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# Reducing High Public Debt Ratios: Lessons from UK Experience

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## **Abstract**

This paper examines contrasting experiences of the United Kingdom in addressing high public debt to GDP ratios following major wars. A clear message is that interest rate/growth rate differentials were more important than primary budget surpluses for the different outcomes. The debt to GDP ratio fell very rapidly under financial repression following World War II but remained stubbornly high despite large budget surpluses with price deflation after World War I. Implications for policymakers today are that averting price deflation is a high priority and that supply-side policies that raise growth could play an important part in debt reduction.

**Keywords:** balanced budget; debt reduction; financial repression; fiscal rule; fiscal sustainability

**JEL Classification:** H63; N14

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## 1. Introduction

Recent years have seen a large increase in public debt to GDP ratios in those European countries which have borne the brunt of the financial crisis. In some southern European countries these ratios are very high by historical standards while in the UK the ratio of gross government debt to GDP has doubled since 2007 (cf. Table 1). Worries about fiscal sustainability have led to the adoption of new fiscal rules. For Eurozone countries, a gross government debt ratio no greater than 60% is prescribed and the debt-convergence rules adopted in the light of the crisis indicate that 1/20th of the excess over this level shall be removed each year. For the UK, the government has set a target that the cyclically-adjusted current budget should be in balance by the end of a 5-year rolling period and that public sector net debt as a ratio of GDP should be falling by 2015/16.

The latest projection from the Office for Budget Responsibility sees it as quite likely that the UK will achieve these targets. Its central projection on 'unchanged policies' is for a reduction of about 20 points in the ratio of public sector net debt to GDP over the next 20 years based on an average primary budget surplus of about 1.4 per cent of GDP after which the pressures of an ageing population would return the ratio to its current level by the late 2050s (OBR, 2014). However, OECD (2013) calculates that to stay within Eurozone rules for every year from 2014 to 2023, Greece will have to maintain a primary budget surplus of about 9% of GDP, Italy and Portugal about 6% of GDP, and Ireland and Spain about 3.5% of GDP. Dealing with the debt legacy of the crisis in this way will clearly be much more painful. But even the British path of debt reduction could be considerably more difficult than OBR suggests if pressures to increase public spending prove irresistible and/or the future path of interest rates and economic growth is less favourable than is currently projected.

It is, of course, the case that the UK has successfully dealt with public debt ratios well above anything seen in Table 1 in the past which might seem to suggest that today's European countries can repeat the trick. Indeed, optimistic assessments of the UK's ability to deal with its inflated public debt ratio often emphasize that similar (indeed much more serious) problems have been easily resolved in the past (Neild, 2012). Whilst this could perhaps be claimed for the aftermath of the Napoleonic Wars and World War II, the experience after World War I was much more difficult. Moreover, all of these episodes took place in quite different circumstances from those likely to prevail in the near future. This suggests that in seeking lessons from history it is worthwhile to review the details of past UK policies and achievements in dealing with high public debt ratios. This is the task undertaken by this paper.

In particular, the following questions are addressed:

- 1) On an ex-post accounting basis, how did the UK cut the public debt to GDP ratio after the three major wars of the last 200 years?
- 2) What was the political basis for running primary budget surpluses in each of these periods?
- 3) What are the lessons from major reductions in the UK public debt to GDP ratio for today's policymakers in the UK and in the Eurozone?

The paper proceeds as follows. The arithmetic of debt reduction is briefly reviewed in Section 2. Section 3 analyzes the historical experience of debt reduction in the UK. Section 4 explores implications for today's policymakers and section 5 concludes.

## 2) The Basics of Reducing Public Debt Ratios

It is well-known that the steady-state condition for the public debt to GDP ratio to be stabilized, such that  $\Delta d = -b + (i - \pi - g)d = 0$ , is

$$b^* = d(i - \pi - g) = id - d(\pi + g) \quad (1)$$

where  $b^*$  is the required primary budget surplus to GDP ratio,  $d$  is the public debt to GDP ratio,  $i$  is the nominal interest rate on government debt,  $\pi$  is the rate of inflation and  $g$  is the growth rate of real GDP. The required primary budget surplus increases with the debt to GDP ratio and with the excess of the real interest rate on government debt minus the growth rate of real GDP ( $r - g$ ) and likewise the  $b$  required for any given rate of reduction in  $d$ . A balanced budget rule requires that  $b = id$ , so this will deliver  $b > b^*$  when  $(\pi + g) > 0$ . In 'normal' circumstances with inflation and growth, this condition will be met. In conditions of price deflation or recession, it may not be, and with both deflation and recession, it will not be met.

Of course, if the real interest rate/growth rate differential is negative it is possible to stabilize the debt ratio while running a primary budget deficit. However, conventional theories of economic growth suggest that it is reasonable to expect that  $r > g$ . A Ramsey-model formulation with optimizing households will imply that in steady state  $r^* = \rho + \theta g^*$  where  $\rho$  is the rate of time preference and  $\theta$  is the elasticity of the marginal utility of consumption with respect to the growth of consumption. Both  $\rho$  and  $\theta$  are expected to be positive which implies  $r > g$  (Barro and Sala-i-Martin, 1995, ch. 2). That said, even if in the long run the real interest rate is determined by the fundamentals of productivity and thrift, in the short to medium term these forces may be subordinate to the impact of monetary and fiscal policies and there have been quite long periods where real interest rates have been below real growth rates in many countries, notably in the so-called 'Golden Age' of European growth after World War II (Allsopp and Glyn, 1999).

A policy of 'financial repression' can be defined as one in which government intervention reduces the nominal interest rate on public debt below the free market rate. Combined with inflation, this will be conducive to a more favourable configuration of  $(r - g)$  and may well entail a negative real interest rate on government borrowing.<sup>1</sup> The methods by which this may be achieved include the imposition of interest rate ceilings, balance-sheet regulation of the banking sector, control of central bank interest rate policies and restrictions on international capital mobility (Reinhart and Sbrancia, 2015). The general idea is to create captive domestic savings from which the government can benefit.

This implies that there are several ways to address an incipiently unsustainable fiscal position including fiscal consolidation, manipulating the interest rate/growth rate differential, and reducing debt by restructuring or persuading creditors to give debt relief. If an adequate fiscal response is not forthcoming, then resort must be made to one of these other means.

In this context, it is useful to get a sense of how large reductions in  $d$  have been achieved in the past. A permutation on equation (1) gives the ex-post accounting formula employed by Abbas et al. (2011)

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<sup>1</sup> It should be noted that the ex-ante implication of financial repression on  $r$  is distinct from that of surprise inflation which is a different (possibly complementary) strategy for manipulating the ex-post real interest rate, cf. equation 6 in Reinhart and Sbrancia (2015).

$$d_T - d_0 = \sum_{t=1}^T [(r - g)_t / (1 + \pi + g)_t] d_{t-1} + \sum_{t=1}^T -b_t + \sum_{t=1}^T sfa_t \quad (2)$$

This decomposes the change in  $d$  into a term which is the cumulative effect of the interest rate/growth rate differential, a term which is the cumulative primary deficit, and a cumulative residual stock-flow adjustment term,  $\sum sfa$ , which will reflect valuation effects such as the impact of exchange-rate changes for debt issued in foreign currency, 'below-the-line' fiscal operations such as privatizations, and errors in the data.

Table 2 displays results of a decomposition of large reductions in the public debt to GDP ratio in the past based on equation (2). Two points stand out. First, in cases where the reduction was from a high initial level of  $d$  ( $> 80$  per cent) the growth rate/interest rate differential played a relatively important part. Second, in most periods the lion's share of the reductions in  $d$  was due to primary budget surpluses but a major exception to this was observed in the sample for reductions starting in the years from 1945 to 1970 when the interest rate/growth rate differential was much more important than budget surpluses.

### 3) UK Experience in Dealing with Debt after 3 Major Wars

This section reviews the contrasting UK experiences in attempting to reduce high public debt to GDP ratios in the nineteenth century after the Napoleonic Wars and in the twentieth century after the two World Wars. I consider both the arithmetic and the political economy of debt reduction.

#### a) 1831-1913

Analysis of the post-Napoleonic-War period is undertaken from the point at which national accounts estimates become available on an annual basis in 1830. At that point the public debt to GDP ratio was 1.593 from which level it fell steadily to below 0.6 by 1872 and to 0.247 by 1913. Table 3 shows that, arithmetically, this was achieved by running persistent primary budget surpluses which were sustained at a high average of around 5 per cent of GDP during the 1830s and 1840s and then gradually reduced through the following decades. Nevertheless, in every decade these surpluses were adequate to meet the fiscal sustainability condition since in the later decades the debt ratio was much lower. The real interest rate/ real growth rate differential was positive on average over most of the period. It was over 3 percentage points in the deflationary decades of the 1840s and the 1880s but slightly negative in the relatively fast growth decade of the 1860s. The real interest rate paid on government debt averaged 3.9 per cent and the average rate of growth of real GDP averaged 2.0 per cent per year.

The public debt throughout this period comprised at least 95 per cent 'funded debt', that is to say debt on which the government had no obligation to repay the capital (BPP, 1914). Borrowing was entirely in domestic currency. The vast majority was marketable debt in the form of Consols which paid a nominal interest rate of 3 per cent prior to Goschen's conversion in 1888 which reduced this first to 2.75 per cent and then to 2.5 percent from 1903. Consols were attractive to the public at these interest rates because they were highly liquid in an era when surprise inflation was not seen as a significant risk (Clare, 1898; Wormell, 2000).

The key feature of these years was a strong commitment to balancing the budget. The actual budget surplus or deficit was less than 1 per cent of GDP in all but 6 years. Deficits greater than 1 per cent

of GDP only occurred at the times of the Boer and Crimean Wars and with compensation for slave owners in the mid 1830s. A new 'Sinking Fund' was introduced in 1875 which established a debt charge of £28 million per annum (about 2 per cent of GDP) to cover debt service and redeem a proportion of the debt.<sup>2</sup> There were no periods of severe price deflation and in the era of modern economic growth that followed the industrial revolution following a balanced budget rule was good enough to deliver steady reduction in the public debt to GDP ratio. The context of this adherence to balanced budgets was an 'unwritten fiscal constitution' which entailed a 'rules-based' approach to economic policymaking that constrained political discretion and also entailed a macroeconomic trilemma choice which prevailed throughout the period, namely, a fixed exchange rate (the gold standard) and internationally mobile capital (Middleton, 1996). The primary duty of the Bank of England as an independent central bank was to maintain the gold parity of the pound sterling.

To modern eyes, the priority given to balancing the budget and, even more so, the large primary budget surpluses of the second quarter of the nineteenth century seem quite surprising. The political context was, however, very different at this time. In particular, the electorate was very narrow before the Second Reform Act of 1867 (about 6 per cent of adults) or even before the Third Reform Act of 1883 (about 14 per cent) and it was only in the late nineteenth century that competition for working class votes began. This implied that a very low priority was given to government social expenditure (Lindert, 2004) which even in 1913 only amounted to 4.7 per cent of GDP (Middleton, 1996). In contrast, the rules-based approach to policy making and the discipline that it imposed on politicians, which would mean that Britain would be well placed to borrow in the next military emergency, had some appeal for the enfranchised property owning voters (Bordo and Kydland, 1995).

#### **b) 1921-1938**

A striking feature of this period is the continuing very high level of the public debt to GDP ratio which was above 1.4 throughout, reached almost 1.8 at its peak, and was virtually the same in 1938 as in 1921. Not only had public debt soared as a consequence of World War I but its composition had changed markedly. Nearly 15 per cent was now in foreign currency while 10 per cent had a maturity of less than 1 year and perpetual debt accounted for less than 5 per cent in the early 1920s (Abbas et al., 2014).

Equally remarkable is the continued very high level of primary budget surpluses which averaged 6.2 per cent of GDP during 1921-38. Until rearmament changed the fiscal picture after 1935, the primary budget surplus was never below 5 per cent and in seven years exceeded 7 per cent. These data are reported in Table 4. Despite continuing large primary surpluses the debt to GDP ratio rose sharply in the early 1920s and again in the early 1930s and fell only modestly in the late 1920s; the impact of these surpluses was generally outweighed by adverse interest rate/growth rate differentials. Real interest rates were very high in the years characterized by price deflation.

After the UK left the gold standard and moved to the era of 'cheap money', the fiscal arithmetic changed dramatically as prices stopped falling and the real interest rate fell steeply so that it was below the growth rate for several years. The debt to GDP ratio between 1933 and 1938 fell steadily with positive contributions both from primary budget surpluses (about 2/3) and from interest

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<sup>2</sup> This was subsequently varied on several occasions and by 1899-1900 had been reduced to £23 million.

rate/growth rate differentials (about 1/3). The fall in nominal interest rates permitted the conversion in 1932 of the War Loan from a 5% per cent bond redeemable between 1929 and 1947 to a 3.5 per cent with no redemption date which could not be repaid until 20 years had elapsed. This reduced debt service by about £30 million per year and raised the proportion of private holdings repayable only by government option from 19 to 45 per cent while a further 15 per cent had a maturity of over 15 years (Howson, 1975).

The early 1920s saw an attempt to return to the pre-war rules of the balanced budget and the gold standard but this did not deliver the nineteenth century result. Balanced budget orthodoxy remained very strong as is demonstrated by the over-riding of the automatic stabilizers in the face of the downturn resulting from the world depression in the early 1930s such that there was an overall surplus of 0.5 per cent of GDP in 1933. Although the budget was close to balance in most years, in the face of price deflation and several years when real GDP fell sharply, this was not enough to reduce the public debt to GDP ratio over the period as a whole. Returning to gold made debt reduction much harder. In the early 1920s, the debt problem was seriously exacerbated by the large fall in prices necessitated by the decision to return to gold at the pre-war parity which required prices to fall significantly to restore international competitiveness and severe deflationary pressures were renewed at the end of the decade through gold hoarding by surplus countries (Irwin, 2010).

A long period of big primary budget surpluses which more or less balanced the budget in the face of high levels of debt service was achieved even though the franchise was extended to about 75 per cent of adults in 1918 and to 95 per cent by the time of the 1929 election which was conducive to strong growth in public expenditure for social purposes (education, health, housing, transfers) which rose from 4.7 per cent of GDP on the eve of World War I to 7.2 per cent in 1925 and 8.7 per cent by 1938 (Middleton, 1996). This seems to reflect a substantial 'displacement effect', namely, that the experience of war finance seemed permanently to raise the maximum tolerable taxation level, which was first identified by Peacock and Wiseman (1961) and has been confirmed by modern econometric analysis (Henry and Olekalns, 2010).<sup>3</sup>

Although the problem of the war debt was a major issue in the 1920s, the Labour Party's proposal of a capital levy was rejected. When Labour formed a minority government for the first time following the 1923 general election the controversial matter was referred in March 1924 to a committee of enquiry chaired by Lord Colwyn which eventually published its report in February 1927 (BPP, 1927). Its majority report was against a capital levy and the proposal was dropped. The maximum yield of such a levy was estimated at £3 billion (equal to about 40 per cent of the stock of national debt which would have reduced b from 1.6 to 1.0). The impact on the fiscal arithmetic was seen as relatively modest compared with the potential damage to the legitimacy of the taxation system and the adverse effects on the incentive to save. The net improvement in the annual budgetary position was put at only about £60 million based on interest savings of £150 million offset by reduction in other tax receipt of £90 million.

### **c) 1950-1970**

The outstanding feature of the 1950s and 1960s is the very rapid reduction of the public debt to GDP ratio. From almost 200 per cent of GDP in 1950 it was below the Maastricht limit by 1971 when it

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<sup>3</sup> Peacock and Wiseman suggested that the displacement effect was about 14 per cent of GDP.

had fallen to 58.3 per cent of GDP. These two decades were characterized by primary budget surpluses in every year but one but the average was much smaller than during the inter war years at 2.3 per cent of GDP compared with 6.2 per cent in 1921-38. The average rate of inflation was about 4 per cent per year and in eight years the ex-post real interest rate on government debt was negative. Nominal interest rates were lower than at any time in the 1930s until 1958 and real interest rates were almost always below the real growth rate. Growth was strong by British standards but, even so, the really noteworthy aspect of this period is the very low level of real interest rates; the average over the whole 20 years is only slightly positive. Outlays on debt interest averaged only 4.5 per cent of GDP during the 1950s and 1960s compared with 6.6 per cent in the interwar period. The fiscal sustainability data for this period are reported in Table 5.

The rapid debt reduction of these years was achieved without many years of very painful fiscal consolidation which may explain why many British commentators do not think high public debt to GDP ratios matter. This could be done because it was possible to address the issue through financial repression. Allen (2014) provides a detailed account of the means by which this was achieved which included making banks have high levels of liquid assets to deposits which could be met by holding Treasury Bills, controls on interest rates, credit restrictions for private sector lending, and comprehensive foreign exchange controls. In the 1950s, over 40 per cent of the public debt was held by domestic commercial banks and over 40 per cent was non-marketable (Abbas et al., 2014). The financial repression index score calculated by Battilossi (2004) was as high as 73.1 in 1953-7 and still 63.1 in 1963-7.<sup>4</sup> Politically, financial repression fitted with an era of very high top marginal income tax rates in a rather egalitarian climate and a strong preference for tight regulation of the financial system following the banking crises of the interwar period.

The context under the Bretton Woods system was also a different macroeconomic policy trilemma choice, namely, a fixed exchange rate, independent monetary policy, and obstacles to capital mobility as foreign exchange controls were maintained from World War II until 1979. The UK had low scores both for central bank independence (Cukierman et al. 1992) and also for capital account openness (Quinn and Toyoda, 2008). The evidence presented to the Radcliffe Committee (1959) underlined that the Chancellor not the Bank had responsibility for interest rate policy while debt management and controlling the interest costs of the national debt were central tasks for the Bank throughout these decades (Goodhart, 2012). Interest rates were decoupled from those prevailing abroad (Obstfeld, 1993). There was relatively little surprise inflation (Reinhart and Sbrancia, 2015); nominal interest rates rose but, even so, were held down relative to inflation. The average maturity of the debt became much shorter than before World War II with short term debt accounting for nearly 20 per cent of the stock in the 1950s and 1960s as those who held the (unredeemable) War Loan issued in 1932 saw its price fall steadily from par in 1948 to 40 by 1970 (Allen, 2012).

After 1945, public expenditure as a share of GDP was much higher than between the wars. Between 1951 and 1964 it was typically around 38 per cent of GDP with social expenditure now amounting to as much as 17 per cent of GDP. World War II once again saw a sizeable displacement effect (Henry and Olekalns, 2010) and the longer-term impact of the expanded electorate and the rise of the Labour Party was reflected in the Beveridge-era welfare state which was regarded as untouchable by

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<sup>4</sup> The index has 3 equally-weighted components, namely, reserve requirements for banks, real deposit rates of banks and government liabilities held by the banking system. Each of these is measured on a scale of 0 (minimum) to 100 (maximum) standardized to a normal distribution.

the Conservatives when back in office (Middleton, 1996). At the same time, the Conservatives had been elected in 1951 on the back of popular dissatisfaction with austerity and ‘you’ve never had it so good’ was to be the basis of future electioneering by them (Zweininger-Bargielowska, 1994). In this context, they were constantly seeking ways within the political constraints of the postwar settlement to reduce taxes (Daunton, 2002). By contrast, Labour wanted further expansion of social expenditure which did indeed rise sharply after they regained office in 1964. Moreover, in this ‘Keynesian era’, balanced budgets were no longer ‘mandatory’ and overall budget deficits averaged 2.1 per cent of GDP (Middleton, 2010). It seems clear that there was no longer any political possibility of running primary budget surpluses at the level of the 1920s. In the absence of favourable interest rate/growth rate differentials, a sizeable reduction in the public debt to GDP ratio would have been most unlikely.

Although the Labour Party won a landslide victory in the 1945 election, there was no attempt to introduce a capital levy. The issue was dealt with by the National Debt Enquiry Committee in 1945 whose members included Keynes and Meade who wrote the report which rejected the idea mainly because it would do even less to improve the fiscal arithmetic than in the 1920s given that ‘cheap money’ would continue to prevail, and rates of income and capital taxation were now much higher and highly progressive (Howson, 1988, ch. 15).

#### **d) Overview**

Table 6 provides a comparative decomposition of the changes in public debt to GDP ratios in these different periods. This highlights how different was the experience after World War II from what had gone before. In the 1950s and 1960s, well over half of the reduction in the debt to GDP ratio came from a favourable interest rate/growth rate differential in conditions of financial repression and rapid growth. Before World War I, primary budget surpluses did all the work and  $(r - g)$  offset a good part of their impact. In the difficult deflationary conditions of the 1920s and early 1930s, very substantial primary budget surpluses were more than offset by very unfavourable interest rate/growth rate differentials.<sup>5</sup> In turn, these contrasting episodes also underline the importance of the exchange rate regime or more generally the macroeconomic trilemma policy choice in facilitating or obstructing debt ratio reduction.

Table 7 reports some details of the composition of the UK public debt in different periods which helps to establish the context for the financial repression of the decades after World War II. Compared with the years before World War I, it is clear that the proportion of marketable debt was much lower. The high share of public debt held by the banks in the 1950s also stands out. This was a configuration which gave the government considerable scope to distort interest rates to its advantage.

British economic history demonstrates that it has been possible to run much larger sustained primary budget surpluses even in an economy with a broad electorate than recent OECD experience seems to suggest.<sup>6</sup> However, the circumstances in which that was possible (balanced budget rule

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<sup>5</sup> The relatively large residual adjustment term for the years 1921 to 1938 reflects in considerable part the importance of debt in foreign currency and the higher exchange rate in the late 1930s compared with the early 1920s.

<sup>6</sup> IMF (2013a) reported that the maximum annual average primary budget surplus over a 10-year period in an advanced economy since 1950 is only about 3 per cent of GDP.

plus big displacement effect) are not easy to repeat and they had already disappeared by the 1950s when the displacement effect of World War II went to increase the size of the welfare state. As Keynes (1927) forcefully pointed out in his evaluation of the report of the Colwyn Committee, running large primary budget surpluses to pay off the national debt was not realistic when there were so many more voter-friendly uses for the tax revenues.

The rejection of proposals for a capital levy after each of the World Wars can be as epitomizing the general impracticality of imposing a welfare-improving capital levy that would reduce the deadweight burden of the debt without undermining saving (Eichengreen, 1990). In a democracy, the imposition would only come after protracted argument and delay and probably substantial capital flight. This would make a capital levy ineffectual even in the unlikely event that reputational effects or a credible commitment technology were able to address the time-inconsistency problem.

#### **4) Lessons for Post-Crisis Policy**

This section considers current approaches to debt reduction in the UK and the Eurozone in the light of earlier British experience in tackling large public debt to GDP ratios. The environment differs in that debt reduction will be attempted in the context of the fiscal pressures resulting from population ageing, European single market rules preclude capital controls, and balanced budget orthodoxy no longer holds sway. Nevertheless, some useful lessons are available.

##### **a) Future UK Public Debt/GDP Reduction**

OBR (2014) projects future debt to GDP ratios in terms of public sector net debt on the basis of 'unchanged policies' and assumptions about key economic variables. In all projections a steady state is assumed in which  $g = 2.4$  per cent per year (based on labour productivity growth of 2.2 per cent and employment growth of 0.2 per cent) and  $(r - g) = 0.4$  (based on a nominal interest rate of 5 per cent and inflation at 2.2 per cent). The primary budget surplus averages about 1 per cent of GDP over the period 2013/14 through 2032/33 with a peak level of 3 per cent in 2018/19 gradually falling to 0.7 per cent by 2032/33. As Table 8 reports, this delivers a central projection that public sector net debt will be 54 per cent of GDP in 2032/33. This rate of debt to GDP reduction is quite modest by 1950s standards but requires primary budget surpluses which are more than double the average of the 20 years before the crisis. OBR also projects the implications of smaller and larger budget surpluses and note that returning the debt ratio to 40 per cent by 2032/33 would require the primary budget surplus to average about 2 per cent of GDP.

From an historical perspective, the assumption of a small positive number for  $(r - g)$  catches the eye. As section 3 showed, the interest rate/growth rate differential not only matters a lot for the outcome of a fiscal consolidation process aimed at reducing the debt to GDP ratio but it has also exhibited a great deal of variation, at least for periods as short as 20 years. Table 8 reports illustrative calculations with  $(r - g)$  at +2.0 per cent from 2018/19, the average for the half-century before World War I, and at -2.7 per cent, the average for the 1950s and 1960s. In the former case, the projected fiscal strategy delivers only a small reduction in the debt to GDP ratio from 74 to 65 per cent whereas in the latter case there is a large reduction to 27 per cent.

In the absence of the framework which sustained financial repression in the early post-war decades (capital controls, a highly regulated banking system, and a far from independent central bank), it is

not likely that a large negative interest rate/growth rate differential can be contrived by UK policymakers.<sup>7</sup> A more salient aspect of this arithmetic is that supply-side policy is a key ingredient for the reduction of debt to GDP because of the importance of sustaining real GDP growth given the level of real interest rates. Effectively addressing well-known deficiencies in such areas as human capital, infrastructure, regulation and taxation (Crafts, 2013) would reduce the need for further austerity to bring the debt to GDP ratio down.

Recent UK productivity performance strongly reinforces the importance of addressing weaknesses in supply-side policy since it raises the possibility that OBR's assumption of 2.2 per cent per year labour productivity growth may be quite optimistic. A 'productivity puzzle' exists in that real GDP per hour worked at the end of 2013 was about 16 per cent below what would have been expected on the basis of its pre-crisis trend and a significant part of this shortfall is unexplained (Barnett et al., 2014). It is generally agreed that financial crises have a permanent levels effect on output. This may have been substantial in the UK; according to Ollivaud and Turner (2014) there has been a fall of 9.1 per cent in the level of potential labour productivity. At the same time, it is quite possible that trend growth has also been adversely affected, as is suggested by some analyses based on time-series econometrics. For example, Antolin-Diaz et al. (2014) estimate that trend labour productivity growth has fallen to about 1 per cent per year. OBR may well have to revisit its debt sustainability projections since its assumption about future trend growth appears increasingly questionable and long-run reduction of the public debt ratio may be more difficult than it currently allows.

## **b) Dealing with Eurozone Debt Problems**

Table 1 reported that several Eurozone economies currently have very high public debt to GDP ratios and, as noted above, obeying the new fiscal rules is projected by OECD to require large primary budget surpluses over extended periods of time. The required surpluses depend, of course, not only on the public debt to GDP ratio but also on future real interest rates and growth rates which are projected by OECD (2014) to make debt reduction quite demanding (cf. Table 9). If the ECB fails to prevent a period of price deflation in the Eurozone, real interest rates are all the more likely to exceed real growth rates. As with British participation in the gold standard in the interwar years, the constraints of Eurozone membership make the fiscal arithmetic all the more difficult. This raises the question as to how likely it is that the troubled Eurozone economies will actually comply with the fiscal rules.

In these circumstances, financial repression has obvious attractions as the British experience after World War II highlights. However, this is not the 1950s and adopting such policies nowadays is far more difficult, especially because of the much greater degree of European economic integration. That said, it is reasonable to expect some moves toward financial repression. Although EU rules guarantee free movement of capital and the independence of the European Central Bank, countries largely retain sovereignty over fiscal and financial matters and that gives them some scope for financial repression (van Riet, 2013). Even at the European level, Basel III rules for capital adequacy of banks will privilege government bonds as zero risk and EU law allows for capital controls in exceptional circumstances. Governments under financial stress could be granted increased leeway

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<sup>7</sup> Although the very low long-term interest rates that have prevailed with unconventional monetary policy have offered scope, as in the 1930s, to lock in lower real interest rates as recent issues of long-maturity bonds with low yields have underlined.

to introduce national regulatory actions and moral suasion in support of government debt financing.<sup>8</sup>

In the absence of a major return to financial repression, it is quite possible that the maximum politically feasible budget surplus may be too small to meet the Eurozone's fiscal rules (Buiter and Rahbari, 2013). The data in Table 9 inform this judgement. The highest primary budget surpluses sustained over a 5-year period since 1980 are below what will be required according to OECD (2013a) in each of Greece, Italy, Portugal, and Spain. Moreover, in the first three of these countries, the 'fiscal limit' may already have been reached in the sense that estimated fiscal reaction functions suggest that the primary balance will not be improved sufficiently to maintain fiscal sustainability (Ghosh et al., 2013).

The economics literature does not have a good answer as to what the maximum politically feasible primary budget surplus may be. Eichengreen and Panizza (2014) conclude that the very few cases where countries have recently achieved the persistent surpluses needed by these Eurozone economies are so politically and economically idiosyncratic that they provide no guidance. The UK did run such surpluses in the second quarter of the nineteenth century and in the interwar period but this seems to be an outcome of a strong adherence to balanced budget rules which is completely foreign to any of the five countries in Table 9 (Wyplosz, 2012).

There seems still to be scope to increase tax revenues in all the countries which have a potential debt problem. Thus, recent Laffer-Curve estimates suggest that Southern European countries typically have scope to raise revenues from consumption taxes by at least 20 per cent of GDP (Trabandt and Uhlig, 2012). Stochastic frontier analysis has found that 'tax effort' levels are around 70 per cent with the implication that, if potential were achieved, tax revenues would rise by at least 10 per cent of GDP (IMF 2013a).<sup>9</sup> The issue is not the economic but rather the political feasibility of increasing the ratio of tax revenues to GDP. Even if tax burdens are increased, it is apparent that there are significant pressures to increase expenditure on the welfare state.

The huge rise of social transfers as a percentage of GDP during the 20<sup>th</sup> century was driven by the spread of democracy, the desire for safety nets in the face of major economic crises, and population ageing (Lindert, 2004). These forces remain powerful and European countries face demographic pressures that, in the absence of policy reforms, will push social expenditures appreciably higher over the next 20 years. In these circumstances, it is hard to believe that prioritizing the use of additional tax revenues to fund reductions in the stock of public debt will be politically appealing. This is also the message from British economic history. After the interwar depression in an age of mass democracy, the ideas of Beveridge and Keynes ruled the roost in post-war Britain; for both Conservative and Labour governments financing a much expanded welfare state had priority over balancing the budget and paying off the national debt.

In sum, it is quite likely that the primary budget surpluses entailed by the fiscal compact exceed the politically feasible maxima in which case something will have to give! So it is perhaps not surprising that the idea of a capital levy has resurfaced in Europe. Piketty sees an exceptional tax on private

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<sup>8</sup> Van Riet (2013) itemizes measures already undertaken that epitomize financial repression, especially in distressed Eurozone economies, and discusses the financially repressive implications of new prudential regulations and protective measures against market turmoil.

<sup>9</sup> 'Tax effort' is defined as the ratio of actual tax collection to potential tax revenue.

capital as ‘the most just and efficient solution’ to the public debt problem (2014, p. 541) and Bach et al. (2014) offer detailed proposals for just such a not-to-be-repeated tax in Germany. Also unsurprisingly, such proposals have been met with fierce criticism that they will have adverse effects on savings and investment, will be hard to implement without provoking capital flight and will call into question the credibility of tax rules more generally (Keen, 2013), arguments that the Colwyn Committee also recognized. Nevertheless, the main reason such proposal were twice rejected in Britain was that the net budgetary gain was not worth these risks, a point which perhaps deserves more emphasis today.

A more promising unorthodox solution might be debt restructuring even though the political constraints on such a course of action are quite severe. Thus, it is presumably unacceptable for the process to involve inter-country transfers, or to penalize bondholders including especially banks, or to involve monetization of the debt and inflation. It may be possible to devise a scheme which meets these constraints as in the proposal made by Paris and Wyplosz (2014). This entails purchases of sovereign debt by the ECB which would swap them into zero-interest perpetuities and would eventually be repaid by retaining future seigniorage revenues that would otherwise accrue to the sovereign debtor.

## **5) Conclusions**

Attempts in the past by the UK to address the issue of high public debt to GDP ratios which were the legacy of major wars produced strongly contrasting experiences. After the Napoleonic Wars, the debt to GDP ratio was steadily reduced over a long period by running primary budget surpluses which were underpinned by a strong commitment to the balanced budget rule. After World War II, the debt to GDP ratio was reduced very rapidly as primary budget surpluses were strongly augmented by policies of financial repression which held the real interest rate below the real growth rate. In the interwar period, price deflation in the context of policies to return to the gold standard meant that large and persistent primary budget surpluses were undermined by unfavourable interest rate/ growth rate differentials. Given the demise of the balanced budget rule and the advent of the welfare state, it seems quite unlikely that the primary surpluses of the 1830s or even the 1920s could be repeated in Europe today.

These contrasting histories underline the importance of  $(r - g)$ , the real interest rate on government debt minus the growth rate of real GDP, to the success of debt reduction strategies, a point that seems often to be neglected in current policy thinking. Three important points follow from this. First, it is extremely important that central banks prevent price deflation which pushes real interest rates up especially when the lower bound for nominal rates is reached. Second, financial repression policies, which hold down real interest rates on government debt, have strong political appeal when public debt ratios are high because they offer an alternative to severe austerity. Third, in the face of continuing weak productivity performance and limited scope to exploit financial repression nowadays, reforms of supply-side policies with a view to raising real GDP growth are potentially valuable complements to budget stringency in a debt reduction strategy.

## References

- Abbas, S. M. A., Belhocine, N., El-Ganainy, A. and Horton, M. (2011), "Historical Patterns and Dynamics of Public Debt – Evidence from a New Database", *IMF Economic Review*, 59: 717-742.
- Abbas, S. M. A., Blattner, L., De Broeck, M., El-Ganainy, A. and Hu, M. (2014), "Sovereign Debt Composition in Advanced Economies: a Historical Perspective", IMF Working Paper No. 14/162.
- Allen, W. A. (2012), "Government Debt Management and Monetary Policy in Britain since 1919", Cass Business School Centre for Banking Research Working Paper 02/12.
- Allen, W. A. (2014), *Monetary Policy and Financial Repression in Britain, 1951-59*. Basingstoke: Palgrave Macmillan.
- Allsopp, C. and Glyn, A. (1999), "The Assessment: Real Interest Rates", *Oxford Review of Economic Policy*, 15(2), 1-16.
- Antolin-Diaz, J., Drechsel, T. and Petrella, I. (2014), "Following the Trend: Tracking GDP when Long-Run Growth is Uncertain", CEPR Discussion Paper No. 10272.
- Bach, S., Beznoska, M. and Steiner, V. (2014), "A Wealth Tax on the Rich to Bring Down Public Debt? Revenue and Distributional Effects of a Capital Levy in Germany", *Fiscal Studies*, 35, 67-89.
- Barnett, A., Batten, S., Chiu, A., Franklin, J. and Sebastiá-Barriel, M. (2014), "The UK Productivity Puzzle", *Bank of England Quarterly Bulletin*, 54, 114-28.
- Barro, R. J. and Sala-i-Martin, X. (1995), *Economic Growth*. New York: McGraw-Hill.
- Battilossi, S. (2004), "The Little Reversal: Capital Markets and Financial Repression in Western Europe in the Second Half of the 20<sup>th</sup> Century", Occasional Paper, Graduate School of Economics, University of Tokyo.
- Bordo, M. D. and Kydland, F. E. (1995), "The Gold Standard as a Rule: an Essay in Exploration", *Explorations in Economic History*, 32, 423-464.
- British Parliamentary Papers (1914), *National Debt*, Cd. 7426. London: HMSO.
- British Parliamentary Papers (1927), *Report of the Committee on National Debt and Taxation*, Cmd. 2800. London: HMSO.
- Buiter, W. and Rahbari, E. (2013), "Why Do Governments Default and Why Don't They Default More Often?", CEPR Discussion Paper No. 9492.
- Clare, G. (1898), *The London Daily Stock and Share List*. London: Charles and Edwin Layton.
- Crafts, N. (2013), "Returning to Growth: Policy Lessons from History", *Fiscal Studies*, 34, 255-282.
- Cukierman, A., Webb, S. B. and Neyapri, B. (1992), "Measuring the Independence of Central Banks and Its Effect on Policy Outcomes", *World Bank Economic Review*, 4, 353-398.

- Daunton, M. J. (2002), *Just Taxes: the Politics of Taxation in Britain, 1914-1979*. Cambridge: Cambridge University Press.
- Eichengreen, B. (1990), "The Capital Levy in Theory and Practice", in R. Dornbusch and M. Draghi (eds.), *Public Debt Management: Theory and History*. Cambridge: Cambridge University Press, 191-220.
- Eichengreen, B. and Panizza, U. (2014), "A Surplus of Ambition: Can Europe Rely on Large Primary Surpluses to Solve Its Debt Problem?", NBER Working Paper No. 20316.
- Feinstein, C. H. (1972) *National Income, Expenditure and Output of the United Kingdom, 1855-1965*. Cambridge: Cambridge University Press.
- Ghosh, A. R., Kim, J. I., Mendoza, E. G., Ostry, J. and Qureshi, M. S. (2013), "Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies", *Economic Journal*, 123, F4-F30.
- Goodhart, C. (2012), "Monetary Policy and Public Debt", *Banque de France Financial Stability Review*, 16, 123-130.
- Henry, O. and Olekalns, N. (2010), "Peacock and Wiseman's Displacement Hypothesis: Some New Long-Run Evidence for the UK", *Applied Economics*, 42, 1455-1460.
- Howson, S. (1975), *Domestic Monetary Management in Britain, 1919-1938*. Cambridge: Cambridge University Press.
- Howson, S. (1988), *The Collected Papers of James Meade*, vol. 2. London: Unwin Hyman.
- IMF (2013a), *Fiscal Monitor*.
- IMF (2013b), *Historical Public Finance Database*.
- IMF (2015), *Fiscal Monitor*.
- Irwin, D. (2010), "Did France Cause the Great Depression?", NBER Working Paper No. 16350.
- Keen, M. (2013), "Once and For All – Why Capital Levies are Not the Answer".  
<http://blog-imfdirect.imf.org/2013/11/06/>
- Keynes, J. M. (1927), "The Colwyn Report on National Debt and Taxation", *Economic Journal*, 37, 198-212.
- Lindert, P. H. (2004), *Growing Public*. Cambridge: Cambridge University Press.
- Middleton, R. (1996), *Government versus the Market*. Cheltenham: Edward Elgar.
- Middleton, R. (2010), "British Monetary and Fiscal Policy in the 1930s", *Oxford Review of Economic Policy*, 26, 414-441.
- Mitchell, B. R. (1988), *British Historical Statistics*. Cambridge: Cambridge University Press.
- Mitchell, J., Solomou, S. and Weale, M. (2012), "Monthly GDP Estimates for Interwar Britain", *Explorations in Economic History*, 49, 543-556.

- Neild, R. (2012), "The National Debt in Perspective", *Royal Economic Society Newsletter*, 156.
- OBR (2014), *Fiscal Sustainability Report*.
- Obstfeld, M. (1993), "The Adjustment Mechanism", in M. Bordo and B. Eichengreen (eds.), *A Retrospective on the Bretton Woods System*. Chicago: University of Chicago Press, 201-268.
- OECD (2013), *Economic Outlook*.
- OECD (2014), *Economic Outlook*.
- Ollivaud, P. and Turner, D. (2014), "The Effect of the Financial Crisis on OECD Potential Output", OECD Economics Department Working Paper No. 1166.
- Paris, P. and Wyplosz, C. (2014), *Politically Acceptable Debt Restructuring in the Eurozone*. London: CEPR Press.
- Peacock, A. T. and Wiseman, J. (1961), *The Growth of Public Expenditure in the United Kingdom*. Princeton: Princeton University Press.
- Piketty, T. (2014), *Capital in the Twenty-First Century*. Cambridge, Mass. : Belknap Press.
- Quinn, D. P. and Toyoda, A. M. (2008), "Does Capital Account Liberalization Lead to Economic Growth?", *Review of Financial Studies*, 21, 1403-1449.
- Reinhart, C. M. and Sbrancia, M. B. (2015), "The Liquidation of Government Debt", *Economic Policy*, 82, 291--333.
- Van Riet, A. (2013), "Financial Repression to Ease Fiscal Stress: Turning Back the Clock in the Eurozone?", paper presented to Banco Central do Brasil 8<sup>th</sup> Annual Seminar on Risk, Financial Stability and Banking, Sao Paulo.
- Wormell, J. (2000), *The Management of the National Debt of the United Kingdom, 1900-1932*. London: Routledge.
- Wyplosz, C. (2012), "Fiscal Rules: Theoretical Issues and Historical Experiences", NBER Working Paper No. 17884.
- Zweininger-Bargielowska, I. (1994), "Rationing, Austerity and the Conservative Party Recovery after 1945", *The Historical Journal*, 37, 173-197.

**Table 1. General Government Gross Debt (%GDP)**

	<b>2007</b>	<b>2014</b>
Austria	64.8	86.8
Belgium	86.9	105.6
Denmark	27.3	42.6
Finland	33.9	59.6
France	64.2	95.1
Germany	63.5	73.1
Greece	102.8	177.2
Ireland	24.0	109.5
Italy	99.7	132.1
Netherlands	42.5	68.3
Norway	49.6	30.1
Portugal	68.4	130.2
Spain	35.5	97.7
Sweden	38.1	41.5
Switzerland	53.3	46.1
United Kingdom	43.6	89.5

Source: IMF (2015).

**Table 2. Average Decomposition of Large Public Debt Ratio Reductions (% GDP)**

<i>Start</i>	<i>Initial Ratio</i>	<i>Final Ratio</i>	<i>Decrease</i>	<i>Budget Surplus Component</i>	<i>Growth-Interest Differential Component</i>	<i>Residual Adjustment</i>
Pre-1914	88.9	62.3	26.6	18.5	9.3	-1.2
Between 1914-44	121.7	87.7	34.0	23.1	12.0	-1.0
Between 1945-70	92.3	32.7	59.6	20.7	53.2	-14.2
Post-1970	73.6	46.3	27.3	22.7	0.8	3.8
Ratio > 80	136.7	79.6	57.1	29.0	37.4	-9.3
Ratio < 80	55.2	33.9	21.3	15.1	4.3	1.9

*Notes:* the samples are drawn from an unbalanced panel with start dates somewhere in the intervals shown; examples do not include cases where default occurred.

Source: Abbas et al. (2011).

**Table 3. Fiscal Sustainability Data, 1831-1913**

	<i>b</i>	<i>i</i>	$\pi$	<i>g</i>	<i>d</i>	<i>b*</i>
1831-40	5.23	3.68	-0.85	2.26	1.487	3.60
1841-50	4.97	3.68	-1.04	1.66	1.350	4.36
1851-60	3.52	3.58	1.23	2.25	1.071	0.06
1861-70	2.50	3.36	0.48	3.03	0.769	-0.12
1871-80	2.13	3.72	0.16	1.95	0.568	1.06
1881-90	2.08	4.08	-0.62	1.30	0.490	1.72
1891-1900	1.50	3.92	0.63	2.16	0.372	0.50
1901-13	1.34	5.39	0.48	1.68	0.313	1.02

*Note:*

$b^*$  is the required primary budget surplus to GDP ratio to satisfy the condition that  $b = (i - \pi - g)d$ .

*Sources:*  $b$ , primary budget surplus to GDP ratio,  $i$ , average nominal interest rate on government debt,  $d$ , public debt to GDP ratio,  $\pi$ , rate of inflation based on GDP deflator,  $g$  real GDP growth rate are all from Mitchell (1988).

**Table 4. Fiscal Sustainability Data, UK 1921-1938**

	<i>b</i>	<i>i</i>	$\pi$	<i>g</i>	<i>d</i>	<i>b*</i>
1921	5.10	4.41	-10.52	-4.71	1.472	28.92
1922	7.38	4.45	-16.05	4.11	1.668	27.34
1923	8.92	4.52	-8.01	3.40	1.763	16.10
1924	7.60	4.58	-1.39	5.10	1.726	1.50
1925	6.46	4.59	0.27	2.89	1.633	2.34
1926	6.10	4.85	-1.41	-4.59	1.717	18.63
1927	6.89	4.57	-2.36	8.22	1.635	-2.11
1928	7.53	4.75	-1.12	1.17	1.613	7.58
1929	7.00	4.85	-0.34	3.43	1.584	2.79
1930	6.15	4.75	-0.40	-3.72	1.592	14.12
1931	5.41	4.51	-2.40	-2.37	1.698	15.76
1932	7.25	4.49	-3.58	0.65	1.736	12.88
1933	7.42	3.90	-1.40	4.74	1.792	1.00
1934	6.76	3.58	-0.68	4.78	1.731	-0.90
1935	5.68	3.64	0.87	4.26	1.650	-2.46
1936	4.95	3.59	0.55	4.15	1.587	-1.76
1937	3.89	3.67	3.73	3.17	1.472	-4.75
1938	1.56	3.62	2.77	0.42	1.438	0.62
1925-29 average	6.78	4.72	-0.99	2.22	1.636	5.71
1933-38 average	5.04	3.67	1.67	3.59	1.612	-1.38

Note:

*b\** is the required primary budget surplus to GDP ratio to satisfy the condition that  $b = (i - \pi - g)d$ .

Sources:

*b*, primary budget surplus to GDP ratio, *i*, average nominal interest rate on government debt, and *d*, public debt to GDP ratio from Middleton (2010) database;  $\pi$ , rate of inflation based on GDP deflator from Feinstein (1972); *g*, 4<sup>th</sup> quarter real GDP growth rate, from Mitchell et al. (2012).

**Table 5. Fiscal Sustainability Data, UK 1950-1970**

	<i>b</i>	<i>i</i>	$\pi$	<i>g</i>	<i>d</i>	<i>b*</i>
1950	6.64	2.43	0.65	3.24	1.995	-2.91
1951	4.98	2.63	7.40	3.62	1.798	-15.09
1952	2.22	2.91	9.03	-0.16	1.656	-9.87
1953	0.26	3.09	3.02	4.62	1.547	-7.04
1954	1.96	3.08	2.06	3.80	1.497	-4.16
1955	2.28	3.37	3.64	3.64	1.410	-5.51
1956	1.51	3.43	6.28	1.60	1.309	-5.83
1957	1.56	3.52	4.03	1.91	1.236	-2.99
1958	2.54	3.84	4.53	0.29	1.197	-1.17
1959	1.94	3.92	1.58	4.12	1.142	-2.03
1960	1.48	4.25	1.72	4.93	1.089	-2.61
1961	1.63	4.45	3.16	4.09	1.049	-2.94
1962	2.87	4.49	3.44	2.13	1.006	-1.09
1963	1.61	4.34	1.94	3.48	0.986	-1.06
1964	1.09	4.53	1.98	6.32	0.920	-3.47
1965	1.47	4.83	3.67	2.53	0.863	-1.18
1966	0.94	4.96	5.13	1.92	0.825	-1.72
1967	-0.39	5.35	2.44	2.78	0.797	0.10
1968	1.19	5.58	3.57	4.15	0.786	-1.68
1969	4.74	6.03	5.75	1.30	0.729	-0.74
1970	6.46	6.48	7.61	2.27	0.647	-2.20
1950-59	2.59	3.22	4.22	2.67	1.479	-5.66
1960-70	2.10	5.03	3.67	3.26	0.882	-1.69

*Note:*

*b\** is the required primary budget surplus to GDP ratio to satisfy the condition that  $b = (i - \pi - g)d$ .

*Sources:*

*b*, primary budget surplus to GDP ratio, *i*, average nominal interest rate on government debt, and *P*, public debt to GDP ratio from Middleton (2010) database;  $\pi$ , rate of inflation based on GDP deflator, and *g*, real GDP growth rate, from Feinstein (1972).

**Table 6. Decomposition of Changes in UK Public Debt Ratio as %GDP**

	<i>Initial Ratio</i>	<i>Final Ratio</i>	<i>Decrease</i>	<i>Budget Surplus Component</i>	<i>Growth- Interest Differential Component</i>	<i>Residual Adjustment</i>
1831-54	157.9	103.9	54.0	120.2	(88.6)	22.4
1855-75	101.8	54.7	47.1	53.1	(11.9)	5.9
1876-1913	56.5	24.7	31.8	58.8	(42.7)	15.7
1921-38	147.2	143.8	3.4	112.1	(137.1)	28.4
1950-70	199.5	64.7	134.8	48.9	72.7	13.2

*Source:* derived from Tables 3, 4 and 5 using equation (2).

**Table 7. Characteristics of UK Public Debt****a) Maturity, Currency and Marketability**

	<b>&lt; 1 year in £</b>	<b>≥ 1 year in £</b>	<b>Foreign Currency</b>	<b>Non-Marketable</b>
1900-13	2.4	97.6	0.0	15.0
1921-32	10.1	75.5	14.4	19.3
1933-38	10.0	77.0	13.0	19.8
1950-59	18.9	73.0	8.0	41.9
1960-70	16.7	76.9	6.4	25.6

**b) Ownership**

	<b>Non-Bank Domestic</b>	<b>Domestic Commercial Banks</b>	<b>Central Banks</b>	<b>Non-Resident</b>
1900-13	n/a	n/a	n/a	n/a
1921-32	69.2	19.8	5.7	5.3
1933-38	61.9	26.0	5.0	7.1
1950-59	34.8	37.7	12.2	15.3
1960-70	53.5	12.7	19.9	13.9

*Note:* 'non-marketable debt' includes debt held by the National Debt Commissioners some of which comprised terminable annuities, ways and means advances, National Savings securities, Tax Reserve Certificates, interest-free loans from international organizations, and loans from overseas governments.

*Source:* database for Abbas et al. (2014)

**Table 8. UK Public Sector Net Debt/GDP in 2032/33 (%)**

OBR Central Projection	54
b: + 1 ppt	40
b: -1 ppt	68
r – g: +2.0 per cent	65
r – g: -2.7 per cent	27

Sources: OBR (2014) first 3 rows, own calculations last 2 rows.

**Table 9. Aspects of Future Fiscal Sustainability**

	<b>2014 <i>d</i></b>	<b>2020 <i>r</i></b>	<b>2030 <i>r</i></b>	<b>2014-30 <i>g</i></b>	<b>Max <i>b</i></b>	<b>Limit of <i>d</i></b>
Greece	1.772	6.9	3.2	2.2	3.9	<1.586
Ireland	1.095	3.1	1.8	2.3	5.4	1.497
Italy	1.321	3.1	2.3	1.5	5.3	<1.247
Portugal	1.302	5.4	2.4	1.4	2.4	<0.984
Spain	0.977	4.2	2.0	1.5	2.9	1.539

*Sources:*

2013 *d* is public debt to GDP ratio in 2013 (IMF, 2015).

2020 *r* and 2030 *r* are projected real interest rates on 10-year government bonds in 2020 and 2030, respectively (OECD, 2014).

2014-30 *g* is the projected average rate of growth of real GDP between 2014 and 2030 (OECD, 2014).

Max *b* is the largest average primary budget surplus as a percentage of GDP over a 5-year period since 1980 (IMF, 2013b).

Limit of *d* is the projected public debt to GDP ratio at which past experience indicates that the response of the primary surplus would no longer satisfy a fiscal-sustainability criterion (Ghosh et al., 2013).