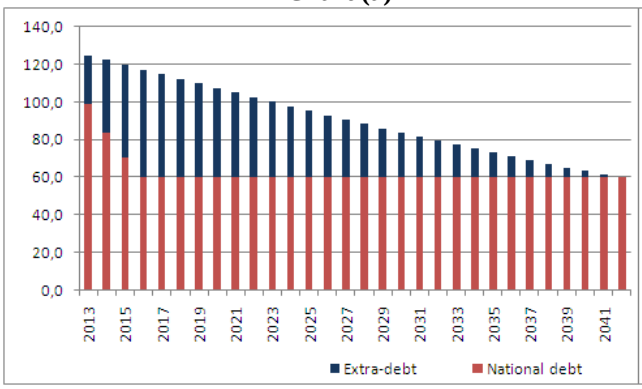


Chart (c)

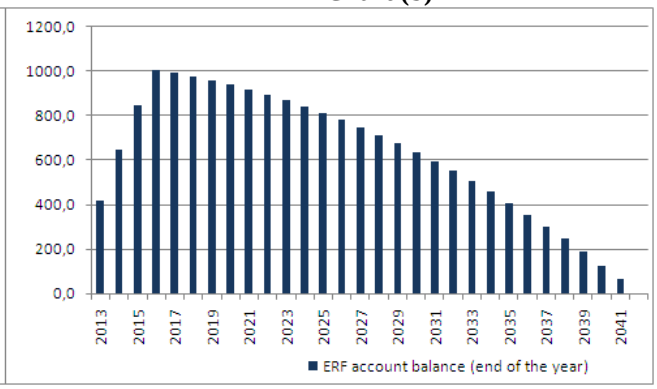


Chart (d)

As shown by Chart (a) of Figure 2, the adoption of this simple fiscal rule does not prevent Italy from both redeeming its extra-debt and stabilizing the debt-to-GDP ratio below the 60% of GDP. As shown by Chart (a), indeed, after the roll-in the budget-deficit-to-GDP ratio never exceeds the

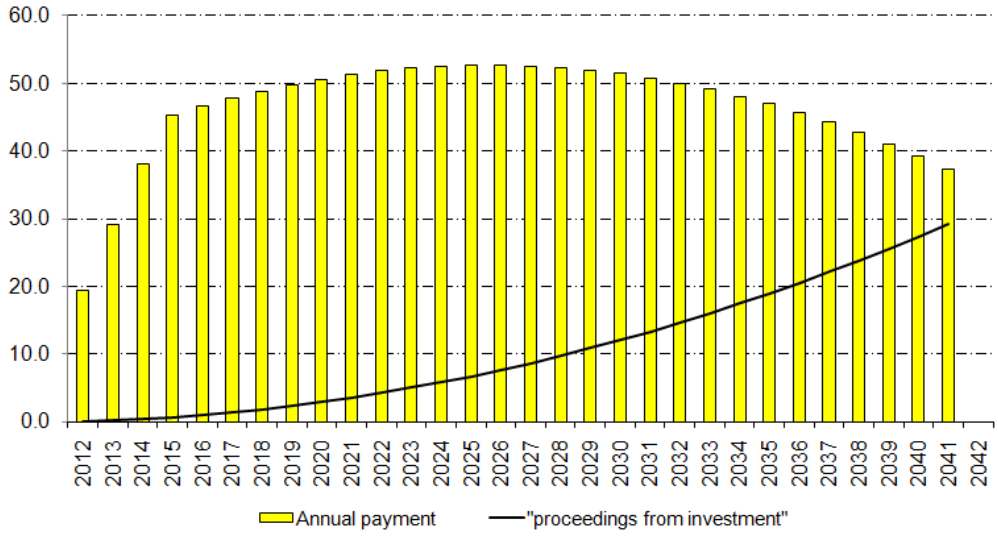
1.7%-threshold of GDP, a value which is even lower than the deficit-to-GDP ratio expected by the Italian Government for the end of 2012.

As regards the behavior of the primary surplus, Chart (a) makes it possible to split the dynamics of the primary-surplus-to-GDP ratio into two different phases. Initially – namely from 2013 to 2016 –, the primary surplus increases over time until it reaches 3.5 GDP points. This initial increase in the ratio is the result of the high interest expense bore by Italy during the roll-in. Then, the primary-surplus-to-GDP ratio steadily falls over time towards the minimum level 1.6% of GDE.

The fall in the primary-surplus-to-GDP ratio can be basically attributable to both the stabilization of the interest expense in relation to GDP and the economic growth. As regards the former, it is noteworthy that along the whole duration of the Fund the proceedings accruing to the Fund because of the investment of the surplus liquidity play a crucial role for the redemption of the extra-debt, particularly in the last phase.

Indeed, as shown by Figure 3, though the size of the proceedings are not very important at the beginning of the Fund, their contribution gets larger and larger as time goes by, thereby making the size of each installment fall from 2026 on.

Figure 3: Annual payments vs. proceedings of the investment of the surplus liquidity (billions of Euros)



4. Comparing proposals

Once the details of both proposals have been spelled out, it is now time to compare the two proposals.

From a technical point of view, probably the main differences between our proposal and that of the GCEE are three:

a. The duration;

b. The calculation of the annual payment;
c. The use of the surplus liquidity.

From a logical point of view, the first two arguments are intrinsically linked. In the GCEE proposal the duration of the Fund is instead a vague concept. Even though the duration of the ERF is supposed to be 25 years, in their paper the redemption mechanism proposed – particularly the key annual payment – is not linked to the expected duration of the Fund because it depends on the growth prospect of the participating country (which of course an exogenous variable not affected by the ERF). It is easy to demonstrate that the time required to redeem the extra-debt falls to 20 years in the presence of an average growth rate of 5% instead of 3% and that it jumps to 30 years in the presence of a lower growth prospect of 1.5% Accordingly, the dynamics of the annual payment/obligations change dramatically because of the growth prospect of the borrowing country as well as the financial cost of the ERF. This feature of the German proposal makes the dynamics of the ERF – not only its duration – very uncertain.

In our proposal, instead, both the duration of the redemption plan and the sequence of annual installments are clearly determined at the beginning of the redemption time by the amortization schedule. In our view this can help governments to relax both political and economic pressures on the public budget and to rely on a less compelling use of the proceedings of taxation; also a longer redemption period would help countries to adjust the term structure of the national debt not exceeding the 60% of GDP, while lengthening the term structure of that transferred to the ERP (30 years). Also, the possibility for all adhering countries to negotiate the first principal balance makes our proposal more flexible without compromising the complete redemption of the extra-debt within the duration of the Fund.

As regards the last technical points – namely the possibility of investing the surplus liquidity in riskless assets –, our proposal makes it possible to "recycle" the mass of liquidity currently transferred by all participating countries. By allowing the authority managing the ERF to use the financial market circuits to generate revenues through the investment of the surplus liquidity, our proposal intends to contribute in reducing the existing shortage of liquidity characterizing many financial markets and to help countries in reducing the interest bill embodied by each installment.

From the financial point of view, the main differences between the two proposals rotate around the following two points:

a. The overall financing cost of the redemption;
b. The fiscal policy implications.

Table 3 summarizes the financial cost and policy implications of the two proposals.[15] As is easy to see, our amortization scheme is undoubtedly less expensive than the redemption scheme proposed

[15] The numerical details and computations of the 25-years Visco's proposal are collected by Appendix C

by Doluca et al. (2012a). The overall saving in financial costs of our proposal, in fact, adds to 248.9 billion Euros, which in turn implies an average saving on the interest expense on the extra-debt of 14.4 billion Euros per year. Such a saving is due to the proceedings of the investment of the surplus liquidity – whose total amount adds up to 314.1 billion Euros (see Table 2) – and to the lower interest rate paid on the extra-debt assumed by Visco's proposal.

All these differences have noticeable implications for national fiscal policies. As the last two rows of Table 3 emphasizes, the adoption of our proposal entails a reduction in the average primary surplus required to cancel out the extra-debt of 1 GDP point – 4.5% for the Doluca et al. (2012a) proposal vs. 2.5% for Visco's proposal. Similarly, the average saving on the interest expense on the overall outstanding debt is close ot 2 GDP points.

Table 3: Comparing proposals. (*) The overall financial cost of Visco's proposal is equal to the overall interest pay less the revenue of the investment of the surplus liquidity; (**) The average financial cost is equal to the ratio between the overall financial cost of each proposal and its duration.

	GCEE's proposal	**Visco's proposal (redemption in 30 years)**	**Visco's proposal (redemption in 25 years)**
Overall financing cost of the Fund (billion Euros)	602.5	353.6	302.1
- *Effective duration of the Fund (years)*	23	30	25
- *Average financing cost (**)*	*26.2*	*11.8*	*12.1*
Average primary surplus (% of GDP)	4.5	2.5	2.9
Overall interest expense (% of GDP)	6.2	4.2	4.7
- *on national debt*	*3.1*	*2.3*	*2.3*
- *on ERF*	*3.1*	*1.9*	*2.3*

This result can be explained in terms of the financial cost saving discussed earlier and the absence of any form of fiscal "brakes" envisaged by our proposal. In our view, this result is particular noteworthy because it confirms our initial statement that the adoption of the FC is not necessary for the successful redemption of the extra-debt.

Since the two proposals differ in the duration of the Fund, one could assert that the better performance of our Fund can be attributable to the longer redemption time envisaged by Visco's proposal. Thus, in order to check whether the results reported by Table 3 are sensitive to changes in the duration of the Fund, we ran an additional numerical simulation where the duration of our amortization scheme is restricted to 25 years.

Our numerical results show that Visco's proposal remains the more attractive proposal. With respect to our 30-years baseline proposal, reducing the duration of the Fund to 25 years increases the financial cost of the redemption from 11.8 to 12.1 billion Euros. Also, the reduction in the duration of the Fund is not harmless for the fiscal policy since it requires higher primary surpluses because of the increase in the interest expense on ERF. Nevertheless, the rises in the average primary surplus and interest expense are still lower than those required by Doluca et al. (2012a), meaning that the duration of the Fund is not a crucial element for evaluating both the effectiveness and convenience of the two proposals.[16]

Figure 4: The Italian economy with and without ERF - Chart (a): interest expense on sovereign debt (data in % of GDP); Chart (b): debt-to-GDP ratio; Chart (c): Primary surplus-to-GDP ratio; Chart (d): Deficit-to-GDP ratio.

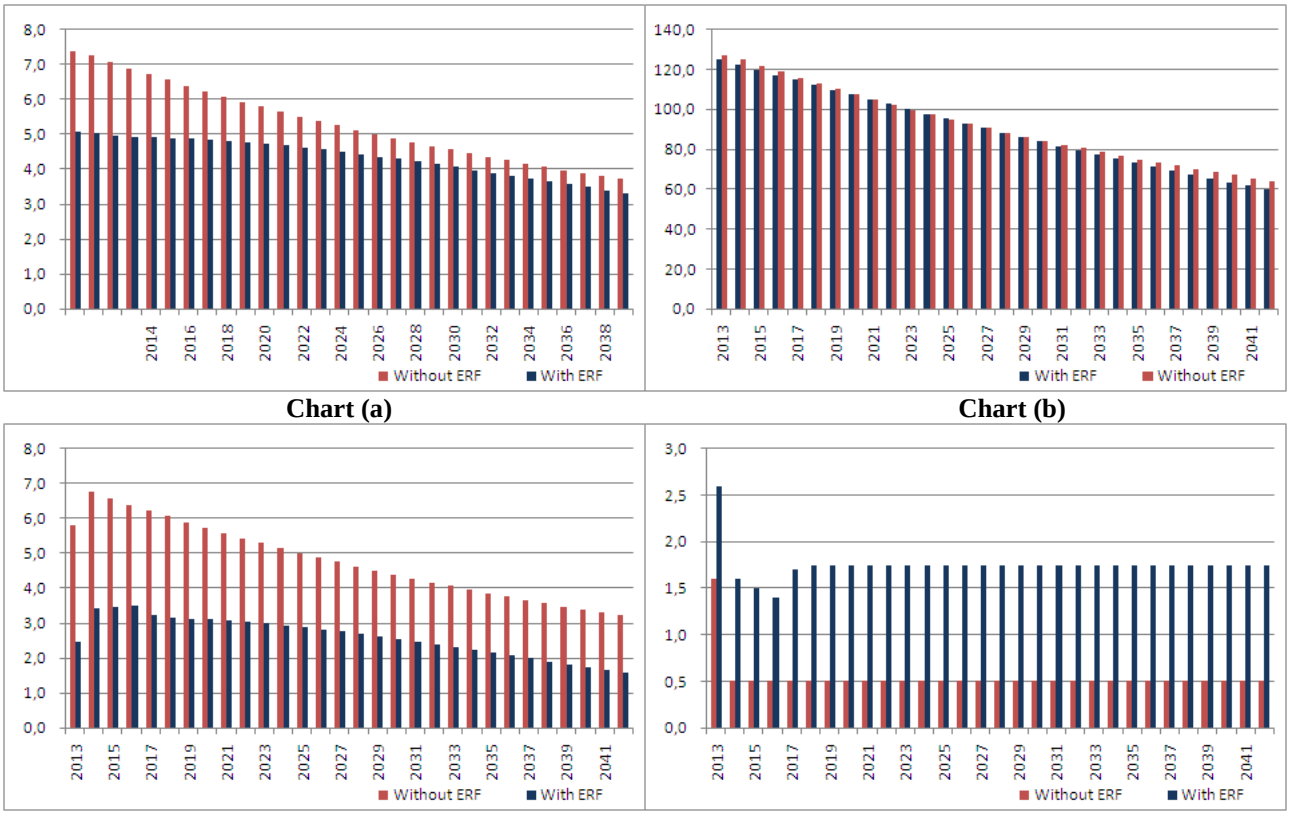


Chart (a) **Chart (b)**

Chart (c) **Chart (d)**

5. The Italian economy without ERF

As a last simulation exercise, in this section we evaluate the gain of adopting the ERF by comparing the long-run scenario we showed in Section 3 with a baseline scenario in which no proposal is adopted but the FC. To build the baseline scenario we make the following basic assumptions:

- Average interest expense on the outstanding sovereign debt: 5.8% of GDP;

[16] It is possible to show that our redemption scheme performs better than that proposed of the GCEE even in the presence of positive interests for both funds as well as in case of a lower growth rate of GDP - for example 2% of nominal growth instead of 3%. The numerical details of this extra exercise are available from the authors upon request.

- Fiscal tightness: Deficit-to-GDP ratio no higher than 0.5 % of GDP in case the debt-to-GDP ratio exceeded the 60%-threshold of GDP.

Figure 4 summarizes the main results of the comparison. In the figure, Chart (a) compares the interests expense on the outstanding debt with (red histogram) and without (blue histogram) the ERF. Chart (b) shows the dynamics of the debt-to-GDP ratio, while Chart (c) shows the dynamics of the surplus-to-GDP ratios required to make the stock of sovereign debt converge below the 60% of GDP in 30 years. Finally, Chart (d) compares the time paths of the deficit-to-GDP ratio.

A glance at Chart (c) makes it clear how the implementation of the ERF considerately improves the financial conditions of the Italian economy. In the presence of the ERF, the primary budget required to redeem the ERF is always lower than 3.5% of GDP, while, in the absence of, it is always far higher than 3.5% (with the exception of the last 5 years).

The fiscal austerity of the baseline scenario is necessary to allow the debt-to-GDP ratio to match the Maastricht Treaty requirements of 60% of GDP in thirty years. In our calculations, in fact, the fiscal tightness lasts exactly thirty years – see the Chart (d) –, a time length which is very difficult to be sustained from the point of view of the social cohesion. By implementing the ERF, instead, the overall amount of resources freed in 30 years adds to 1,480 billion Euros, with an average of about 49 billion Euros per year. [17]

6. Final remarks

In this paper we presented an amortization scheme for the European public debt that restates and refines the original idea of the ERF proposed by Visco (2010a,b; 2011a,b). Our objective is that of building a debt-redemption device able to help EZ countries to reduce permanently their stock of debt exceeding the 60% of GDP, without compromising their economic growth prospects and social cohesion.

In contrast with the redemption scheme recently proposed by Doluca et al. (2012a), our ERF proposal turns out to be cheaper and less constraining. For the case of the Italian economy, in fact, we find that the reduction in the interest expense adds to 14 billion Euros per year, and that the average primary surplus required to redeem the extra-debt is always lower (around 2 GDP point per year) than that found by Doluca et al. (2012a). Moreover, our numerical analysis also shows that fiscal "breaks" are unnecessary in the presence of a redemption plan, with the consequence that ERF and FC can be taken as alternative stabilization devices for the debt-to-GDP ratio.

[17] It is worth noting that the redemption scheme proposed by the GCEE also represents an improvement with respect to the alternative scenario in which no intervention is adopted. Indeed, as pointed out by Doluca et. al (2012a), both the interest expense and primary surpluses are undoubtedly higher in the absence of the ERF. However, the higher financial impact that their ERF proposal tends to produce on the public budget makes it possible to think of their proposal as a kind of second-best with respect of our proposal.

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Appendix

A. GCEE proposal: The computational details

Table A.1: Payment-Obligations computation

t	Roll-in	D[t]=	i on ERF=	n =	GDP 2012	APK=	Surcharge
2013	422.0	422.0	0.0400	25	1564.4	0.0332	0.0100
2014	234.8	651.9	i on N.D.=				
2015	211.0	854.1	0.0500				
2016	171.0	1011.9					
Debt to be transferred	1038.8						

t	ERF Balance (*)	Hypothetical payment allocation	Correction for debt not yet transferred to the ERF	Payment-obligations at time t	I[t]	A[t]	
		(a)	(b)	(c)=(a)-(b)	(d)	(f)=(c)-(d)	
2013	417.1	53.5	31.8	21.7	16.88	4.9	
2014	643.1	55.1	20.3	34.8	26.08	8.8	
2015	840.9	56.8	9.3	47.4	34.17	13.2	
2016	993.9	58.5	0.0	58.5	40.48	18.0	
2017	973.5	60.2	0.0	60.2	39.76	20.5	
2018	950.4	62.0	0.0	62.0	38.94	23.1	
2019	924.5	63.9	0.0	63.9	38.02	25.9	
2020	895.7	65.8	0.0	65.8	36.98	28.8	
2021	863.8	67.8	0.0	67.8	35.83	31.9	
2022	828.5	69.8	0.0	69.8	34.55	35.2	
2023	789.8	71.9	0.0	71.9	33.14	38.8	
2024	747.3	74.1	0.0	74.1	31.59	42.5	
2025	700.9	76.3	0.0	76.3	29.89	46.4	
2026	650.4	78.6	0.0	78.6	28.04	50.5	
2027	595.5	80.9	0.0	80.9	26.02	54.9	
2028	536.0	83.3	0.0	83.3	23.82	59.5	
2029	471.6	85.8	0.0	85.8	21.44	64.4	
2030	402.0	88.4	0.0	88.4	18.86	69.6	
2031	327.0	91.1	0.0	91.1	16.08	75.0	
2032	246.3	93.8	0.0	93.8	13.08	80.7	
2033	159.5	96.6	0.0	96.6	9.85	86.8	
2034	66.4	99.5	0.0	99.5	6.38	93.1	
2035	0.0	102.5	0.0	102.5	2.66	99.8	

(*) End of the year

Table A.2: Public finance implications

t					Billion Euros		% of GDP			
Y[t]	Nominal GDP				1564,4		-			
	- Av. Growth Rate				3,0		-			
D[t]	Outstanding Debt				1977,4		126,4			
S[t]	Primary Surplus				45,4		2,9			
I[t]	Interest expense				86,0		5,5			
BD[t]	Budget Deficit				40,7		2,6			
	I[t]						Budget Deficit		Primary Surplus	
t	ERF	% of GDP	National Debt	% of GDP	Total	% of GDP	BD[t]	Deficit-GDP ratio	S[t]	Prim-surplus-GDP ratio
	(a)		(b)		(c)=(a)+(b)		(d)		(e)=(c)-(d)	
2013	21,7	1,3	78,2	4,9	99,9	6,2	8,1	0,5	91,8	5,7
2014	34,8	2,1	66,8	4,0	101,7	6,1	8,3	0,5	93,4	5,6
2015	47,4	2,8	56,7	3,3	104,1	6,1	8,5	0,5	95,6	5,6
2016	58,5	3,3	50,8	2,9	109,3	6,2	52,8	3,0	56,5	3,2
2017	60,2	3,3	53,5	3,0	113,7	6,3	54,4	3,0	59,3	3,3
2018	62,0	3,3	56,0	3,0	118,1	6,3	50,0	2,7	68,0	3,6
2019	63,9	3,3	57,7	3,0	121,6	6,3	33,6	1,7	88,0	4,6
2020	65,8	3,3	59,5	3,0	125,2	6,3	34,6	1,7	90,6	4,6
2021	67,8	3,3	61,2	3,0	129,0	6,3	35,7	1,7	93,3	4,6
2022	69,8	3,3	63,1	3,0	132,9	6,3	36,7	1,7	96,1	4,6
2023	71,9	3,3	65,0	3,0	136,9	6,3	37,8	1,7	99,0	4,6
2024	74,1	3,3	66,9	3,0	141,0	6,3	39,0	1,7	102,0	4,6
2025	76,3	3,3	68,9	3,0	145,2	6,3	40,1	1,7	105,0	4,6
2026	78,6	3,3	71,0	3,0	149,5	6,3	41,4	1,7	108,2	4,6
2027	80,9	3,3	73,1	3,0	154,0	6,3	42,6	1,7	111,4	4,6
2028	83,3	3,3	75,3	3,0	158,7	6,3	43,9	1,7	114,8	4,6
2029	85,8	3,3	77,6	3,0	163,4	6,3	45,2	1,7	118,2	4,6
2030	88,4	3,3	79,9	3,0	168,3	6,3	46,5	1,7	121,8	4,6
2031	91,1	3,3	82,3	3,0	173,4	6,3	47,9	1,7	125,4	4,6
2032	93,8	3,3	84,8	3,0	178,6	6,3	49,4	1,7	129,2	4,6
2033	96,6	3,3	87,3	3,0	183,9	6,3	50,9	1,7	133,1	4,6
2034	99,5	3,3	89,9	3,0	189,4	6,3	52,4	1,7	137,1	4,6
2035	69,1	2,2	92,6	3,0	161,7	5,2	54,0	1,7	107,7	3,5
2036	0,0	0,0	95,4	3,0	95,4	3,0	55,6	1,7	39,8	1,3

Table A.3: Public debt dynamics

	Debt (Billion euros)			GDP		Debt (as a % of GDP)		
t	Extra	National	Total	Level	growth	Extra	National	Total
	(*)	(a)	(b)				(d)	(e)=(d)*i_L
2013	417,1	1563,5	1980,6	1611,3	3,0	25,9	97,0	122,9
2014	643,1	1337,0	1980,1	1659,7	3,0	38,8	80,6	119,3
2015	840,9	1134,5	1975,4	1709,5	3,0	49,2	66,4	115,6
2016	993,9	1016,4	2010,3	1760,7	3,0	56,4	57,7	114,2
2017	973,5	1070,8	2044,2	1813,6	3,0	53,7	59,0	112,7
2018	950,4	1120,8	2071,2	1868,0	3,0	50,9	60,0	110,9
2019	924,5	1154,4	2078,9	1924,0	3,0	48,1	60,0	108,1
2020	895,7	1189,0	2084,8	1981,7	3,0	45,2	60,0	105,2
2021	863,8	1224,7	2088,5	2041,2	3,0	42,3	60,0	102,3
2022	828,5	1261,5	2090,0	2102,4	3,0	39,4	60,0	99,4
2023	789,8	1299,3	2089,1	2165,5	3,0	36,5	60,0	96,5
2024	747,3	1338,3	2085,6	2230,5	3,0	33,5	60,0	93,5
2025	700,9	1378,4	2079,4	2297,4	3,0	30,5	60,0	90,5
2026	650,4	1419,8	2070,2	2366,3	3,0	27,5	60,0	87,5
2027	595,5	1462,4	2057,9	2437,3	3,0	24,4	60,0	84,4
2028	536,0	1506,2	2042,2	2510,4	3,0	21,4	60,0	81,4
2029	471,6	1551,4	2023,0	2585,7	3,0	18,2	60,0	78,2
2030	402,0	1598,0	2000,0	2663,3	3,0	15,1	60,0	75,1
2031	327,0	1645,9	1972,9	2743,2	3,0	11,9	60,0	71,9
2032	246,3	1695,3	1941,6	2825,5	3,0	8,7	60,0	68,7
2033	159,5	1746,1	1905,7	2910,2	3,0	5,5	60,0	65,5
2034	66,4	1798,5	1864,9	2997,6	3,0	2,2	60,0	62,2
2035	0,0	1852,5	1852,5	3087,5	3,0	0,0	60,0	60,0
2036	0,0	1908,1	1908,1	3180,1	3,0	0,0	60,0	60,0

B. 30-years Visco's proposal: The computational details

Table B.1: The amortization schedule – β = 2.0431

t	Roll-in	D[t]=	i =	n =	P[0] =	i_L=	n =
2013	422.0	422.0	0.0342	30	5.0	0.0300	30
2014	234.8	651.8					
2015	211.0	855.7					
2016	171.0	1017.6					
Total	1038.8						

t	ERF Balance (*)	P[t]	I[t]	R[t]	SL[t] (*)	I_L[t]	A[t]
		(a)	(b)	(c)=(a)+(b)	(d)	(e)=(d_{t-1})*i_L	(f)=(c)-(e)
2013	417.0	5.0	14.4	19.4	5.0	0.0	19.4
2014	644.7	7.0	22.3	29.3	12.0	0.2	29.2
2015	846.6	9.1	29.3	38.4	21.1	0.4	38.0
2016	1006.5	11.1	34.8	45.9	32.3	0.6	45.3
2017	993.3	13.2	34.4	47.6	45.4	1.0	46.6
2018	978.1	15.2	34.0	49.2	60.6	1.4	47.8
2019	960.9	17.3	33.5	50.7	77.9	1.8	48.9
2020	941.6	19.3	32.9	52.2	97.2	2.3	49.8
2021	920.2	21.3	32.2	53.5	118.6	2.9	50.6
2022	896.8	23.4	31.5	54.9	141.9	3.6	51.3
2023	871.4	25.4	30.7	56.1	167.4	4.3	51.8
2024	843.9	27.5	29.8	57.3	194.8	5.0	52.3
2025	814.4	29.5	28.9	58.4	224.4	5.8	52.5
2026	782.8	31.6	27.9	59.4	255.9	6.7	52.7
2027	749.2	33.6	26.8	60.4	289.5	7.7	52.7
2028	713.6	35.6	25.6	61.3	325.2	8.7	52.6
2029	675.9	37.7	24.4	62.1	362.9	9.8	52.3
2030	636.2	39.7	23.1	62.8	402.6	10.9	52.0
2031	594.4	41.8	21.8	63.5	444.4	12.1	51.5
2032	550.6	43.8	20.3	64.1	488.2	13.3	50.8
2033	504.7	45.9	18.8	64.7	534.1	14.6	50.0
2034	456.8	47.9	17.3	65.2	582.0	16.0	49.1
2035	406.8	49.9	15.6	65.6	631.9	17.5	48.1
2036	354.9	52.0	13.9	65.9	683.9	19.0	46.9
2037	300.8	54.0	12.1	66.2	737.9	20.5	45.7
2038	244.7	56.1	10.3	66.4	794.0	22.1	44.2
2039	186.6	58.1	8.4	66.5	852.1	23.8	42.7
2040	126.5	60.2	6.4	66.5	912.3	25.6	41.0
2041	64.3	62.2	4.3	66.5	974.5	27.4	39.2
2042	0.0	64.3	2.2	66.4	1038.8	29.2	37.2
Total	-	1038.8	667.7	1706.4	-	314.1	1392.3

(*) End of the year

Table B.2: Public finance implications

t		Billion Euros	% of GDP
Y[t]	Nominal GDP	1564.4	-
	- Av. Growth Rate	3.0	-
D[t]	Outstanding Debt	1977.4	126.4
S[t]	Primary Surplus	45.4	2.9
I[t]	Interest expense	86.0	5.5
BD[t]	Budget Deficit	40.7	2.6

	I[t]						Budget Deficit		Primary Surplus	
t	ERF	% of GDP	National Debt	% of GDP	Total	% of GDP	BD[t]	Deficit-GDP ratio	S[t]	Prim.-Surplus-GDP ratio
	(a)		(b)		(c)=(a)+(b)		(d)		(e)=(c)-(d)	
2013	19.4	1.2	62.3	3.9	81.7	5.1	41.9	2.6	39.8	2.5
2014	29.2	1.8	54.2	3.3	83.4	5.0	26.6	1.6	56.8	3.4
2015	38.0	2.2	46.9	2.7	84.9	5.0	25.6	1.5	59.3	3.5
2016	45.3	2.6	41.2	2.3	86.5	4.9	24.7	1.4	61.9	3.5
2017	46.6	2.6	42.4	2.3	89.1	4.9	30.8	1.7	58.3	3.2
2018	47.8	2.6	43.7	2.3	91.5	4.9	32.6	1.7	58.9	3.2
2019	48.9	2.5	45.0	2.3	93.9	4.9	33.6	1.7	60.3	3.1
2020	49.8	2.5	46.4	2.3	96.2	4.9	34.6	1.7	61.6	3.1
2021	50.6	2.5	47.8	2.3	98.4	4.8	35.7	1.7	62.7	3.1
2022	51.3	2.4	49.2	2.3	100.5	4.8	36.7	1.7	63.8	3.0
2023	51.8	2.4	50.7	2.3	102.5	4.7	37.8	1.7	64.7	3.0
2024	52.3	2.3	52.2	2.3	104.4	4.7	39.0	1.7	65.5	2.9
2025	52.5	2.3	53.8	2.3	106.3	4.6	40.1	1.7	66.1	2.9
2026	52.7	2.2	55.4	2.3	108.1	4.6	41.4	1.7	66.7	2.8
2027	52.7	2.2	57.0	2.3	109.7	4.5	42.6	1.7	67.1	2.8
2028	52.6	2.1	58.7	2.3	111.3	4.4	43.9	1.7	67.5	2.7
2029	52.3	2.0	60.5	2.3	112.8	4.4	45.2	1.7	67.7	2.6
2030	52.0	2.0	62.3	2.3	114.3	4.3	46.5	1.7	67.7	2.5
2031	51.5	1.9	64.2	2.3	115.6	4.2	47.9	1.7	67.7	2.5
2032	50.8	1.8	66.1	2.3	116.9	4.1	49.4	1.7	67.6	2.4
2033	50.0	1.7	68.1	2.3	118.1	4.1	50.9	1.7	67.3	2.3
2034	49.1	1.6	70.1	2.3	119.3	4.0	52.4	1.7	66.9	2.2
2035	48.1	1.6	72.2	2.3	120.4	3.9	54.0	1.7	66.4	2.2
2036	46.9	1.5	74.4	2.3	121.4	3.8	55.6	1.7	65.8	2.1
2037	45.7	1.4	76.6	2.3	122.3	3.7	57.2	1.7	65.1	2.0
2038	44.2	1.3	78.9	2.3	123.2	3.7	59.0	1.7	64.2	1.9
2039	42.7	1.2	81.3	2.3	124.0	3.6	60.7	1.7	63.3	1.8
2040	41.0	1.1	83.8	2.3	124.7	3.5	62.5	1.7	62.2	1.7
2041	39.2	1.1	86.3	2.3	125.4	3.4	64.4	1.7	61.0	1.7
2042	37.2	1.0	88.9	2.3	126.1	3.3	66.4	1.7	59.7	1.6

Table B.3: Public debt dynamics

	Debt (Billion euros)			GDP		Debt (as a % of GDP)		
t	Extra	National	Total	Level	growth	Extra	National	Total
	(a)	(b)	(c)=(a)+(b)	(d)		(e)=(a)/(d)	(f)=(b)/(d)	(g)=(e)+(f)
2013	417.0	1597.3	2014.3	1611.3	3.0	25.9	99.1	125.0
2014	644.7	1389.1	2033.8	1659.7	3.0	38.8	83.7	122.5
2015	846.6	1203.7	2050.4	1709.5	3.0	49.5	70.4	119.9
2016	1006.5	1057.4	2063.9	1760.7	3.0	57.2	60.1	117.2
2017	993.3	1088.1	2081.5	1813.6	3.0	54.8	60.0	114.8
2018	978.1	1120.8	2098.9	1868.0	3.0	52.4	60.0	112.4
2019	960.9	1154.4	2115.3	1924.0	3.0	49.9	60.0	109.9
2020	941.6	1189.0	2130.6	1981.7	3.0	47.5	60.0	107.5
2021	920.2	1224.7	2144.9	2041.2	3.0	45.1	60.0	105.1
2022	896.8	1261.5	2158.3	2102.4	3.0	42.7	60.0	102.7
2023	871.4	1299.3	2170.7	2165.5	3.0	40.2	60.0	100.2
2024	843.9	1338.3	2182.2	2230.5	3.0	37.8	60.0	97.8
2025	814.4	1378.4	2192.8	2297.4	3.0	35.4	60.0	95.4
2026	782.8	1419.8	2202.6	2366.3	3.0	33.1	60.0	93.1
2027	749.2	1462.4	2211.6	2437.3	3.0	30.7	60.0	90.7
2028	713.6	1506.2	2219.8	2510.4	3.0	28.4	60.0	88.4
2029	675.9	1551.4	2227.3	2585.7	3.0	26.1	60.0	86.1
2030	636.2	1598.0	2234.1	2663.3	3.0	23.9	60.0	83.9
2031	594.4	1645.9	2240.3	2743.2	3.0	21.7	60.0	81.7
2032	550.6	1695.3	2245.9	2825.5	3.0	19.5	60.0	79.5
2033	504.7	1746.1	2250.9	2910.2	3.0	17.3	60.0	77.3
2034	456.8	1798.5	2255.3	2997.6	3.0	15.2	60.0	75.2
2035	406.8	1852.5	2259.3	3087.5	3.0	13.2	60.0	73.2
2036	354.9	1908.1	2262.9	3180.1	3.0	11.2	60.0	71.2
2037	300.8	1965.3	2266.1	3275.5	3.0	9.2	60.0	69.2
2038	244.7	2024.3	2269.0	3373.8	3.0	7.3	60.0	67.3
2039	186.6	2085.0	2271.6	3475.0	3.0	5.4	60.0	65.4
2040	126.5	2147.5	2274.0	3579.2	3.0	3.5	60.0	63.5
2041	64.3	2212.0	2276.2	3686.6	3.0	1.7	60.0	61.7
2042	0.0	2278.3	2278.3	3797.2	3.0	0.0	60.0	60.0

C. 25-years Visco'sproposal: The computational details

Table C.1: The amortization schedule – β = 3.0459

t	Roll-in	D[t]=	i =	n =	P[0] =	i_L=	n =
2013	422.0	422.0	0.0342	25	5.0	0.0300	25
2014	234.8	651.8					
2015	211.0	854.7					
2016	171.0	1014.6					
Total	1038.8						

t	ERF Balance (*)	P[t]	I[t]	R[t]	SL[t] (*)	I_L[t]	A[t]
		(a)	(b)	(c)=(a+b)	(d)	(e)=(d)*i_L	(f)=(c)-(e)
2013	417.0	5.0	14.4	19.4	5.0	0.0	19.4
2014	643.7	8.0	22.3	30.3	13.0	0.2	30.2
2015	843.6	11.1	29.2	40.3	24.1	0.4	39.9
2016	1000.5	14.1	34.7	48.8	38.3	0.7	48.1
2017	983.3	17.2	34.2	51.4	55.5	1.1	50.3
2018	963.1	20.2	33.6	53.9	75.7	1.7	52.2
2019	939.8	23.3	32.9	56.2	99.0	2.3	53.9
2020	913.5	26.3	32.1	58.5	125.3	3.0	55.5
2021	884.1	29.4	31.2	60.6	154.7	3.8	56.8
2022	851.7	32.4	30.2	62.6	187.1	4.6	58.0
2023	816.2	35.5	29.1	64.6	222.5	5.6	59.0
2024	777.7	38.5	27.9	66.4	261.0	6.7	59.7
2025	736.2	41.6	26.6	68.1	302.6	7.8	60.3
2026	691.6	44.6	25.2	69.8	347.2	9.1	60.7
2027	643.9	47.6	23.7	71.3	394.8	10.4	60.9
2028	593.3	50.7	22.0	72.7	445.5	11.8	60.9
2029	539.5	53.7	20.3	74.0	499.2	13.4	60.7
2030	482.7	56.8	18.5	75.2	556.0	15.0	60.3
2031	422.9	59.8	16.5	76.3	615.8	16.7	59.7
2032	360.0	62.9	14.5	77.3	678.7	18.5	58.9
2033	294.1	65.9	12.3	78.2	744.6	20.4	57.9
2034	225.2	69.0	10.1	79.0	813.6	22.3	56.7
2035	153.2	72.0	7.7	79.7	885.6	24.4	55.3
2036	78.1	75.1	5.2	80.3	960.7	26.6	53.7
2037	0.0	78.1	2.7	80.8	1038.8	28.8	52.0
Total	-	1038.8	557.2	1596.0	-	255.2	1340.8

(*) End of the year

Table C.2: Fiscal policy implications

t		Billion Euros	% of GDP
Y[t]	Nominal GDP	1564.4	-
	- Av. Growth Rate	3.0	-
D[t]	Outstanding Debt	1977.4	126.4
S[t]	Primary Surplus	45.4	2.9
I[t]	Interest expense	86.0	5.5
BD[t]	Budget Deficit	40.7	2.6

	I[t]						Budget Deficit		Primary Surplus	
t	ERF	% of GDP	National Debt	% of GDP	Total	% of GDP	BD[t]	Deficit-GDP ratio	S[t]	Prim.-Surplus-GDP ratio
	(a)		(b)		(c)=(a)+(b)		(d)		(e)=(c)-(d)	
2013	19.4	1.2	62.3	3.9	81.7	5.1	41.9	2.6	39.8	2.5
2014	30.2	1.8	54.2	3.3	84.4	5.1	26.6	1.6	57.8	3.5
2015	39.9	2.3	46.9	2.7	86.9	5.1	25.6	1.5	61.2	3.6
2016	48.1	2.7	41.2	2.3	89.4	5.1	24.7	1.4	64.7	3.7
2017	50.3	2.8	42.4	2.3	92.7	5.1	30.8	1.7	61.9	3.4
2018	52.2	2.8	43.7	2.3	95.9	5.1	32.6	1.7	63.3	3.4
2019	53.9	2.8	45.0	2.3	99.0	5.1	33.6	1.7	65.3	3.4
2020	55.5	2.8	46.4	2.3	101.9	5.1	34.6	1.7	67.2	3.4
2021	56.8	2.8	47.8	2.3	104.6	5.1	35.7	1.7	68.9	3.4
2022	58.0	2.8	49.2	2.3	107.2	5.1	36.7	1.7	70.5	3.4
2023	59.0	2.7	50.7	2.3	109.6	5.1	37.8	1.7	71.8	3.3
2024	59.7	2.7	52.2	2.3	111.9	5.0	39.0	1.7	73.0	3.3
2025	60.3	2.6	53.8	2.3	114.1	5.0	40.1	1.7	73.9	3.2
2026	60.7	2.6	55.4	2.3	116.1	4.9	41.4	1.7	74.7	3.2
2027	60.9	2.5	57.0	2.3	117.9	4.8	42.6	1.7	75.3	3.1
2028	60.9	2.4	58.7	2.3	119.6	4.8	43.9	1.7	75.7	3.0
2029	60.7	2.3	60.5	2.3	121.2	4.7	45.2	1.7	76.0	2.9
2030	60.3	2.3	62.3	2.3	122.6	4.6	46.5	1.7	76.0	2.9
2031	59.7	2.2	64.2	2.3	123.8	4.5	47.9	1.7	75.9	2.8
2032	58.9	2.1	66.1	2.3	125.0	4.4	49.4	1.7	75.6	2.7
2033	57.9	2.0	68.1	2.3	126.0	4.3	50.9	1.7	75.1	2.6
2034	56.7	1.9	70.1	2.3	126.8	4.2	52.4	1.7	74.4	2.5
2035	55.3	1.8	72.2	2.3	127.5	4.1	54.0	1.7	73.6	2.4
2036	53.7	1.7	74.4	2.3	128.1	4.0	55.6	1.7	72.6	2.3
2037	52.0	1.6	76.6	2.3	128.6	3.9	57.2	1.7	71.4	2.2

Table C.3: Public debt dynamics

	Debt (Billion euros)			GDP		Debt (as a % of GDP)		
t	Extra	National	Total	Level	growth	Extra	National	Total
	(a)	(b)	(c)=(a)+(b)	(d)		(e)=(a)/(d)	(f)=(b)/(d)	(g)=(e)+(f)
2013	417.0	1597.3	2014.3	1611.3	3.0	25.9	99.1	125.0
2014	643.7	1389.1	2032.8	1659.7	3.0	38.8	83.7	122.5
2015	843.6	1203.7	2047.4	1709.5	3.0	49.4	70.4	119.8
2016	1000.5	1057.4	2057.9	1760.7	3.0	56.8	60.1	116.9
2017	983.3	1088.1	2071.4	1813.6	3.0	54.2	60.0	114.2
2018	963.1	1120.8	2083.9	1868.0	3.0	51.6	60.0	111.6
2019	939.8	1154.4	2094.2	1924.0	3.0	48.8	60.0	108.8
2020	913.5	1189.0	2102.5	1981.7	3.0	46.1	60.0	106.1
2021	884.1	1224.7	2108.8	2041.2	3.0	43.3	60.0	103.3
2022	851.7	1261.5	2113.2	2102.4	3.0	40.5	60.0	100.5
2023	816.2	1299.3	2115.5	2165.5	3.0	37.7	60.0	97.7
2024	777.7	1338.3	2116.0	2230.5	3.0	34.9	60.0	94.9
2025	736.2	1378.4	2114.6	2297.4	3.0	32.0	60.0	92.0
2026	691.6	1419.8	2111.4	2366.3	3.0	29.2	60.0	89.2
2027	643.9	1462.4	2106.3	2437.3	3.0	26.4	60.0	86.4
2028	593.3	1506.2	2099.5	2510.4	3.0	23.6	60.0	83.6
2029	539.5	1551.4	2091.0	2585.7	3.0	20.9	60.0	80.9
2030	482.7	1598.0	2080.7	2663.3	3.0	18.1	60.0	78.1
2031	422.9	1645.9	2068.8	2743.2	3.0	15.4	60.0	75.4
2032	360.0	1695.3	2055.3	2825.5	3.0	12.7	60.0	72.7
2033	294.1	1746.1	2040.3	2910.2	3.0	10.1	60.0	70.1
2034	225.2	1798.5	2023.7	2997.6	3.0	7.5	60.0	67.5
2035	153.2	1852.5	2005.6	3087.5	3.0	5.0	60.0	65.0
2036	78.1	1908.1	1986.2	3180.1	3.0	2.5	60.0	62.5
2037	0.0	1965.3	1965.3	3275.5	3.0	0.0	60.0	60.0