

# The Greek Crisis: Causes and Consequences

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CESIFO WORKING PAPER NO. 3663  
CATEGORY 6: FISCAL POLICY, MACROECONOMICS AND GROWTH  
NOVEMBER 2011

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# The Greek Crisis: Causes and Consequences

## Abstract

Greece has reached a point where, under any plausible macroeconomic scenario, public debt will continue growing faster than GDP. Fiscal consolidation alone cannot close the solvency gap. A substantial reduction in the stock of debt is needed. Even post-debt restructuring, there is no guarantee that the government will succeed in its dual goal of restoring fiscal solvency and closing the competitiveness gap. Yet we think Greece stands a better chance of accomplishing these goals from inside the EMU rather than outside it. This chapter takes stock of the factors that led to the explosion of public debt, the loss of competitiveness, and the failure of the first EU-IMF programme. We also present our views on the likely debt restructuring (and post-restructuring) scenarios.

JEL-Code: E600, F400.

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## 1. Introduction

By April 2010, Greece had lost market access, as the economy was contracting by 3% in real terms, the fiscal deficit - partly on account of unreported spending - reached 15% of GDP, and public debt rose to more than 125% of GDP. How did Greece get to that point? As in other peripheral countries, upon joining the euro area, access to low-cost credit boosted domestic demand. Years of strong growth masked underlying vulnerabilities that were undermining competitiveness and produced large inefficiencies in the public sector.

In May 2010, the Greek government requested a financial bailout from the IMF and the EU. The government signed a memorandum of economic and financial policies for a three-year programme with the so-called “troika”: the IMF, the European Commission and the European Central Bank. The programme provided EUR110bn loans disbursed quarterly over a three-year period in exchange for the Greek government’s commitment to an ambitious macroeconomic adjustment plan. The EU-IMF programme had the dual objective of undertaking a large fiscal adjustment to address fiscal insolvency and, simultaneously, achieving “internal devaluation” to close the competitiveness gap.

The programme had a promising start, with the approval of a meaningful pension reform and a first-round of labour market reforms. However, it soon became apparent that programme implementation was lagging behind schedule. The government failed to frontload difficult policy decisions, such as large cuts to the public sector wage bill. Likewise, control of the sub-central government budgets proved much more difficult than envisaged under the programme. To make matters worse, the combination of fiscal austerity, the “internal devaluation”, and the credit crunch sent the economy into a downward spiral.

Greek banks have not been immune either. To date, more than 20% of deposits have been lost since the beginning of the crisis in early 2010. Banks’ access to international capital markets has also been shut off. At present, they rely fully on the ECB’s funding via regular open market operations and the Greek central bank’s emergency liquidity assistance. Meanwhile, the sharp and long-lasting contraction in economic activity is taking a toll on the quality of loan portfolios.

Public sector debt dynamics have now reached a point at which, under any plausible macroeconomic scenario, debt grows faster than GDP (see, Greece: the long countdown to restructuring, May 2011). Greece faces a solvency gap that fiscal austerity alone cannot address. At the EU summit on the 26 October, the European leaders, along with representatives of the private sector, agreed to a 50% reduction in the notional stock of privately-held debt. While the discussions between the public and private sector are still ongoing at the time of the writing, we believe a 50% notional haircut is likely to be the minimum required from bondholders. And only if the public sector (ie, EU loans) also provides meaningful debt relief (beyond the larger, longer and cheaper credit already committed) can the overall level of

public debt fall below 100% over the long run (see: “Greece, what works and what does not” and “Greece: love me tender”).

Even after an orderly debt restructuring, Greece is unlikely to recover access to international capital markets in the near future. It will have to rely on tight monitoring under the financial umbrella of an EU-IMF programme. That is the price it has to pay for the policy slack of the past decade. Most importantly, even post restructuring, there is no guarantee that the government will succeed in its dual goal of restoring fiscal solvency and closing the competitiveness gap. But we think Greece stands a better chance of accomplishing this from inside rather than outside the EMU.

The rest of this chapter is organised as follows. First, we review the structural problems that over the past decade have dragged Greece’s competitiveness behind peers. Second, we examine the fiscal fragilities and data misreporting which are behind the rapid accumulation of public debt. Third, we examine the EU-IMF programme and its failure. Fourth, we explain why fiscal austerity alone is insufficient to stabilise the public debt dynamics. Fifth, we examine the relationship between sovereign insolvency and debt haircuts. Lastly, we discuss why both Greece and the euro area are likely to be better off with Greece inside rather than outside the monetary union.

## **2. A story of declining productivity and loss of competitiveness**

After joining the monetary union in 2001, Greece experienced a sharp decline in competitiveness, as inflation consistently exceeded the euro area average. Based on prices and unit labour costs (ULCs), the real effective exchange rate has appreciated by 20% and 40%, respectively, since 2001. As a result, Greece has been losing market share of exports relative to peers.

What are the main factors explaining the loss of competitiveness? We believe blame falls mainly on the deep-rooted structural problems at practically all levels, including high administrative costs, high margins across most economic activities, and rising labour costs. Poor governance and regulation have also been a hurdle to inward FDI, which has been low throughout these years. State-owned enterprises have been particularly inefficient; many are loss-making and, consequently, have been a source of fiscal underperformance (more on this below).

Given the structural nature of the problems, restoring efficiencies and regaining competitiveness will likely be a slow and painstaking process. It would require fundamental changes in at least three key areas. First, inefficiencies in the public administration require restructuring, with the privatisation of loss-making public entities. This should also involve improvements in the transparency on public accounts and performance. Second, competition should be enhanced in both the product and service markets. Administrative burdens should be reduced for all sectors, including liberalisation of network industries and opening up of all “closed”

professional services, and retail trade. Third, labour market reforms are essential in regaining cost competitiveness, including regulatory changes to: 1) employment protection legislation; 2) the collective bargaining regime, to favour wage moderation; and 3) promoting more part-time work to boost participation of the youth and women in the labor force.

### **3. A fiscal time-bomb: under-reported deficits and hidden debts**

A year before the crisis hit Greece, the 2009 IMF Article IV on Greece laid out very clearly the essential problems of Greece underperformance: “[...] *failures to stick to budget plans, deficit-increasing one-off measures, expenditure slippages, and ad-hoc revenue efforts have coincided with persistent deficits above 3% since 2000.*”

After joining the European Monetary Union, with very accommodative monetary conditions, Greece’s stance was extremely lax during the boom years. The public sector wage bill increased continuously. Social transfers also increased by more than 3pp of GDP since 2000, outpacing social contributions. Weaknesses in the tax administration acted to handicap tax revenues. The tax burden in Greece remains very unevenly redistributed; with a large share of self-employed and small SMEs vastly under-reporting their incomes. As a result of these persistent weaknesses, in 2008, just before the sovereign crisis exploded, Greece was running a fiscal deficit of 5% and public debt had increased to nearly 100% of GDP.

Data shortcomings have also been a recurring problem, casting significant doubts over the reliability of public sector numbers. Large discrepancies (including “stock-flow adjustments”) between cash accounts and those of the SGP repeatedly led to a worse underlying deficit than was reported to Eurostat. In fact, public debt consistently rose faster than indicated by the SGP deficits reported to Eurostat.

Changes in government have tended to unveil misreported deficits and hidden debts. In October 2009, the new government disclosed that fiscal data had been largely misreported. The deficit for 2008 was revised from 5% of GDP to 7.7% of GDP. The projected deficit for 2009 was revised from 3.7% of GDP to 13.6% of GDP (and in 2010 revised up again to 15.4% of GDP). The corresponding public debt figure was also corrected from 100% of GDP to 115% of GDP at end-2009 (later rising further to 129% of GDP).

The large fiscal revisions reflected critical shortcomings in the coverage of the public sector data. Large fiscal black holes were found in sub-central government fiscal accounts, especially in loss-making public enterprises not classified as part of the general government sector. These included state-owned companies in the rail, public transport, and defense sectors.

Arrears have also been a recurrent source of fiscal revisions, including tax refund arrears and lump-sum payments to retiring civil servants. Other corrections of

social security balances were due to imputed interest payments, double counting of revenues, and other inaccuracies.

#### **4. The EU-IMF programme went off-track within a year**

A significant revision of the 2008-09 fiscal deficits shocked the markets in 2010, as they were double the size of those originally projected and reported by the authorities. The crisis of confidence also rapidly spilled over into the banking system. The successive sovereign downgrades put pressure on banks' liquidity. The recession also led to rising NPLs, which by end 2009 reached 8% of total loans. Banks lost virtually all access to wholesale markets, but also significant deposits in the first half of 2010, leaving the Eurosystem as their main source of funding.

The Greek authorities were left with no alternative other than to request help from the EU and IMF. In May 2010, they signed a three-year programme, which would provide EUR80bn from eurozone countries and EUR30bn from the IMF. The programme came with strings attached, including quarterly fiscal and structural targets.

The programme was centered on a very ambitious strategy to deliver fiscal consolidation in order to restore fiscal solvency while simultaneously achieving an "internal devaluation" to restore competitiveness. Such a the combination of fiscal austerity, increases in unemployment, and wage cuts was bound to result in a sharp reduction in disposable income and economic activity. The programme proposed a fiscal path with measures worth 7.5% of GDP in 2010; 4% in 2011; and 2% of GDP in both 2012 and 2013. The aim was for debt/GDP to peak at 150% by 2013 and to decline thereafter. The programme also included several long-term structural reforms to unlock Greece's growth potential.

The EU and IMF recognised that risks to the programme were high from inception: "[...] the adjustment needs are unprecedented and will take time, so fatigue could set in". And indeed, it did not take too long for problems to emerge. Next, we take a closer look at the evolution of the programme performance.

First programme review (September 2010): the Greek authorities positively surprised the markets and passed a meaningful pension and (a first-round of) labour market reforms. The government also met the end-June quantitative targets.

However, from very early on, the programme already showed signs of what would eventually become a black hole: fiscal slippages were identified in the sub-central government entities, hospitals and state-owned enterprises, where arrears were accumulating faster than any had anticipated. To compensate for these slippages, the central government under-executed its own expenditure.

Second programme review (December 2010): the troika's assessment changed from "on track" to "broadly on track" in the second review. A disappointing growth

performance, along with continuing problems in the control of sub-central government expenditures, required continuing budget under-execution at the central government level. The troika also hinted that the deficit target would likely be missed on account of both fiscal underperformance and weaker growth than originally envisaged under the programme. Liquidity for the banking system remained very tight (ECB funding stood at EUR95bn, representing more than 20% of banking system assets).

At the time, it also became clear that the revisions to the fiscal data of 2008-09 were even larger than anticipated at the beginning of the programme. The 2009 deficit increased from 13.6% to 15.4% of GDP, and debt from 115% to 127% of GDP, largely on account of the reclassification of some loss-making public enterprises into the general government and accumulation of arrears, including pensions.

Market sentiment also changed for the worse after EU policy makers mentioned “bondholders’ burden sharing” in the event of unsustainable public debt dynamics. With Greece’s challenging public debt dynamics, investors re-assessed the risks of a potential Greek default. That decision marked an inflexion point, as investor fears of a possible restructuring were validated by the proposals of the official sector.

Third programme review (March 2011): real GDP growth at -4.5% in 2010 came in worse than expected. The government delivered a fiscal consolidation worth 5pp of GDP instead of the 7.5pp envisaged. Liquidity conditions for banks remained extremely tight and bank deposits continued leaking.

Fourth programme review (June/July 2011): policy implementation delays were now clearly flagged in the report. To compensate for the fiscal slippages, the government put forward a medium-term fiscal adjustment strategy (MTFS) with the objective of reducing the deficit below 3% of GDP by 2014. Under pressure from the EU, the MTFS was also submitted for parliamentary approval. As part of the medium-term strategy, the government also approved an ambitious privatisation plan through 2014 worth EUR50bn (Greek MinFin estimates).

It also became clear that the programme had been (optimistically) designed for Greece’s return to the debt markets in the first half of 2012. Under IMF internal regulations, that created an identified funding gap. The IMF asked the EU to commit additional resources to fill the funding gap. But in exchange, several European countries demanded that the private sector should be involved as well in providing debt relief. A proposal was put forward for private sector involvement, which entailed a (relatively limited) contribution by the private sector (see Greece: assessing the new debt proposal, July 2011). The public sector however committed to additional debt relief for Greece in the form of larger, longer and cheaper credit from the EFSF.

Fifth programme review (September/October 2011): amid growing concerns about the inability of the government to implement many of the measures contained in the

MTFS, negotiations between the troika and Greek authorities stalled. The troika clearly signaled that the programme was off-track. European leaders admitted that the private sector involvement that was proposed in July (equivalent to an average 5% NPV debt relief) would not be sufficient to address solvency concerns.

At the time of writing, the EU-IMF and the Greek government are still in discussions on the government commitments required before releasing the 6<sup>th</sup> tranche (EUR8bn). A government crisis has resulted in a unity transition government expected to approve the fiscal and structural adjustments required by the troika. This would unlock the next tranche before the general elections are held in early 2012.

## **5. What's next? Debt restructuring to address the overhang**

In 2011 Greek public sector debt has reached a point at which, under any plausible macroeconomic scenario, it will continue growing faster than GDP (see, Greece: the long countdown to restructuring, May 2011). A debt reduction is needed to tackle the debt overhang and bring public debt dynamics back into solvency. The restructuring of Greek debt is likely to take place by end 2011 or in H1 2012.

Given the fiscal slippages under the programme, growth underperformance, and the statistical discrepancies highlighted by Eurostat revisions, we have revised our fiscal projections accordingly. On Barclays Capital estimates, public debt by end-2011 will reach more than 160% of GDP and the primary balance will stand at about -2.5% of GDP. From here, we estimate that, if the total size of the expected cumulative fiscal adjustment would remain at about 9%, the primary balance could realistically reach a surplus of 2-3% of GDP by 2015 and stay on average at that level over the medium term.

While the Greek medium-term fiscal plan and, in particular, the privatisation plans could deliver some fiscal upside to our projections, we are using conservative assumptions in our fiscal sustainability exercise, given that developments in Greece have consistently disappointed relative to EU/IMF targets. In particular, we assume that the government could deliver c.EUR10bn from privatisation receipts. Our medium-term macroeconomic scenario assumes nominal growth of c.3.0% (ie, 1.5% GDP deflator and real GDP growth of 1.5%). Under this baseline scenario, any reasonable interest rate results in precarious debt dynamics. Put differently, an unrealistically low interest rate of 4.6% would be needed from 2013 onwards to stabilise debt dynamics.

## **6. Quantifying potential haircuts in Greece**

Given that it is clear that it is politically and economically unfeasible to undertake the fiscal adjustment required to stabilise Greek debt dynamics, the alternative is to present a combination of debt face value/coupon reduction and maturity extension that, combined with feasible fiscal adjustment, restores solvency.



Decisions on the NPV losses (ie, haircuts) to investors cannot be taken in a vacuum. The debt sustainability framework allows us to calculate the debt reduction needed to restore solvency. The standard debt dynamics equation is

$$\Delta\left(\frac{D}{Y}\right)_t = \left(\frac{r_t - g_t}{1 + g_t}\right)\left(\frac{D}{Y}\right)_{t-1} - pb_t \quad (1)$$

where D is the debt stock, Y is nominal GDP, r is the average nominal interest rate, g is the nominal growth rate, pb is the primary fiscal balance (ie, revenues minus no debt service related expenditures) as a share of GDP, and  $\Delta$  indicates a change over the previous year. If for the sake of simplicity (and only with expositional purposes), one assumes that the nominal interest (r) and growth rates (g) do not change over time, the primary balance ( $pb^*$ ) required to stabilise debt dynamics is defined below:

$$pb^* = \left(\frac{r - g}{1 + g}\right)\left(\frac{D}{Y}\right) \quad (2)$$

However, if such a primary balance target ( $pb^*$ ) is unachievable, the alternative would be to bring down the RHS of (2), ie, to reduce the debt stock (D), the coupons paid (r) or both, in order to make debt service consistent with the achievable primary balance.

Figure 1 sets out combinations of primary balance and debt reduction that achieve 60% of debt to GDP in 2050. Debt reduction needs to be complemented by fiscal adjustment as Greece needs to be on a credible path to a primary surplus. Otherwise, not even full debt reduction (ie, writing off all debt) would be consistent with sustainability.

In our baseline scenario (a primary balance of -2.5% in 2011), Greece would need to extract around 60% from all its debt holders (or around 90% of GDP) by 2012 (with a primary balance of 4%, in the optimistic scenario, the debt reduction required would be about 45%).

Figure 1: Greece – Combinations of fiscal adjustment and debt haircuts

Combinations of primary fiscal balance adjustment and debt stock reductions compatible with 60% debt-to-GDP in 2050		
Primary balance adjustment from 2011-2015 (% GDP)	Final primary balance from 2015 onwards (% GDP)	One-off reduction of total outstanding debt stock in 2012 (%)
12.8	7.9	0
11.5	6.6	15
10.2	5.3	30
8.8	3.9	45
7.4	2.5	61
6.6	1.7	75
4.8	-0.1	90
3.9	-1.0	100

Source: Barclays Capital

The mapping of required debt reduction into haircuts of bonded debt is not automatic. First, there is the issue of debt seniority. Greek public sector debt currently stands at c.EUR345bn (including EUR47bn held by EU loans and EUR18bn by IMF loans), with approximately one-third held by Greek residents and about two-thirds by non-residents. Of the Greek residents, c.EUR50bn is with Greek banks and c.EUR30bn is held by pension/social security funds and insurance companies. The ECB, under the government bond-buying programme (SMP), holds approximately EUR45bn (see Figure 2 details on debt holdings).

Figure 2: Greek debt ownership breakdown

Greece debt ownership (€ bn)	
IMF (loan)	18
EU (loan)	47
ECB (bonds)	45
Greek social security funds (bonds)	30
<b>Sub total 1</b>	<b>140</b>
Banks (bonds & bills)	79
Insurance (bonds & bills)	12
Central banks/official institutions	38
Other investors (real money, etc, bonds & bills)	76
<b>Sub total 2</b>	<b>205</b>
Total marketable Greek debt	280
Total non-marketable Greek debt	65
<b>Total Greek debt</b>	<b>345</b>

Source: Barclays Capital, Central Bank of Greece, IMF, European Banking Authority.

Some debt holders are likely to be excluded from a restructuring. IMF debt is likely to be spared. T-bills are also unlikely to be restructured, mainly to avoid disruptions in this market (about EUR13bn). There are also bilateral EU government loans under the EU/IMF programme. Although this is not officially senior debt (unlike the

IMF, it does not have implicit preferred creditor status), in our view it is politically difficult to see them receiving a haircut.<sup>1</sup>

However, some debt reduction will implicitly be extracted from the official sector. Under the current programme, lending yields are below the exit yield (the yield that would prevail post debt-restructuring) and hence are already providing some debt relief. Larger, longer and cheaper loans from the EU provide substantial debt relief. For example, if we assume that the maturity of all EU loans (c.EUR170bn, including a 2<sup>nd</sup> programme for Greece) is extended by 15 years (and rates reduced to 3.5% from currently c.5%) the percentage of debt relief obtained from the official sector could be 23%, or nearly 17% of GDP.

Given the implicit debt reduction obtained by the official sector (c. 17% of GDP), bonded debt needs to contribute an additional EUR170bn. Given that bonded debt represents c.125% of GDP by end-2011, this is equivalent to a haircut of 65% (or even higher, 74%, if the ECB holdings are excluded)<sup>2</sup>. Figure 3 shows the debt/GDP path that would be consistent with a two-thirds haircut on bonded debt (Figure 4 compares the size of the potential haircut in Greece relative to recent sovereign debt restructurings in emerging markets since 1999).

We do not think it is possible to extract much debt relief from the Greek banking system. Banks are currently holding EUR50bn of Greek government debt (of which c.EUR13bn is T-bills), against capital of EUR28bn. A 50% haircut would virtually wipe out their entire capital. Any outright debt reduction is likely to require future recapitalisation by a large (probably similar) amount. The impact on Greek banks would also come via profitability, especially as credit quality of the loan portfolio would likely continue deteriorating, market funding would remain nonexistent and funding costs would remain elevated.

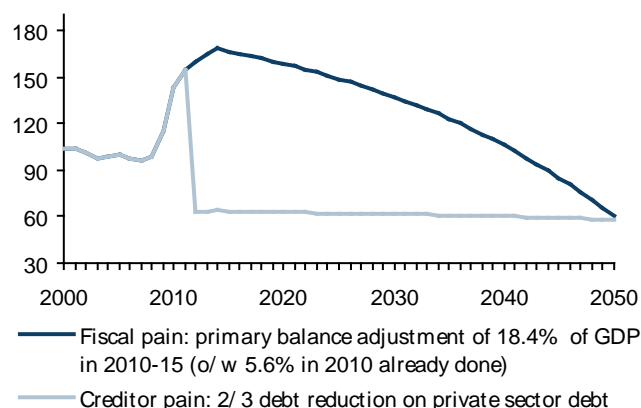
One additional risk for the banking sector associated with any restructuring is the impact it would have on the collateral value of the GGBs held, and their eligibility at the ECB. The alternative collateral they have is likely insufficient to cover their ECB borrowings (EUR77bn in open market operations, OMOs) if GGBs value was to be affected significantly. Hence, the move towards more emergency liquidity assistance (ELA) provided the Greek central bank (EUR39bn as of mid November) is likely to be further extended at the expense of lower OMOs. Note that the ECB via OMOs, and Greek central bank via ELA, would always lend against collateral (or government guarantees), so any drop in the value of the collateral would need to be replaced.

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<sup>1</sup> International debt (EUR18.6bn) might be excluded from debt restructuring to prevent hold-outs and triggers of CDS. Excluding that debt from our calculation would not change significantly our calculations.

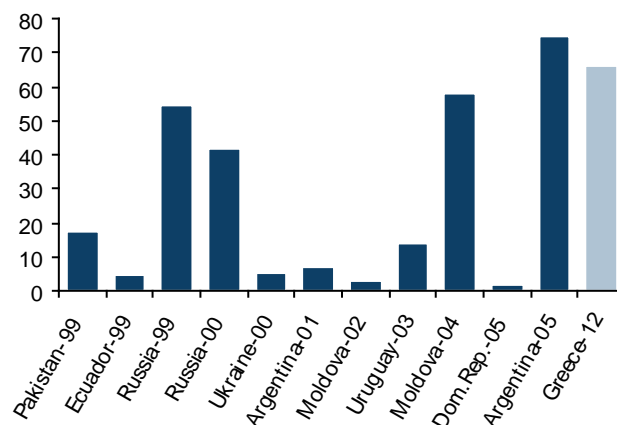
<sup>2</sup> Notice that the definition of haircut is not straightforward. We are implicitly assuming that "claim" is the NPV of old cash flows discounted at the exit yield. The haircut is obtained by comparing NPV of old and new cash flows at the exit yield. If we assume the claim is 100 instead (as all bonds are accelerated upon default), the haircut calculation would be higher to the extent that coupons of existing debt are lower than exit yields. See Annex 1 for further details.

**Figure 3: Paths to solvency (debt/GDP, in %)**



Source: Barclays Capital

**Figure 4: NPV debt reduction in recent debt restructurings**



Source: Barclays Capital, IMF

A useful approximation of recovery values using a haircut calculation can be obtained by assuming that all current Greek bonded debt subject to restructuring would be represented by one synthetic bond paying a coupon of c.5.15% (the average interest rate of Greek debt) with maturity of about eight years (the average maturity of Greek debt). We then assume that in a restructuring, the notional principal of the bonds included in the restructuring is reduced by a given percentage (say 65% in a baseline scenario). To obtain recovery values, we simply obtain the price (ie, the NPV) of a synthetic bond with coupons of 5.15% with notional principal of  $100 \times (1 - 0.65)$  paid in 20 years (assuming that new maturity) and discounted at our exit yield. The price of that hypothetical bond would be the recovery value (Figure 5). Using a range of exit yields is arbitrary but for levels in the 9-12% range, the recovery values would be between 23 and 17, respectively.

**Figure 5: Preliminary recovery values under different primary balance and exit yields compatible with 60% debt-to-GDP in 2050**

2011-15 primary balance adjustment (% GDP)	Reduction of residual bonded debt stock (in %)	Present value of synthetic Greek bond price assuming:	
		Exit yield of 9%	Exit yield of 12%
12.8	0%	64.9	48.8
11.5	11%	57.7	43.5
10.2	30%	45.4	34.2
8.8	48%	33.7	25.4
7.4	65%	22.7	17.1
6.6	84%	10.4	7.8

Source: Barclays Capital

The potential haircuts involved in the debt restructuring calculations are very high relative to past emerging market defaults. Part of the problem is that markets underestimated the costs and overestimated the benefits of euro area membership. In particular, markets did not fully realise that by lacking a lender of last resort, the Greek government (as other euro area governments) is effectively having “foreign

currency” denominated debt. There was also the implicit assumption that a euro area sovereign could not default. As a result, markets lent Greece much more than the country could repay.

The high debt stock makes the restructuring process challenging. We believe, however, that the high concentration of ownership structure among euro area financial institutions raises the probability of an orderly restructuring.

**Figure 6: NPV debt reduction (in %) through a combination of maturity extension and different average coupons – calculations based on an assumed 9% exit yield**

Average Coupon	10yr	15yr	20yr	25yr	30yr	35yr
5%	26	32	37	39	41	42
4%	32	40	46	49	51	53
3%	39	48	55	59	62	63
2%	45	56	64	69	72	74
1%	51	64	73	79	82	85
0%	58	73	82	88	92	95

Source: Barclays Capital.

## 7. Greece post-restructuring: some concluding remarks

Even after an orderly debt restructuring Greece is unlikely to recover access to international capital markets for government bonds in the near future. Greece will have to rely on tight monitoring under the financial umbrella of an EU-IMF programme in the years to come. Even post-debt restructuring, there is no guarantee that the government will succeed in its dual goal of restoring fiscal solvency and closing the competitiveness gap. Yet we think Greece stands a better chance of accomplishing this from inside rather than outside the EMU.

First, on the fiscal front, streamlining the public sector, empowering the tax agency, ensuring a more even distribution of the tax burden, controlling the budgets of sub-central government entities, and enhancing the reliability of public sector data must be the main goals of the Greek government under the umbrella of the EU’s supervision. Second, for the financial sector, maintaining the liquidity in the Greek banking system and containing the depth of the credit crunch to facilitate the recovery are goals that without ECB’s backstop, would be very hard to accomplish. Third, closing the competitiveness gap will require tackling deep-rooted structural vulnerabilities, which would have to be addressed anyway, inside or outside the EMU.

While a large devaluation would certainly bring about some near-term gains derived from import substitution, it is not clear that those near-term benefits would compensate for the costs. The exit from the EMU would likely precipitate a financial

meltdown of the Greek financial institutions. And economic recovery in a “credit-less economy” would be very challenging. Also, inflation would eventually catch up with the nominal exchange rate devaluation, largely offsetting the scope for exchange-rate competitiveness gains.

And yet EMU membership is not carved in stone. The euro area will eventually need an “EMU exit path” for countries that are unwilling or unable to do what it takes to stay in. And Greece will only manage if its future policy choices are consistent with the straight jacket of a currency union.

### **ANNEX 1: Linking debt reduction to haircut**

When thinking about debt restructuring, it makes sense to start from the debt sustainability framework: equation (1) in the main text

$$\Delta\left(\frac{D}{Y}\right)_t = \left(\frac{r_t - g_t}{1 + g_t}\right)\left(\frac{D}{Y}\right)_{t-1} - pb_t \quad (1)$$

Ruling out Ponzi schemes requires the following inter-temporal condition to hold (in continuous time to simplify notation):

$$\left(\frac{D}{Y}\right)_0 = \int_0^{\infty} \exp\left(-\int_0^s (r_v - g_v)dv\right) pb_s ds \quad (2)$$

For a known path of feasible primary balances, we can solve the above. The solution requires the following inter-temporal condition to hold:

$$(1 - \alpha)\left(\frac{D}{Y}\right)_0 = \int_0^{\infty} \exp\left(-\int_0^s (r_v - g_v)dv\right) pb_s^* ds \quad (3)$$

where  $\alpha$  is the debt reduction necessary to stabilise debt dynamics.  $r_v$  and  $g_v$  are the average interest and growth rates (that change over time) and  $pb^*(t)$  is the economically and politically feasible primary surplus path. As time goes on the average interest rate will converge to the marginal interest rate.

Under our calculation  $\alpha$  equates the “haircut”. The reason for this is twofold:

First, we have defined haircut as:

$$\text{Haircut: } 1 - \text{NPV}(\text{new bond cash flows, } r) / \text{NPV}(\text{old cash flows, } r) \quad (4)$$

where  $r$  is the “exit yield”. The haircut is hence defined with respect to a claim associated to the cash flows of the old bonds.

Second, the exit yield,  $r$ , in (4) equates the marginal funding rate in our debt sustainability in (2) and (3).

Market participants often define the claim (the denominator) in (4) as 100 with the idea that all bonds are accelerated once restructuring is announced. Since in general

coupons of the bonds issued before restructuring are lower than exit yields, the haircut estimated under our preferred method is higher.

The advantage of our method is twofold in our view: (1) it allows us to cleanly map haircuts with debt reduction under a debt sustainability analysis, (2) it quantifies more precisely the losses suffered by investors in a restructuring.

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