THE ROLE OF PUBLIC DEBT IN THE UK FISCAL RULES

Robert Woods[*]

Introduction

In 1997 the UK fiscal framework was substantially reformed, including through the legislation for the Code for Fiscal Stability (1998). This was related to developments in countries, such as New Zealand and Australia, which had sought to enhance the credibility of fiscal policy alongside similar attempts to enhance the credibility of monetary policy. The Code for Fiscal Stability requires the Government to set out its objectives for fiscal policy and the operational rules it uses. The UK Government has set two fiscal rules. This paper focuses on the sustainable investment rule, or the debt rule, which requires the Government to hold public sector net debt as a share of GDP at a stable and prudent level over the economic cycle.[1]

The paper begins by briefly reviewing the reasons why governments accumulate debt and the history of government debt in the UK. It also considers some of the costs of high debt levels. Section 1 reviews the academic literature on fiscal sustainability and considers why a limit on debt levels may be desirable. Section 2 then discusses the case for debt rules in general and the role of the debt rule in the UK fiscal framework in particular. In Section 3, the paper illustrates how the debt rule is used to assess the long-term sustainability of the UK's public finances in the light of an ageing population drawing on the Government's Long-term public finance report published last year.[2] Section 4 concludes.

1. Debt – some UK history and issues

1.1 A brief history of UK debt

In the UK public debt has existed since the end of the 17th century. As can be seen from Figures 1 and 2, public debt has fluctuated greatly since then, exceeding 200 per cent of GNP on three occasions. The charts also show the periods when the

---

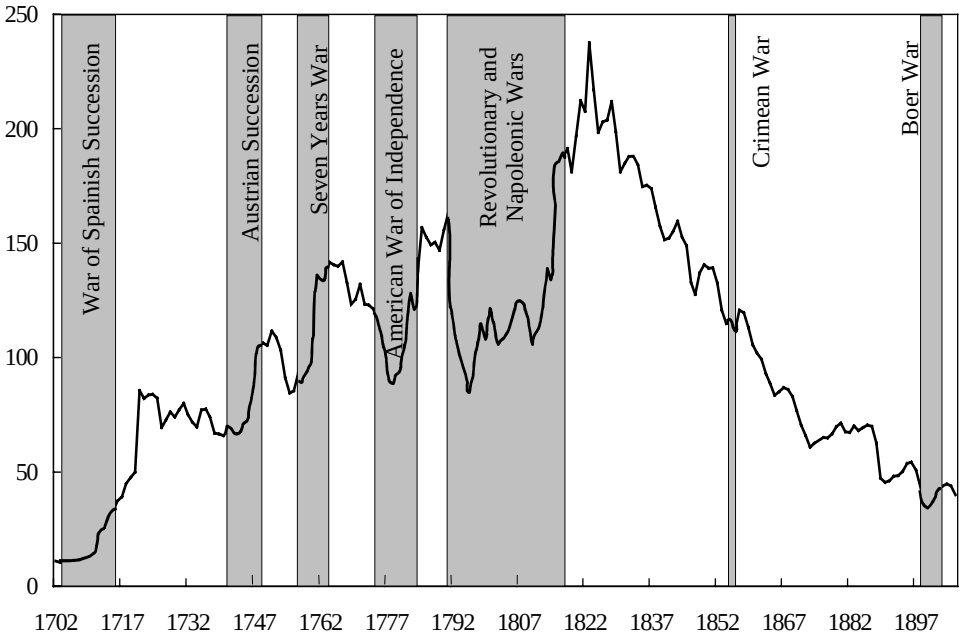
[*] Head of Fiscal and Macroeconomic Policy at HM Treasury.
The views expressed here are those of the author and are not necessarily the views of the UK Treasury or the UK Government. I am very grateful for contributions from Frank Eich, Pietro Toigo and Matthew Pointon, participants at the Banca D'Italia workshop and some helpful comments from Chris Allsopp. I should also like to thank Kirk Hay for his able assistance.

[1] The prudent level of debt is defined as 40 per cent of GDP. The Government's other fiscal rule is the golden rule which implies that over the economic cycle the government borrows only to invest and not to fund current spending. This is not discussed in detail here. For more information on the golden rule see Balls and O'Donnell (eds.) (2002), Chapter 9.

[2] H.M.Treasury (2003), *Long-term Public Finance Report: Fiscal Sustainability with an Ageing Population*, December.

Figure 1

Ratio of Market Value of Debt to GNP, 1702-1906



Source: Janssen, Nolan and Thomas (2002).

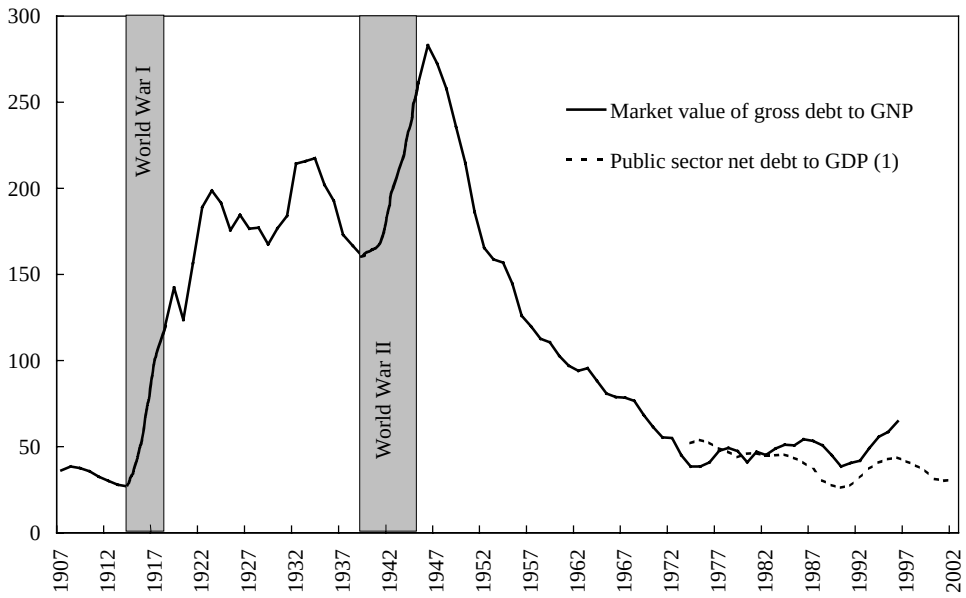
UK was involved in a major war and illustrate the historic tendency to build up debt during war years and then reduce it during peacetime.

Barro (1987) studied the evolution of UK budget deficits between 1701 and 1918, regressing the change in the budget deficit on a temporary military spending term. Unsurprisingly given the figures above he found that: “Temporary changes in military spending accounted for the bulk of budget deficits from the early 1700s through to 1918. This association explains the main increases in the ratio of public debt to GNP, as well as the decreases that typically occurred during peacetime.”

As can be seen in Figure 2, the debt to GNP ratio was also reduced sharply after World War II. Having risen from 160 per cent in 1939, to just over 280 per cent in 1946, it was reduced to around 50 per cent by the mid-Seventies. Since the early Eighties a key driver of the evolution of public debt has been the economic cycle (see Figure 3), reflecting the effect of the automatic fiscal stabilisers. In addition since 1997, the debt to GDP ratio has also been reduced following tough decisions on government spending and the decision to use the proceeds of the spectrum auction to pay back debt.

Figure 2

Ratio of Market Value of Debt to GNP and Public Sector Net Debt to GDP



[1] Measure of debt used in the sustainable investment rule.
Sources: Janssen, Noland and Thomas (2002) and Office for National Statistics.

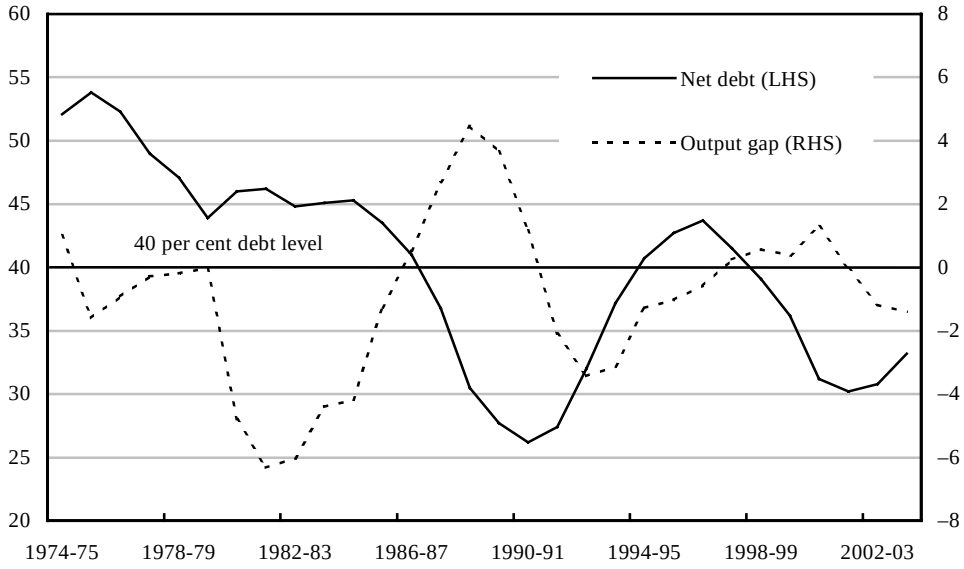
1.2 Why do governments issue debt?

Governments issue debt for much the same reason as individuals – to allow them to smooth expenditures in the face of fluctuations in income (or tax receipts). If borrowing were not possible, in order to smooth consumption a government would need either to maintain a stock of net liquid financial assets or tax revenue would have to be continually adjusted to meet spending plans. In the latter case, the administrative costs would be prohibitive. More fundamentally, frequent tax rate changes would also run counter to the theory underlying the concept of tax smoothing (Barro, 1979). If there is a "deadweight cost" incurred when raising taxation, a cost that increases as the tax rate rises, cost minimisation implies that governments should aim to hold tax rates constant over the economic cycle, rather than varying them from year to year.

The smoothing of spending can occur over various time horizons. Individuals typically smooth their spending over their entire lifetime, borrowing earlier in their adult life, building up net assets over their main working years, and running down their assets after retiring from the workforce. Any remaining assets (after inheritance tax) usually transfer to the individual's descendants after death. A government's

Figure 3

Output Gap and Public Net Debt, 1974-75 to 2003-04
(percent of GDP)



Source: Office for National Statistics and H.M.Treasury.

motives to borrow may reflect considerations related to fairness between generations as well as factors related to the economic cycle.

The idea that fiscal policy should be counter-cyclical dates back to Keynes. Elmendorf and Mankiw (1999) comment that: "…most economists believe that some output variability arises from rigidities or coordination failures. These changes in output, relative to the potential determined by the available factors of production, are socially costly. In this case, timely adjustments to the government deficit and debt may raise social welfare." A specific way of thinking about the potential welfare-enhancing role of government debt over the cycle is that it enhances the liquidity of households by providing an additional means of smoothing consumption and by effectively loosening borrowing constraints.[3] In part, counter-cyclical fiscal policy arises automatically from the design of tax and transfer programmes, and in the UK also from the way that the budgets for the discretionary part of government spending are set in nominal terms.[4] In addition, fiscal policy can be operated on a

[3] This is explored in Aiyagari and McGrattan (1998).

[4] In the UK case it is estimated that a 1 per cent reduction in actual output relative to potential output increases public sector net borrowing by 0.7 per cent after 2 years. See H.M.Treasury (2003), *End of Year Fiscal Report*, p. 41.

discretionary basis. Problems of lags and conflicting objectives have discouraged the use of discretionary fiscal policy in recent decades, however.[5]

Like households, governments also borrow to buy assets that provide a flow of services over time. Borrowing allows the government to spread the upfront costs associated with capital projects across generations, so that the costs and benefits are matched more fairly and each generation pays only for the capital that it consumes.[6] This idea is sometimes referred to as the "benefit principle".[7]

Both the "benefit principle" and the tax-smoothing motive can also extend to incidences of temporary higher expenditure which are unrelated to the economic cycle or capital investment, for example wars. Funds borrowed during wars paid for the extraordinary spending required on Britain's defence. This benefited both current and future generations, and thus it was fair that the cost was spread over time. Sometimes the costs of war can be so great that there is a real risk governments would simply not be able to raise the required level of funds through taxation alone, and have no choice but to borrow – certainly the levels of taxation required could be highly distortionary and governments might seek to avoid them on tax smoothing grounds.[8] Other examples of temporary events that might justify government borrowing include natural disasters.

Even in the absence of major catastrophes such as war, most countries have positive levels of net public debt. In part, this may reflect an explicit recognition of the intergenerational factors associated with investment spending. However, in many cases it has also been symptomatic of poor control of public spending and the overall fiscal position. Borrowing continually to fund current consumption will push the cost onto future generations.

---

5 A detailed discussion of the case for using fiscal policy in a more discretionary way for stabilisation purposes in the context of the UK joining EMU, including the possible institutional reforms needed, is given in *Fiscal Stabilisation and EMU,* H.M.Treasury (2003).

6 This sort of approach was advocated by Musgrave (1959). He also argued that the deficit should vary over the business cycle for stabilisation purposes although he also noted that when the budget balance is altered for stabilisation purposes: "…the function of taxes as an index of opportunity cost [of government spending] is impaired." (p. 522).

7 For example, see Elmendorf and Mankiw (1999), p. 1661. Another approach they present to considering inter-generational concerns is to use a social welfare function including current and future generations. If the net marginal product of capital exceeds the rate the social planner discounts income (a function of the inter-generational discount rate for utility, the growth rate of income and the inter-temporal elasticity of substitution) then deferring consumption to future generations is socially optimal. On p. 1662 they present some simple parameterisations but comment that applying this approach is: "by no means straightforward".

8 Following Barro(1979), Aiyagari, Marcet, Sargent and Seppälä (2002) consider the behaviour of UK debt and show that it can be related to the solution to a Ramsey problem with incomplete markets (in particular without state contingent debt).

1.3 Problems with high debt levels

There are a number of channels through which high debt levels can impact negatively on economic growth, thus reducing the consumption possibilities of all generations. For an economy operating at its full potential, higher government consumption financed by borrowing puts upward pressure on interest rates and reduces private investment, this is commonly known as the "crowding out effect". This in turn reduces the potential output of future generations. If investment is at or below the optimal level this will lower welfare.[9]

The "crowding out effect" will be more powerful where increased public debt levels lead to higher risk premia as the perceived risk increases that the government might seek to relieve the debt burden by non-conventional means, either by allowing inflation to rise or by defaulting.[10] As a result, lenders will demand a risk premium when lending to the government. Again, higher interest rates will dampen or crowd out interest-rate sensitive components of aggregate demand, including investment.

Elmendorf and Mankiw (1999) make an estimate of the cost of the crowding out effect of debt in the US (where the government debt ratio is about half of GDP) in terms of output. They estimate that if the crowding out effect of debt were fully reversed, US output would be about 3 per cent higher.[11] In terms of incomes (as opposed to GDP) it does not matter much whether the extra investment is assumed to be at home or abroad: "As long as the rate of return to wealth is the same at home and abroad, the location of the extra wealth does not affect our income".[12]

Another potential effect on economic growth comes from the burden of paying debt interest bills. High debt levels imply high levels of debt interest payments – resources that would otherwise be available for spending on programmes or could be distributed as tax cuts. For any given level of spending, a higher level of taxes would need to be collected in order to finance the interest payments on the debt. As taxation is generally distortionary, this will tend to reduce incentives to work and save. High debt interest payments may also crowd out other potentially more productive forms of public expenditure, such as infrastructure

---

9 Feldstein (1984) noted that the tax smoothing argument for debt finance ignores this additional excess burden of debt finance: "If the initial capital stock is smaller than optimal and the increase in government borrowing reduces the capital stock further, the debt financing entails a separate excess burden that must explicitly be recognized in the choice between debt and taxes." (1984, p. 2).

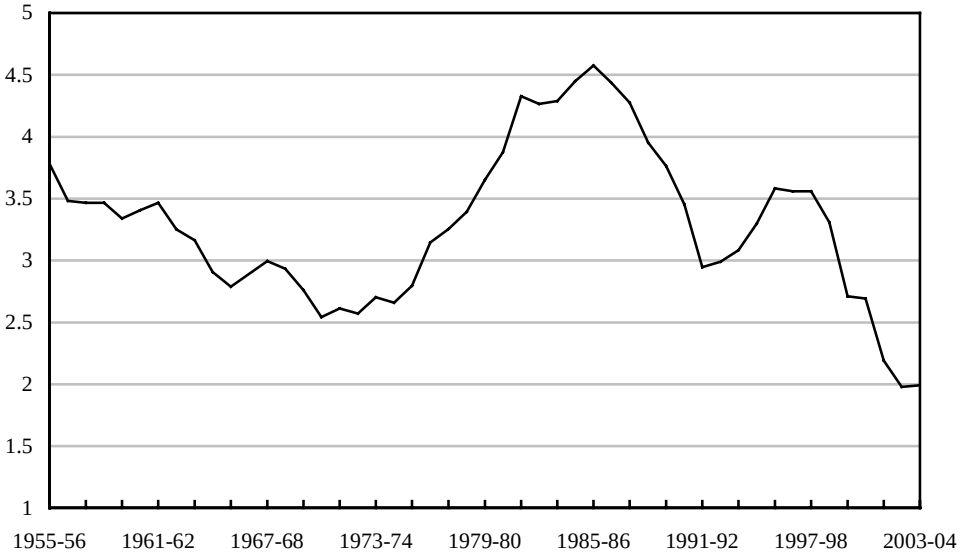
10 Elmendorf and Mankiw (1999) observe that: "…staggering budget deficits as a share of national income were the root cause of the hyperinflations in Twenties Germany and Eighties Bolivia."

11 P. 1632. Their estimate includes an assumption that in the long term debt has a one for one effect on crowding out capital. This may seem on the high side but they argue it is consistent with studies by Auerbach and Kotlikoff (1987) and Blanchard (1985) and the effects may be very long term. For example, in the Auerbach and Kotlikoff study the capital stock is only reduced by one-fifth of its eventual decline after 20 years.

12 P. 1637.

Figure 4

UK Debt Interest Payments
(percent of GDP)



Source: Office for National Statistics.

investment or education spending. As Figure 4 shows, debt interest payments as a share of GDP in the UK are currently around 2 per cent of GDP.[13]

Again Elmendorf and Mankiw (1999) try to quantify the effect on output of the cost of debt service through distortionary taxation in the USA. They estimate the deadweight loss from servicing the US government debt is about ½ per cent of GDP.[14]

High levels of public debt also make the economy vulnerable to the need for large adjustments in fiscal policy due to changes in the debt interest burden, for exampleas a result of changes in real interest rates. With very high debt levels, interest payments can make up a significant part of overall government spending. A sudden increase in real interest rates could then raise the share still further requiring an abrupt change in other spending or tax policies.[15]

---

[13] Note, in order to compare the real burden of debt over time it is necessary to allow for the effects of differential rates of inflation.

[14] P. 1639.

[15] For example, consider the case of a country seeking to stabilise net public debt at 80 per cent of GDP. If the government can borrow at real interest rates of 3 per cent and the country's real economic growth rate is 2 per cent, a primary surplus of 0.8 per cent of GDP is needed in order to stabilise the public debt ratio

(continues)

More generally, high levels of debt make governments more vulnerable to shocks, not just major wars but also serious recessions, as it reduces the government's ability to use fiscal policy to cushion shocks. If the debt level is not maintained at low levels during favourable economic times, there will be reduced scope for supporting monetary policy and cushioning the economy when faced with unfavourable cyclical shocks. Indeed, it is conceivable that high levels of public debt could lead to perverse short-run responses to changes in the fiscal stance (for example, a tightening of the fiscal stance could have an expansionary impact on the economy as concerns about long-term fiscal sustainability diminish).[16]

A key problem is that as the debt burden increases it can lead to both higher real interest rates and lower GDP growth rates. This adds to the debt burden and can lead to vicious circles, which have often ended in default or high inflation. This has contributed to the recent financial crisis in Argentina. Debt nearly doubled ahead of the financial crisis, rising from 35 per cent of GDP in 1995 to nearly 65 per cent in 2001. A debt level of 65 per cent may seem low in European terms, but, as pointed out by the Federal Reserve Bank of San Francisco (2002) emerging markets, facing macroeconomic instability and with a history of defaults, may have a substantially lower threshold for a sustainable debt to GDP ratio.[17] In the case of Argentina, this led to sharply rising interest rates, with the yield on a 10-year bond rising by around 20 percentage points between January and November 2001, as a result of increasing investor uncertainty over credit worthiness. As summarised by Hausmann (2002): "The dominant diagnostics were self-fulfilling bad expectations about a weak public debt position, a pessimism that led to rising interest rates and lower output." The endogeneity of GDP growth and real interest rates to fiscal policy is sometimes ignored in assessments of fiscal sustainability. This may lead people to be too relaxed about the effects of high debt levels.

---

at the target level. Now suppose an economic shock leads to higher world real interest rates with the government's real rate increasing to 5½ per cent – assuming trend growth is unchanged, a primary surplus of 2 per cent of GDP is now required. In the absence of corrective action, public debt would climb from 80 per cent of GDP to over 100 per cent of GDP inside ten years. This experience can be contrasted with that of a lower debt country, e.g. one trying to stabilise public debt at around 40 per cent of GDP. Such a country would need to raise its primary surplus from 0.4 per cent of GDP to 1 per cent of GDP if faced by the same shock – a much less dramatic adjustment. Moreover, if corrective action were not taken immediately the public debt ratio would rise by a more modest 11 percentage points of GDP over a ten year period.

16 Giavazzi and Pagano (1996).

17 In Argentina's case another factor was that a relatively high proportion of the debt was in foreign currency. More generally the reasons why emerging market economies may have a lower debt tolerance threshold than advanced economies include their tendency to have: narrower tax bases, with a high dependence on commodity or primary products that are particularly sensitive to global developments; lower spending to GDP ratios - which means there is less scope for retrenchment when fiscal consolidation is needed; and within government spending, interest costs account for a high share of GDP and have been volatile, e.g., because it is short maturity and large proportions are often in foreign currency. (See chapter III of IMF (2003), *World Economic Outlook*, September, for a further discussion).

2. Fiscal sustainability and debt in the UK fiscal framework

This section introduces the UK's two fiscal rules, reviews the popular measures of fiscal sustainability in the academic literature, and provides a brief discussion of their merits in providing a guide to the implementation of fiscal policy. The end of the section explains the UK Government's policy on debt and its debt rule.

Firm fiscal rules can help reduce the tendency for fiscal policy to deviate from sound economic principles to provide short-term gains to certain interest groups. Indeed, as Keech (1985) suggests, even if a fiscal rule is not optimal it may well be the best economic response in a situation where the unconstrained political process delivers less desirable outcomes. In the UK, fiscal policy is operationalised through fiscal rules as required by the legislation enshrined in the Code for Fiscal Stability.[18]

The current UK Government has adopted two rules to guide fiscal policy:

- **The golden rule**: over the economic cycle, the Government will borrow only to invest and not to fund current spending; and
- **The sustainable investment rule**: public sector net debt as a proportion of GDP will be held over the economic cycle at a stable and prudent level. Other things being equal, net debt will be maintained below 40 per cent over the economic cycle.

The need for the second debt rule arises because the golden rule by itself does not provide any limit on debt or net borrowing. This might not matter if the benefits from public investment were financial as in the private sector. The investment would then imply future returns and it would be appropriate, as in the private sector, for the costs to be distributed over time as the returns accrue. However, the benefit of some public investment is social and it will not be self-financing. Indeed, one of the motivations for public investment will be that the social return is higher than the private return and therefore while efficient from the social point of view, they might not be undertaken by the private sector. If the investments are not self-financing, other things being equal, higher debt-servicing costs would require future reductions in other areas of public spending or higher taxes and so some limit on debt levels is needed.

2.1 Approaches to fiscal sustainability in the literature

2.1.1 The inter-temporal budget constraint

The typical starting point for assessing fiscal sustainability involves imposing an inter-temporal solvency condition. The condition implies that the present discounted value (*PDV*) of all future revenue should be equal to the *PDV* of all

[18] Finance Bill (1998).

future spending and today's outstanding debt burden. This is the government's solvency condition, which can be expressed by the Inter-temporal Budget Constraint (IBC):

$$\sum_{s=t}^{\infty} T_s (1+r)^{-s+t} = \sum_{s=t}^{\infty} S_s (1+r)^{-s+t} + D \tag{1}$$

where T_s is revenue in year s, S_s is spending in year s, r is the real discount rate, t is the current year and D the initial stock of net debt (all in real terms).

In order to clarify the impact of this solvency condition on implementation of fiscal policy, it is useful to express it in terms of specific fiscal variables, starting from the budget identity:

$$D_t = S_t - T_t + (1+i)D_{t-1} \tag{2}$$

where D_t is debt accumulated at time t, S_t is spending and T_t is revenue and i is the (nominal) interest rate. In order to capture the effective capability of a government to repay its financial obligation, the budget constraint is usefully expressed as a percentage of GDP. Defining $PB = T–S$ as the primary balance, and labelling variables as percentage of GDP in lower case, it is possible to obtain an expression for current debt in terms of future primary surpluses and debt:

$$d_{t-1} = \frac{1+g}{1+r} pb_t + \left(\frac{1+g}{1+r}\right)^2 pb_{t+1} + ... \left(\frac{1+g}{1+r}\right)^T pb_{t+T-1} + \left(\frac{1+g}{1+r}\right)^T d_{t+T-1} \tag{3}$$

where g is the real rate of economic growth. In order to satisfy the condition of the IBC, the no-Ponzi condition that the present discounted value of final debt is equal to zero must hold. Put differently, $\lim_{n\to\infty} \frac{D_n}{(1+r)^n} = 0$ so that the last term in (3) drops out. The current level of debt must therefore be equal to the *PDV* of all primary balances:

$$d_{t-1} = \sum_{s=1}^{\infty} \left(\frac{1+g}{1+r}\right)^s pb_{t+s-1} \tag{4}$$

which defines the primary surplus necessary to meet the IBC, pb^*:

$$pb^* = \left(\frac{r-g}{1+g}\right) d_{t-1} \tag{5}$$

The IBC does not imply that debt is necessarily ever fully paid off. Rather, it shows that any fiscal stance (expressed in terms of the primary balance) compatible with the IBC is a function of past levels of debt, d_{t-1}. Expression (5) also highlights

the fact that the difference between the real interest rate, *r*, and the real growth rate, *g*, is key to the assessment of intertemporal solvency.[19]

An important question is to ask whether expression (5) provides the policymaker with a satisfactory tool to inform the conduct of fiscal policy. The IBC approach is appealing from a theoretical point of view, as it is derived from a straightforward budget identity. It is also comprehensive – both in terms of the revenue and spending items considered, and in the time horizon covered. The policy prescriptions from expression (5) are simple: if projected primary surpluses are lower than the primary surplus pb^* compatible with the IBC, then the fiscal stance needs to be tightened to establish solvency. Vice versa, if current and future revenues are more than enough to cover current and future spending and current debt, then the government will be able to loosen its fiscal stance.[20]

An alternative form of the IBC would take account of a government's assets as well as its liabilities.[21] This implies the value of current government **net** liabilities should equal the PDV of current and future primary current surpluses if the financial rate of return on public sector capital equals the cost of borrowing. If the cost of borrowing exceeds the financial rate of return on public sector capital, future primary current surpluses will have to be correspondingly higher and vice versa.[22] One practical problem with this approach is measuring government assets. However, as methodologies improve (see Section 3.2) these difficulties may be reduced.

Returning to expression (5), the condition that satisfies the IBC may not be demanding enough. Satisfying the IBC implies only that a government's debt, on average, is not growing at too fast a rate, given the level of interest rates and economic growth rates, and will hold as long as the debt to GDP ratio converges to any ratio. Effectively, sustainability is not measured in terms of a debt to GDP ratio but in terms of a government's ability to service its debt.

In addition, a measure calculated over an infinite time horizon will be of limited help for the policymaker setting fiscal policy over the medium term. The IBC does not prescribe a specific pattern of adjustment for fiscal policy, nor does it offer a clear assessment of the urgency of policy actions and the cost of delaying

---

[19] If $r < g$, the economy is dynamically inefficient in the Diamond (1965) model, and the government no longer needs to run primary surpluses to achieve sustainability. Instead, it should, on welfare grounds, issue more debt until the upward pressure on the interest rate makes it at least equal to the economic growth rate. However, in the Diamond model there is no uncertainty and therefore there is no difference between the marginal product of capital and the risk free interest rate. Abel *et al*. (1989) show that this does not necessarily hold in stochastic models and suggest that other measures should be used to assess dynamic efficiency. In these circumstances, the risk free rate appropriate for the debt calculations will tend to be lower than the rate of return on capital.

[20] Since the IBC is derived from the budget identity (2) it will hold by definition at all times *ex post*. However, the policymaker will want to rule out some of the options to meet the IBC *ex ante* (e.g., inflation or default).

[21] Buiter (1985).

[22] It is worth emphasising that it is the financial returns rather than the social returns that matter for sustainability although, as discussed at the start of this section, the financial return may not be the motivation for public investment.

them. As the IBC requires only that a fiscal adjustment takes place sometime in the future, the guidance on what the optimal course for fiscal policy in the medium term would be is relatively weak. Debt ratios could go up rapidly, e.g. to finance age-related spending increases, and still satisfy the IBC because of assumed primary surpluses in the far distant future.

Consequently, using the IBC as the only guide for fiscal policy might pose a credibility problem. The IBC does not define any optimal debt pattern, and it is perfectly consistent with rising debt levels in the medium term. However, the size of the public debt ratio can be a key factor influencing the private sector's perception of the government's commitment to meet its budget constraint as well as its ability to do so. Given the infinite time horizon over which sustainability is assessed, it could be potentially difficult for economic agents to discriminate between a policymaker who is pursuing a sustainable policy and one who is allowing for an increase in debt without planning the necessary adjustments to ensure sustainability. Indeed, over long horizons it will be very difficult for a government elected for a limited period to pre-commit future governments.[23]

In turn, loss of trust in a government's ability or willingness to service its debt could be self-fulfilling, as the private sector would require a higher risk premium to hold government debt, altering the key parameters in equation (5). An explicit debt rule could help address this credibility problem and clearly anchor agents' expectations through an easily-monitored debt benchmark. A simple feedback like this would in turn help to strengthen the government's commitment to sticking to its long-term path and is likely to be more effective than a more opaque IBC-based rule.[24] The next sub-section will discuss how an explicit debt target can be incorporated into indicators of long-term sustainability.

2.1.2 From solvency to sustainability

To derive an indicator that provides a useful guide for fiscal policy over the medium-term horizon, people have typically defined a concept of sustainability in the form of a given debt to GDP ratio. A common starting point is to consider the fiscal stance that maintains the debt to GDP ratio constant at its current levels.

Using the information from the IBC, the most immediate indicator of sustainability would measure the adjustment in the primary balance necessary today

---

[23] As the ECB (2004) comments: "From the government's intertemporal budget constraint, it follows that sustainability requires all debt to be covered by future primary (*i.e.*, excluding interest expenditure) surpluses. However, this condition is not sufficiently specific to anchor expectations about the future course of fiscal policy, as governments can promise to cover current high debts with large primary surpluses in an ever more distant future. This leaves agents with much uncertainty as to whether, by the time required, action will be taken as promised.", p. 51.

[24] A general discussion of this issue is given in chapter 2 of H.M.Treasury (2004), *The Stability and Growth Pact: A Discussion Paper,* March.

to maintain debt at its current level d^{-}. Using (5) and imposing the desired debt target d^{-}, it is possible to obtain the expression for the required surplus[25]:

$$pb^{\sim} = \frac{r-g}{1+g} d^{\sim} \tag{9}$$

An analogous approach (see Chalk and Hemming, 2000) is to define sustainability as the policy that maintains the ratio of public sector net worth to GDP at its current level, on the basis that net worth offers, at least in theory, the most encompassing measure of the public sector's balance sheet. Using a similar approach as above, the difference between the primary deficit necessary to achieve this objective and the current primary deficit can be calculated.

The *fiscal gap indicator* defines a specific time horizon by which the chosen debt target must be reached. The fiscal gap indicator shows by how much current policy needs to be changed immediately and permanently (expressed in terms of a change in the primary balance) to achieve a certain, predetermined debt target at a given point in the future.[26] Pursuing a policy that will achieve this debt target is then interpreted as sustainable. Unlike the IBC, the fiscal gap concept therefore focuses explicitly on debt when assessing sustainability.

The fiscal gap for a debt target in target year T equal to debt in the initial year t can be calculated by the following formula:

$$\Delta pb = (r-g)\left[d_t + \left(\frac{1}{1+r}\right) \frac{\sum_{s=t}^{T} - pb_s \left(\frac{1+r}{1+g}\right)^{T-s}}{\left(\frac{1+r}{1+g}\right)^{T-t} - 1} \right] \tag{10}$$

As can be seen from (10), the required change in the primary balance to GDP ratio, Δpb, depends on the initial debt to GDP ratio, the time horizon, the projected primary balance under unchanged policies, and r and g. The formula can also be modified for debt targets other than the initial ratio.

The fiscal gap is closely related to the tax gap indicator proposed by Blanchard *et al*. (1990). In this setting, the tax gap is defined as the difference between the current effective tax rate and the tax rate that would achieve a given debt to GDP ratio by a given target year. The difference between the tax gap and the fiscal gap is one of emphasis, with the former taking spending policies as given and focussing on the revenue side of the government's accounts.

---

[25] Expression (9), while algebraically very similar to (5), implies a different approach, as it imposes a debt target defined ex-ante. In much of the literature, this target is taken to be the current level of debt.

[26] This definition follows Auerbach (1994).

By comparison with the IBC, the key additional variables in this family of indicators are the target year chosen and the level of debt adopted as the target. With regard to the target year, it is best to present calculations over a range of time horizons. Blanchard *et al.* propose a three-tiered indicator, where sustainability is assessed 1, 5 and 40 years ahead. Assessing sustainability over the current year has the advantage of not requiring forecasts, and hence being constructed from publicly available data. However, the resulting snapshot would not be very informative, as it would include the effect of the cyclical position of the economy in that particular year. A medium-term indicator would capture the impact on the primary balance of cyclical movements, and would draw on widely available medium-term forecasts. But even a medium-term indicator would miss longer-term pressures, e.g. those related to demographic developments. So an assessment over a 40-year horizon would usefully complete the analysis by including the long-term trends in revenues and spending.

Such a tiered approach overcomes one criticism of the fiscal and tax gap indicators. Indeed, this approach is adopted by the UK government. In addition to presenting 5-year ahead medium-term projections towards the end of which the economy is assumed to be on trend (thus stripping out cyclical and otherwise temporary effects), the analysis of the fiscal position is complimented with an assessment of long-term sustainability based on fiscal gaps calculated over 20, 30, 40 and 50-year time horizons.[27] Section 3 gives a flavour of the results.

An alternative to presenting the fiscal gap over several different horizons would be to define a fiscal gap indicator that imposed that a given debt target was *never* to be exceeded. This could be useful if revenues and/or spending evolved in a non-linear way, which might be possible over longer time periods, for example due to a cohort effect from an ageing population. Section 3.1 presents the results obtained applying this indicator to the case of the UK.

The second key variable for these sort of indicators is the chosen definition of sustainability, *i.e.* the debt target. Sustainability is defined *a priori* in the sense that it is implicit in the chosen debt target. There is potentially an unlimited range of debt targets although it is often taken as simply the debt to GDP ratio at the beginning of the projection period. This is not the approach taken in the UK, however, where a specific debt target has been set out in the sustainable investment rule. This is discussed further in Section 2.3.

The use of fiscal and tax gaps has the advantage of being intuitive and as they can be constructed to hit a specific debt target, they can be easily explained in the context of existing policy rules, as in the UK case. The link to debt levels over specific horizons also means they can deliver clearer medium-term policy prescriptions than the IBC-based indicators. Further, ease of monitoring assists in promoting transparency which can help strengthen credibility.

---

[27] H.M.Treasury (2003), *Long-term Public Finance Report: Fiscal Sustainability with an Aging Population*.

Finally, one presentational challenge for all the sustainability indicators surveyed here is that they identify the long-term challenges in the form of fiscal imbalances, *i.e.* the amount by which fiscal policy should be tightened/loosened to achieve a given definition of sustainability. This should not be read as a one-dimensional policy prescription. The appropriate response to many long-term challenges may take the form of structural policies, such as raising the trend growth rate and the reform of pension or social security arrangements.

2.2 Fiscal sustainability under uncertainty

The sustainability indicators considered above implicitly assume a world of certainty, where the basic parameters (e.g., productivity growth, interest rates and life expectancy) are known over the time horizon covered. In reality though, there is a high degree of uncertainty even over short horizons and it is important to devise a fiscal strategy that allows for this.

2.2.1 Sensitivity analysis

One way to deal with uncertainty when assessing long-term sustainability is to carry out sensitivity analysis to "stress-test" the results. This can be done by running projections based on a range of assumptions that are varied around their baseline values. Among the key issues to consider are the sensitivity to real interest rates and real GDP growth rates.[28]

Figure 5 provides a simple illustration. Suppose a country had GDP in 2000 of 100 and economic growth was 2 per cent per year. In addition it is assumed that the government had debt of 25 per cent of GDP in 2000, and that, based on current policies, the government's primary balance was projected to be in deficit by 1 per cent of GDP every year in the future. The rate of increase of the debt to GDP ratio will depend on the interest rate relative to the growth rate. If the interest rate, r, is equal to the growth rate, g, then the debt to GDP ratio will simply rise by the primary balance (1 per cent of GDP) every year. In this case, the debt to GDP ratio would reach 50 per cent after exactly 25 years. For a given growth rate, a higher interest rate would imply a faster increase in the debt to GDP ratio. For example, with an interest rate of 3 per cent, the debt to GDP ratio would reach 50 per cent after around 18 years and then continue to rise to reach 60 per cent after 25 years.

For any desired debt target and target year, the fiscal stance needs to be tighter (or less loose) – as indicated by the fiscal gap calculations – the larger the

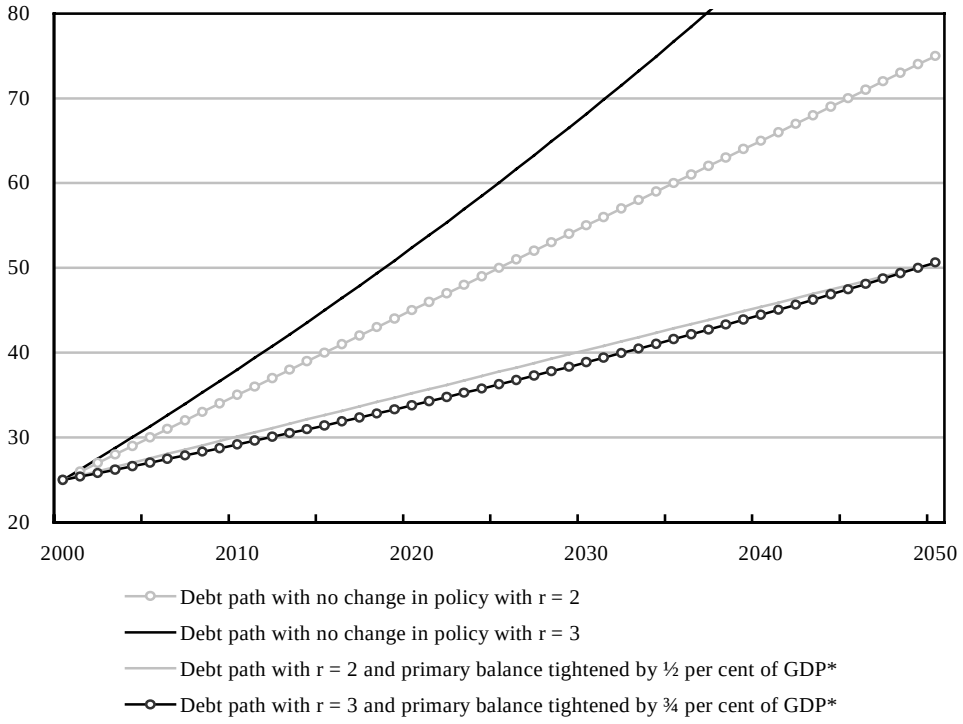
---

[28] Recalling equation (2) and allowing for growth, the evolution of the debt to GDP ratio can be stated as: $d_t = \frac{(1+r)}{(1+g)} d_{t-1} + pb_t$

So, everything else equal, the debt to GDP ratio in year t will be higher, the bigger the ratio of $(1+r)/(1+g)$.

Figure 5

Illustrative Example of Debt Paths and Fiscal Gap Calculations



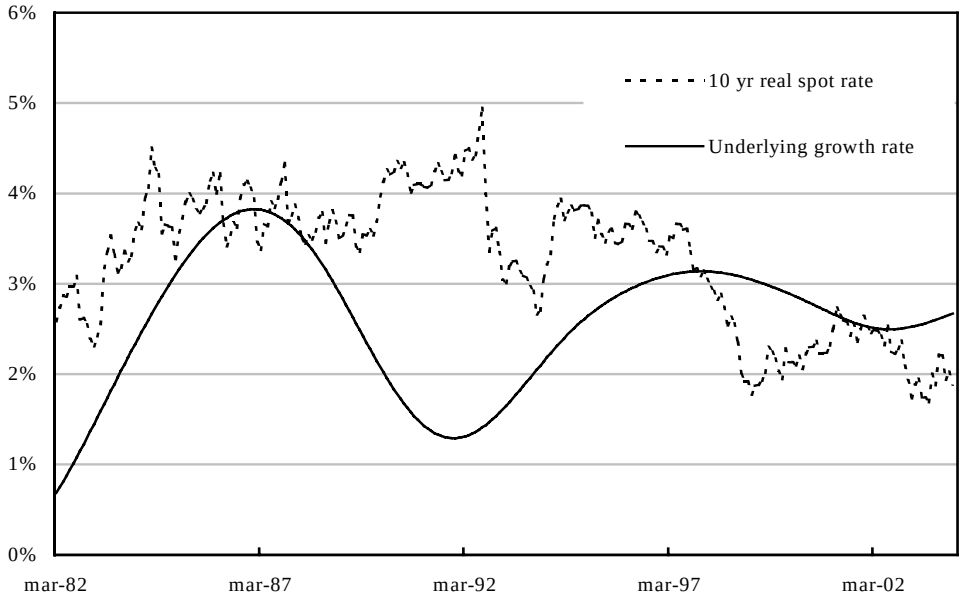
* Debt target of 50 per cent of GDP in 2050.

differential between *r* and *g*. For example, if the government aimed for a debt to GDP ratio of 50 per cent in 50 years' time, then it would have to tighten its primary balance by ½ per cent of GDP in the case with a real interest rate of 2 per cent but by ¾ per cent of GDP for a real rate of 3 per cent.

Figure 6 compares UK real interest rates (estimated from 10 year index linked gilt yields) with underlying GDP growth rates estimated using a Hodrick-Prescott filter. While accepting that the Hodrick-Prescott filter estimate of underlying growth is rather variable in the earlier years when real growth was volatile, in the period since 1997 when growth has been more stable the figure suggests that the real interest rate, r, has been below the real growth rate, g, by just under ½ a percentage point on average. Figure 6 also suggests there may have been a structural break in

Figure 6

Real Interest Rates (10 Year Spot)[1] and Underlying Growth Rate[2]



1 Source: Bank of England.

2 Estimated using a Hodrick-Prescott filter. Note this differs from H.M.Treasury's official estimates of trend growth as set out in *Trend Growth: Recent Developments and Prospects* (April 2002), which estimates trend growth based on identifying on-trend points using survey and other economic data.

real interest rates around 1997 associated with the change in the UK's monetary policy regime.[29] [30]

The UK Government's long-term projections focus on the risks from different assumptions about real growth and real interest rates as well as illustrating the effects of different demographic assumptions, in particular higher: longevity, net migration and fertility rates.[31]

Scenario modelling builds on simple sensitivity analysis in that it combines a number of assumptions to describe a possible future state of society and the economy. For example, it could be argued that a population projection with a higher life expectancy assumption (relative to the principal projection) could describe a society with generally higher health standards. It would then be reasonable to

---

29 See Balls and O'Donnell (2002) for further information.

30 If the UK position were to remain like this into the future the UK's fiscal position would be stronger than indicated in the sustainability indicators in Section 3.

31 H.M.Treasury (2003), *Long-term Public Finance Report: Fiscal Sustainability with an Ageing Population*, December.

combine the higher life expectancy population projection with the assumption that health spending per person would rise later in life than in the principal case and that more older people would be in employment.[32]

While sensitivity and scenario analysis can give some sense of the risks to sustainability and the range of illustrative fiscal actions that might be necessary to ensure sustainability, the choice of variants is arbitrary. Moreover, the analysis does not attach a probability distribution to the different scenarios, nor define a stochastic process that generates the uncertainty, and therefore it does not provide quantitative estimates of risks.

2.2.2 Modelling fiscal risks

A different approach is to model risk explicitly by developing a measure of sustainability that quantifies the vulnerability of public finances to uncertainty. These approaches have been studied with an eye to emerging markets, which face a particularly volatile economic environment and are more vulnerable to external shocks than developed economies (IMF, 2003). However, there could be scope to apply this sort of analysis to developed countries as well.

One way to incorporate risk is by redefining sustainability in terms of a government's ability to service its debt under all possible circumstances. This implies a "prudential" approach to debt ceilings, whereby debt is kept at a low level to create a margin against future risks. Mendoza and Oviedo (2003)[33] use a model of the economy to incorporate uncertainty, where the primary surplus is affected by exchange rates, shocks to the tax base and interest rates. They estimate the lowest level of debt compatible with a state of "financial crisis" whereby the primary balance permanently remains at the level that is generated after a large negative shock to the public finances. Requiring debt to be at a level compatible with a permanent financial crisis is clearly very stringent, and derives from the fact that the approach is intended to apply to emerging market economies where such worse case scenarios have sometimes persisted for some time.[34]

Barnhill and Kopits (2003) have developed a conceptually similar approach, which extends the Value-at-Risk methodology, commonly used in the assessment of financial institutions risk, to the public sector balance sheet. This is a comprehensive approach in the sense that it is based on net worth rather than debt. This approach estimates the portion of government net worth that could be lost due to economic uncertainty. The methodology calculates a government's net worth, and then estimates the possible future movements of the main variables that could affect government net worth. The main variables are those that are subject to a high degree

---

[32] This approach was used in the Wanless Review describing potential future UK health outcomes. See Wanless, D. (2002), *Securing our Future Health, Taking a Long-Term View*.

[33] Following this, the IMF (2003) also explores this approach.

[34] For example, the IMF (2003) note that governments in oil-exporting countries faced this situation after the collapse of oil prices in the Eighties and that slumps in commodity prices are generally quite long lasting.

of volatility and at the same time have a large effect on public finances (e.g. exchange rates, interest rates or oil prices). Based on these estimates, an overall probability distribution for government net worth can be calculated, deriving which proportion is "at risk" from movements in these variables. Then for a given level of confidence, an estimate of the potential loss in net worth the government could face over a given period of time in a "worst case" scenario is presented.[35] [36]

These recent approaches are interesting in that they explicitly attempt to estimate the amount of prudence necessary to guard against risk. To provide reliable information on sustainability in the future, the value-at-risk approach still needs to deal with the problem of estimating government assets as discussed earlier. Another criticism concerns the use of past data to estimate future risk. Where the economic environment is changing rapidly, past trends might be poor indicators of the future.

A more fundamental question concerns the fact that these approaches estimate risk, while the judgement on the right amount of prudence necessary to offset such risk is left to the policymaker. For example, what is the appropriate policy response in the event of debt exceeding the level considered to be sustainable in the worst-case scenario? The presence of welfare costs caused by a tightening of fiscal policy presents a trade-off between reacting to relatively small risks to maintain a high level of prudence and pursuing other policy objectives. The question then becomes what is the right amount of risk that a government should bear, an issue that is beyond the scope of this paper, and possibly of any indicator of sustainability, and may be better left to the judgements expressed through the policy-making process. In the case of the UK, this judgement has been expressed in the choice of a ceiling of 40 per cent for the net debt to GDP ratio. The next section discusses why this ceiling was chosen in the UK.

2.3 Turning theory into policy – the sustainable investment rule

A government's inter-temporal budget constraint does not determine a specific debt level. It is simply a solvency condition. Fiscal gap type measures suggest the primary balance needed to maintain a certain debt to GDP ratio in the very long term but this does not imply the level of debt is optimal. Moreover, while the sustainability indicators surveyed in Section 2.1 can be calculated with reference to a desired level of debt, much of the literature adopts a definition of sustainability that keeps debt constant at the initial level.

There is, however, a case for taking an explicit view on the desired level of debt. One reason is that committing to a clear benchmark level of debt helps to

---

[35] The IMF (2003) provides an example: "…the estimated net worth may currently be, say 100 per cent of GDP, the calculations may suggest that because of the risks the government faces there is a 5 per cent chance that in one year its net worth will only be 60 per cent of GDP. In this case, the government's "value-at-risk" is said to be 40 per cent of GDP", p. 134.

[36] An application of this approach to Equador found the single most important source of risk was interest rates, see IMF (2003), p. 135.

anchor expectations and helps avoid self-fulfilling losses of credibility in fiscal policy. Another reason is that it may be desirable for fiscal policy to complement the objective of sustainability with other welfare objectives, and therefore to take a view on the optimal level of debt. This is discussed in more detail in this section.

2.3.1 Which target for debt?

While a moderate level of public debt could be justified on welfare and efficiency grounds, high levels of public debt make the economy vulnerable to the need for large adjustments in fiscal policy and are likely to have negative consequences for long-term growth.[37] This suggests that there may be a non-zero level of debt that represents an optimal trade-off between the need to undertake public investment (and funding this in an equitable way) and the economic costs associated with higher levels of public debt. The UK Government's debt rule takes an explicit view on the desired debt target, interpreting a ratio of 40 per cent of GDP as the prudent and sustainable level of net debt.

As discussed in Section 2.1, there is a wide range of possible debt targets underpinning the analysis of sustainability, including maintaining the inherited level of debt. This approach implicitly assumes a world of certainty, as it does not capture the risks associated with high levels of debt. However, as discussed in Section 2.2, uncertainty is an important dimension of sustainability that needs to be taken into account in a real world setting.

Uncertainty arises both in the form of risks of permanent and temporary shocks to the macroeconomic environment. As discussed in Section 2.2.1, one of the shocks could take the form of a permanent increase in the real interest rate. Faced with such a shock, a high debt country would need a much sharper fiscal tightening than a low debt country. Sustainability indicators that are based on stable debt to GDP ratios (e.g., fiscal gaps based on the same level of debt in the target year as in the initial year) ignore this important difference between high and low debt countries. Low levels of debt (in terms of GDP) also provide a useful safety margin in the face of temporary shocks, or simply cyclical movements of the economy, by allowing room for the stabilisation role of fiscal policy. Last but not least, the level of debt may affect the economic growth rate negatively as discussed in Section 1.3. Everything else equal, high debt countries will tend to have a more limited range of policy options than low debt countries.

It is therefore important to complement an assessment of sustainability using the sort of indicators considered in Section 2.1 with a prudential approach to fiscal policy, in other words a policy that is likely to be sustainable even in the face of adverse shocks. This implies adopting a view on the desirable level of debt beyond the current level of debt inherited from past history.

---

[37] The paper by Aiyagari and McGrattan (1998), discussed below, provides a formal analysis of the optimal level of debt which explicitly identifies some of the costs and benefits of debt.

The economic literature does not provide a clear-cut criterion for optimal debt limit but rather provides a number of approaches to deriving a desirable level of debt. The relatively small number of academic studies is reviewed by H.M.Treasury (2002):[38]

- One approach consists of inferring the optimal debt ratio by observing the gearing ratio prevailing in the private sector. This approach implicitly assumes away the Modigliani-Miller theorem, and conjectures that the competitive pressures have induced the private sector to find an optimal gearing ratio. On the basis of an estimate of the government's assets, the observed 60/40 to 40/60 gearing ratios in the private sector would imply that the optimal debt ratio for the UK might lie between 30 and 50 per cent of GDP. However, this approach ignores the different roles and risk characteristics of the private and public sector (e.g., a government's sovereign right to tax).
- An alternative approach is to try to estimate the growth-maximising debt ratio. Smyth and Hsing (1995), using the US data, suggested that economic growth is maximised when public debt is around 50 per cent of GDP. Robson and Scarth (1997) argue for a target of 20 per cent of GDP in the Canadian context. However, other studies (Asilis, 1994) show that the costs of being away from the optimal level of debt are small. This approach has two downsides. First, it is very aggregated and so it ignores the underlying policies that lead to a given stock of debt, when growth rates are most likely to be influenced by the nature of the expenditure that has generated the debt. Second, the approach focuses on growth, which does not necessarily correspond with a broader welfare objective.
- A third approach tries to infer the optimal debt ratio from tests of dynamic efficiency. A simple way to assess dynamic efficiency is to analyse the differentials between growth rates and interest rates. However, this assumes that the government's risk-free rate of return is equal to the rate of return in the economy. As noted earlier, this may not hold due to uncertainty[39] and so a more appropriate test for dynamic efficiency should consider the difference between investment and profit levels. Using this approach, one US study by Zee (1988) suggests that the optimal public debt level is around 20 per cent of GDP.

Aiyagari and McGratten (1998) consider the optimal level of debt in a formal model[40] in terms of the balance between the benefit of having government debt for its role in enhancing the liquidity of households and helping to ease credit constraints, against the costs of adverse wealth distribution and incentive effects, plus the cost of the crowding out effect (as discussed in Section 1). When they parameterise the model using US data they conclude that the optimal debt-GDP ratio is 2/3 – around the post-war US average. However, in terms of their model, the estimated welfare costs of being away from the optimal debt level are small. For

---

38 P. 174.

39 Abel *et al*. (1989).

40 The model involves a large number of infinitely lived households whose saving behaviour is influenced by precautionary saving motives and borrowing constraints.

example they find: "…the loss to being at a debt/GDP ratio of zero rather than 2/3 is only 0.08 per cent of consumption."[41]

In sum, the academic literature does not provide a definitive view on the optimal level of public debt. Empirical results are sensitive to the assumptions adopted, and it would generally be more appropriate to define a *range* of desirable debt targets. This reflects the point that the optimal level of debt is likely to vary over time (the impact of wars was discussed in Section 1) and the costs of being away from the optimum level may not be very high within a range. The discussion in Section 2.2.2 also presented some arguments for taking a prudential approach. Section 2.3.2 sets out the considerations that led the UK Government to choose its 40 per cent net debt to GDP ceiling.

2.3.2 The UK Government's policy on public debt

Neither theory nor empirical evidence provides a definitive guide for policymakers on what is the optimal level of public debt. This is reflected in the International Monetary Fund's *Manual on Fiscal Transparency*: "…judgements about excessive debt, and particularly excessive debt-to-GDP ratios, are hard to make … assessments of fiscal sustainability have to be made on a country-specific basis, relying on particular knowledge about the implications of, and market reactions to, the government's past and future fiscal policies." (IMF 1998)

Judgements on the desirable public debt to GDP ratio for any one country are therefore contingent on the size and frequency of the economic shocks to which that country has been exposed and the worthwhile investment opportunities that are available to the government. Care needs to be taken, therefore, when studying empirical evidence and international experiences in an attempt to learn lessons in the British context. Nonetheless, the UK Government's policy was consistent with the emphasis on debt reduction seen other industrialised countries.

In setting the debt-level target (in terms of the sustainable investment rule) and producing its fiscal plans, the Government had to weigh up the need to:

- Invest in the reform and modernisation of the public sector that is necessary to deliver the public services Britain needs;
- Fund investment in a way that does not impose an unfair burden on current or future generations;
- Maintain public debt at levels, which do not expose the Government to risk and that are unlikely to have a substantive negative impact on long-term growth and employment.

At that time, the Government concluded that, other things being equal, a reduction in net public debt – to below 40 per cent of GDP – was consistent with a

---

[41] P. 462.

balanced and responsible approach to fiscal management.[42] Having achieved this, the challenge is to keep net debt below 40 per cent. Recent projections given in Budget 2004,[43] show net debt stabilising at just over 36 per cent at the end of the medium-term projection period, comfortably below the level defined by the sustainable investment rule.[44] At the same time, the debt rule is consistent with a doubling in public sector net investment to 2¼ per cent of GDP by 2007-8 to meet the Government's key spending priorities.[45]

The level of debt is intended to be a prudent one, *i.e.* a level, which is likely to be sustainable even with unfavourable shocks. The rationale for setting debt at a prudent level is consistent with the more formalised approach as set out in Section 2.2. External commentators have shared the view that this level of net debt is cautious.[46]

3. Assessing long-term sustainability in the UK

3.1 Long-term sustainability of the UK public finances

The UK Government assesses the long-term sustainability of the public finances on an annual basis in its *Long-term Public Finance Report* (LTPFR). This complements the twice yearly production of medium-term fiscal projections which report against the Government's two fiscal rules.

The LTPFR provides a comprehensive assessment of the fiscal sustainability of current policies using bottom-up spending projections and a range of sustainability indicators and variants. The baseline projections in the 2003 LTPFR were based on the assumption of 2 per cent productivity[47] growth per year beyond 2008-9, the end of the medium-term forecast horizon. GDP is assumed to grow in line with changes in productivity and the size of the working-age population as given by the Government Actuary's Department principal population projections. As

---

42 Two definitional points about the UK's sustainable investment rule are worth highlighting. First, it is based on a concept of net debt as opposed to the gross debt concept used in the EU context. Net debt just nets off liquid financial assets from total financial liabilities and is a better reflection of a government's immediate solvency and is usually preferred to the gross concept where both sets of figures are available. Second, the debt rule is based on the whole of the public sector. This follows a long tradition in UK fiscal policy. The UK Government believes that fiscal rules should apply across the public sector because the burden of repaying the debt of public corporations could ultimately fall on the taxpayer.

43 H.M.Treasury (2004).

44 The gross general government debt is forecast to remain well below 60 per cent of GDP (the Treaty reference level), thus allowing the UK to meet its European debt commitment.

45 If the golden rule were met exactly so that the current budget was zero then a net debt ratio of 40 per cent of GDP would be consistent with net investment of 2 per cent of GDP in the steady state assuming trend real GDP growth of 2½ per cent (and GDP deflator growth of 2¾ per cent). This falls to about 1.8 per cent for trend growth of 2 per cent.

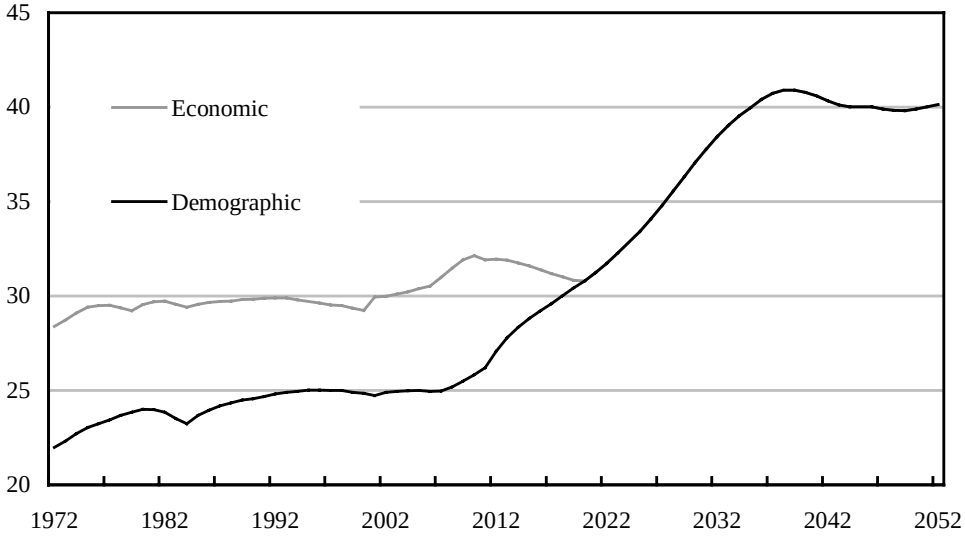
46 For example, Buiter (2003) and Institute for Fiscal Studies (2004).

47 Output per worker.

Figure 7

Demographic and Economic Old-age Dependency Ratios[1]

(percent)



Source: Government Actuary's Department, historical data and 2001-based population projections.
[1] The economic old age dependency ratio represents the ratio of people above working age over the number of people of working age. The demographic old age dependency ratio is the number of people over 65 relative to those aged 16-64. The ratios differ in the earlier years as the state retirement age for women is currently 60. The ratios converge as the retirement age for women gradually increases to 65 over 2010 to 2020.

in other developed economies, the UK population is expected to age in aggregate (see Figure 7). This is due to three distinct demographic trends: the post-war baby boom generation gradually reaching retirement age; expected further increases inlongevity; and a fertility rate below the natural replacement rate. In the UK case, these trends are moderated somewhat by projected continued net migration.[48]

Table 1 shows projected spending in the baseline case. The increases in education and health spending between 2002-3 and 2012-13 mainly reflect Government policies to increase resources in these areas over the medium term up to 2007-8. Beyond the medium term, spending changes are driven by changes in the population size and structure. It can be seen that total spending (excluding interest and dividends payments) is projected to fluctuate between 40 and 42 per cent of GDP over the coming five decades.

---

[48] A detailed presentation of how spending and revenue are projected into the future is given in the 2002 and 2003 Long-term public finance reports.

Table 1

Spending Projections
(percent of GDP)

	2002-03	2012-13	2022-23	2032-33	2042-43	2052-53
Pensions[1]	5.0	5.1	4.9	5.4	5.3	5.3
Health[2]	6.5	8.2	8.5	9.3	9.7	9.7
Education	5.1	5.5	5.3	5.5	5.4	5.4
Long-term care[3, 4]	0.9	1.1	1.1	1.1	1.1	1.1
Total age-related spending	**17.5**	**19.8**	**19.7**	**21.2**	**21.4**	**21.5**
Other spending	21.5	20.7	20.2	20.6	20.2	19.8
Total spending[5]	**38.9**	**40.5**	**39.9**	**41.8**	**41.7**	**41.3**

1 Defined as the sum of the basic state pension, the State Second Pension, Minimum Income Guarantee and Pension Credit, Winter fuel payments, over 75 TV licences, and Christmas Bonus.
2 Gross NHS spending.
3 Compression of morbidity assumed.
4 Excluding long-term care provided within the NHS which is accounted for under Health (for which no compression of morbidity is assumed).
5 Total spending including gross investment but excluding interest and dividends payments.

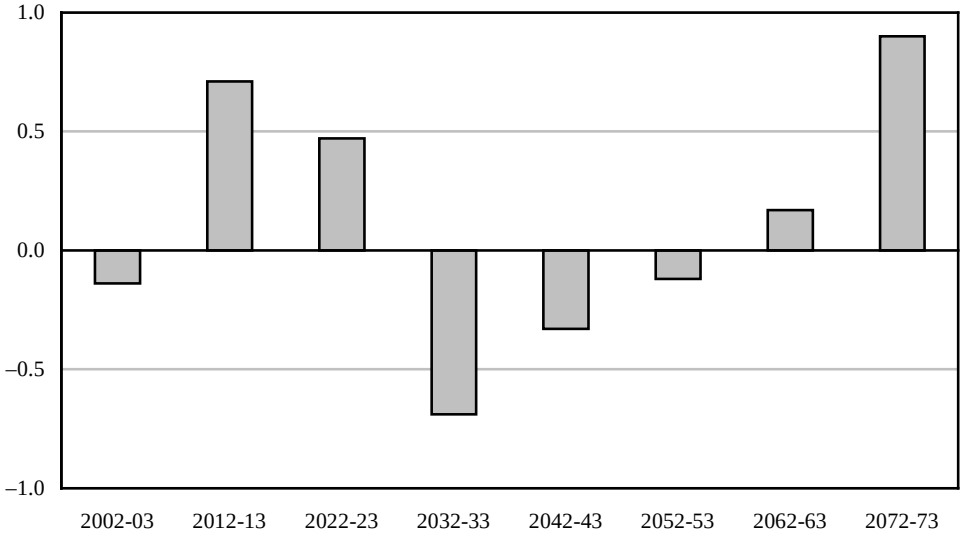
To obtain estimates of the inter-temporal budget gap and fiscal gaps, projections of revenues are also required. In the baseline case revenue is projected to increase more or less in line with GDP, with the share of revenue in GDP fluctuating around 40½ per cent beyond the medium term (excluding interest and dividends received).

Combining the spending and revenues gives the projected general government primary balance (see Figure 8). It can be seen that the primary balance is projected to move from a surplus equivalent to 0.7 per cent of GDP in 2012-13 to a deficit by the late 2020s. The projected deficit is most marked as a share of GDP in the 2030s, when spending pressures related to the ageing of the population are projected to be greatest. However, after 60 years the primary balance returns to surplus, reflecting the fact that part of the ageing process has run its course and that, based on current policies, social security spending will continue to decline gradually as share of GDP.

From the primary balance it is only one step to calculate the inter-temporal budget gap and the fiscal gaps. In theory, the inter-temporal budget constraint, the government's solvency condition, should be calculated over an infinite horizon. For the calculations it is assumed that the economy has reached its steady state in 2102, the final year projected by the model.

Figure 8

Primary Balance
(percent of GDP)



Source: H.M.Treasury, 2003.

Table 2

Inter-temporal Budget Gaps[1]
(percent of GDP)

Discount rate (percent)	**2.5**	**3**	**3.5**
Lower productivity (1¾ per cent)	–¼	1	1¾
Baseline (2 per cent)	–1¼	¼	1¼
Higher productivity (2¼ per cent)	–2½	–¾	–½

[1] Tax increase (or decrease) in 2002-3 and a permanent, proportionate tax increase (or decrease) thereafter needed to ensure inter-temporal balance. Rounded to the nearest quarter percentage point.

Table 2 shows the inter-temporal budget gaps for three different discount rate assumptions and the three different productivity growth rate assumptions. The results suggest the inter-temporal budget gap in the UK is small, indeed whether fiscal policy needs to change at all to maintain inter-temporal fiscal balance depends on the discount rate assumption. In the low discount rate case, even with low productivity growth there is no need for a fiscal tightening.

The differences between the variants can be explained as follows:

- for a given discount rate, higher productivity growth will imply that most social security transfers will decrease more rapidly as a share of GDP, reflecting the current policy of price indexation. For example, for a discount rate of 3 per cent and a productivity growth rate of 2 per cent, taxes need to be raised by an equivalent of ¼ per cent of GDP to meet the IBC, while taxes could be lowered if productivity growth amounted to 2¼ per cent per year; and
- for a given productivity growth rate, taxes will need to be raised by more (or decreased by less) the higher the discount rate. This is due to the fact that with a higher discount rate the distant future projected primary surpluses (Figure 7) are given less weight in the calculations.

The fiscal gap calculations do not require an assumption about the steady state and can be carried out over any finite time horizon. As noted earlier, the LTPFR presents fiscal gaps over four different time horizons: 20, 30, 40 and 50 years ahead. Calculating fiscal gaps over a range of target years helps policy-makers draw more robust conclusions about the possible impact of an ageing population.

Table 3 shows the fiscal gaps in the baseline scenario with 2 per cent productivity growth per year and the three different interest rate assumptions for a target level of net debt of 40 per cent of GDP, *i.e.* consistent with the Government's sustainable investment rule.[49] In this example the target net debt to GDP ratio is a little higher than the ratio at the end of the medium-term projection horizon. If the Government decided to reach a 40 per cent net debt to GDP ratio by 2022-23, then it could ease fiscal policy under the three interest rate assumptions, while this is true

Table 3

Fiscal Gaps[1] in Baseline Scenario with 2 per cent Productivity Growth
(percent of GDP)

Interest rate (per cent)	**2.5**	**3**	**3.5**
Target year			
2022-23[2]	–1	–¾	–½
2032-33	–¼	–¼	0
2042-43	0	¼	¼
2052-53	0	¼	1

1 Change to the primary balance needed to attain desired debt level in the target year starting in 2009-10. Rounded to nearest quarter percentage point.

49 Further variants can be found in the *Long-term Public Finance Report* (2003).

2 Net debt target is reached at end of year specified.

Table 4

Fiscal Gaps[1] in Baseline Scenario with 2 per cent Productivity Growth and an Interest Rate of 3 per cent
(percent of GDP)

Debt target	**30**	**40**	**50**
Target year			
2032-33[2]	¼	–¼	–½
2042-43	½	¼	0
2052-53	½	¼	0

1 Change to the primary balance needed to attain desired debt level in the target year starting in 2009-10. Rounded to nearest quarter percentage point.
2 Net debt target is reached at end of year specified.

only for the two lower interest rate assumptions with a target year of 2032-33. This implies that under current policies the net debt to GDP ratio would reach 40 per cent of GDP sometime around 2030. With the primary balance projected to move into negative territory by the late 2020s, the Government would need to tighten its fiscal stance modestly to meet its debt target for later target years apart from in the low interest rate variant.

Table 4 also shows the fiscal gaps calculations for alternative debt targets of 30 and 50 per cent of GDP for the case with productivity growth of 2 per cent per year and a real interest rate of 3 per cent. As would be expected, everything else equal, with a lower debt target the Government would have to tighten its fiscal stance by more (or loosen by less) than with a higher debt target. However, once you have a horizon of 30 years or more the difference between a 30 per cent and a 50 per cent debt target is not large given the order of uncertainty involved. Indeed over the 50 year horizon it is no more important than the choice between real interest rates of between 2½ and 3½ per cent.

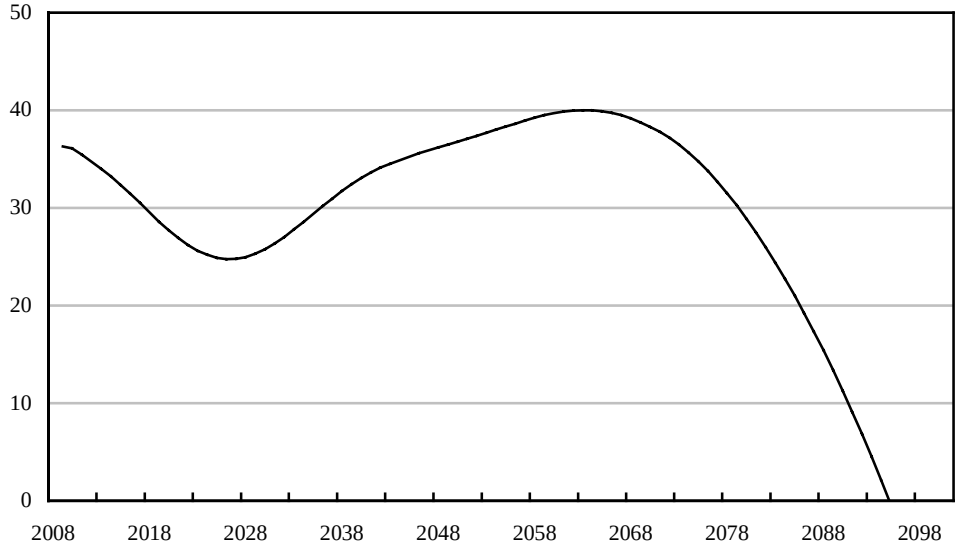
The 2003 LTPFR also introduced an alternative sustainability indicator, which is closely related to the fiscal gap approach and was briefly discussed in Section 2.1. The main difference is that this indicator calculates the required change in the fiscal stance to *never* exceed the debt target rather than to meet a debt target in a specific target year.

Figure 9 shows the projected debt trajectory for the UK[50] where the ¼ point of GDP tightening of the fiscal stance required for net debt never to exceed the 40 per

50 In the baseline case with 2 per cent productivity growth and real interest rates of 3 per cent.

Figure 9

Net Debt under an Alternative Sustainability Indicator[1]
(percent of GDP)



1 With primary balance tightened by ¼ per cent of GDP in 2009-10. Based on baseline case with 2 per cent productivity growth and real interest rates of 3 per cent.
Source: H.M.Treasury

cent is started in 2009-10. Figure 9 shows that if this policy were continued over the long term, the Government would end up building up a net asset position.

The results show that on the basis of current policies and a range of reasonable assumptions, the UK's public finances are sustainable in the long term. The LTPFR also referred to international studies and concluded that the UK was in a strong position relative to other major economies to face the challenges ahead.

3.2 Contingent liabilities and whole of government accounts

A contingent liability is one that may arise, dependent on one or more events happening. By its very definition, it is not certain that the Government will have to meet this liability and in some cases the chances are very slim indeed. Contingent

liabilities are not included in national accounts measures of debt, but clear reporting of contingent liabilities can help improve the transparency of the public finances.[51]

The UK is one of the few countries in the world in which the Government has a statutory requirement to report its liabilities, assets and all other key financial information in the same way as private sector companies. Since 1997, the UK Government has introduced a series of reforms to ensure greater transparency and it has increased the availability of information about national and departmental finances.

The *Code for Fiscal Stability* (1998) commits the Government to apply best-practice accounting methods in the production of its accounts. In 2000, the Government introduced new legislation that requires departmental accounts to follow Generally Accepted Accounting Practices (UK GAAP), adapted as necessary for the public sector context. In line with these statutory requirements, government departments now produce full resource accounts including contingent liabilities.

The Government is committed to further improvements and is currently working towards the production of Whole of Government Accounts (WGA).[52] WGA will present a comprehensive snapshot of the public finances, prepared on a basis comparable with the private sector, as well as accounting for public spending and cash flows in the previous 12 months. The programme will also deliver further benefits in information quality, it will:

- improve data consistency, e.g. it is acting as a catalyst for the convergence of accounting policies across the public sector;
- extend the range of data, e.g. on provisions, contingent gains and liabilities and future contract expenditure; and
- be independently audited and certified by the Comptroller and Auditor General.

In addition, through the WGA programme the Government aims to make it possible to progressively increase the amount of audited data included directly in the UK National Accounts, for example by replacing modelled depreciation data with actual data.

4. Conclusions

The UK Government's medium-term objective for fiscal policy is to ensure sound public finances and that spending and taxation impact fairly within and between generations. The UK's fiscal rules ensure this is achieved by ensuring that

---

[51] Identifying and then quantifying what the contingent liabilities of the government are is no easy task and can range widely, for example the IMF (2003) comment: "The rise (in public debt in emerging economies) appears to be largely accounted for by interest and exchange rate movements and the recognition of off-balance sheet and contingent liabilities… In a number of countries, the costs of recapitalizing banking systems have been particularly high."

[52] The way in which accruals-based balance sheet information might be used to complement the analysis of fiscal sustainability is discussed in chapter 3 of H.M.Treasury (2003), *Long-term Public Finance Report*.

the Government will borrow only to invest and not to fund current spending over the economic cycle and by keeping net debt to GDP ratio below 40 per cent over the cycle. The debt ceiling is needed given that some public investment is not expected to yield a financial return unlike that in the private sector. Setting a debt rule also helps to anchor expectations and aids transparency which in turn helps to build credibility. The focus on maintaining a low debt ratio is justified in terms of the adverse effects of high debt levels on growth and the increased vulnerability to shocks when debt ratios are high. Extreme debt levels can lead to default or high inflation, both of which are costly.

The UK Government's debt rule is set at a deliberately prudent level that is low by historical and international standards and should be sustainable even with unfavourable shocks. A prudential approach is justified given the well-known uncertainties in making fiscal projections and can be compared with the more formal recent approaches applied to some developing countries. The debt ceiling is also consistent with the increase in the ratio of public net investment to GDP that is required to modernise and reform the UK public sector without imposing an unfair burden on the current generation.

The evidence reviewed in the paper illustrates that it is hard to come to a precise analytical answer as to what the optimal debt level is, but for long-term fiscal sustainability this may matter less than having a clear and credible debt target for the debt ratio. Nevertheless, for prudential reasons, there are clear advantages in going beyond simply trying to stabilise the debt ratio at its current level. The UK Government has consistently argued for a greater focus on debt and long-term fiscal sustainability in the context of the EU Stability and Growth Pact.[53] This is especially important in the context of longer-term fiscal challenges including those related to ageing populations.

Section 3 set out how the UK uses its debt rule in its analysis of long-term fiscal sustainability, applying a range of indicators. In the future, GAPP-based Whole of Government Accounts will provide further useful complimentary information, for example on the government's assets, depreciation and contingent gains and liabilities.

---

[53] A paper was published alongside the recent Budget: H.M.Treasury (2004), *The Stability and Growth Pact: A Discussion Paper*, March.

REFERENCES

Abel, A.B., N.G. Mankiw, L.H. Summers and J. Zeckhausen (1989), "Assessing Dynamic Efficiency, Theory and Evidence", *Review of Economic Studies,* No. 56, pp. 1-20.

Aiyagari, S.R. and E.R. McGrattan (1998), "The Optimum Quantity of Debt", *Journal of Monetary Economics*, No. 42, pp. 447-69.

Aiyagari, S.R., A. Marcet, T.J. Sargent and J. Seppälä (2002), "Optimal Taxation without State Contingent Debt", *Journal of Political Economy*, No. 110, pp. 1220-54.

Asilis, C.M. (1994), "The US Public Debt: Implications for Growth", IMF, Working Paper, 94/4.

Auerbach, A.J. (1994), "The US Fiscal Problem: Where We Are, How We Got There, and Where We're Going", in S. Fischer and J. Rotemberg (eds.), *NBER Macroeconomics Annual*.

Auerbach, A.J. and L.J. Kotlikoff (1987), *Dynamic Fiscal Policy*, Cambridge, Cambridge University Press.

Barnhill, T.M. and G. Kopits (2003), "Assessing Fiscal Sustainability under Uncertainty", IMF, Working Paper, No. 03/79.

Barro, R.J. (1979), "On the Determination of the Public Debt", *Journal of Political Economy*, No. 87, pp. 940-71.

——————— (1987), "Government Spending, Interest Rates, Prices, and Budget Deficits in the United Kingdom, 1701-1918", NBER, Working Paper, No. 2005.

Blanchard, O.J. (1985), "Debt, Deficits and Finite Horizons", *Journal of Political Economy,* No. 93, pp. 223-47.

Blanchard, O.J., J. Cloraqui, R. Hagemann, N. Sartor (1990), "The Sustainability of Fiscal Policy: New Answers to Old Questions", OECD, Economic Studies, No. 15, pp. 8-36.

Buiter, W.H. (1985), "Guide to Public Sector Debt and Deficits", *Quarterly Journal of Economics*, No. 113, pp. 949-63.

——————— (2001), "Notes on 'A Code for Fiscal Stability'", *Oxford Economic Papers*, No. 53, pp. 1-19.

——————— (2003), "Ten Commandments for a Fiscal Rule in the E(M)U", *Oxford Review of Economic Policy*, No. 19, pp. 84-99.

Chalk, N.A. (2000), "The Sustainability of Bond-financed Deficits: An Overlapping Generations Approach", *Journal of Monetary Economics*, No. 45, pp. 293-328.

Chalk, N.A. (1995), "The Impact of Growth on Sustainability of Public Deficits" Ph.D. Dissertation, UCLA.

Chalk, N.A. and R. Hemmings (2000), "Assessing Fiscal Sustainability in Theory and Practice", in Banca d'Italia (ed.), *Fiscal Sustainability*, Rome.

Diamond, P.A. (1965), "National Debt in a Neoclassical Growth Model", *American Economic Review*, No. 55, pp. 1126-50.

Elmedorf, D.W. and N.G. Mankiw (1999), "Government Debt", in J. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics, Volume I*, chapter 25.

European Central Bank (2004), "Fiscal Policy Influences on Macroeconomic Stability and Prices", *ECB Monthly Bulletin*, April, pp. 45-57.

Feldstein, M. (1984), "Debt and Taxes in the Theory of Public Finance", NBER, Working Paper, No. 1433.

Federal Reserve Bank of San Francisco (2002), *Economic Letter,* No. 2002-31, available at:
http://www.frbsf.org/publications/economics/letter/2002/el200231.pdf

Giavazzi, F. and M. Pagano (1996), "Non-Keynesian Effects of Fiscal Policy Changes: International Evidence and the Swedish Experience", *Swedish Economic Policy Review*, Vol. 3, No. 3, pp. 67-103.

Hausmann, R. (2002), quoted in N. Will (ed.), "Argentina in Crisis: What Went Wrong?", *Harbus Online* available at:
http://www.harbus.org/news/2002/03/11/WorldlyViews/Argentina.In.Crisis.What.Went.Wrong-207436.shtml

H.M.Treasury (1998), *The Code for Fiscal Stability,* London, H.M.Treasury.

—————— (2002), E. Balls and G. O'Donnell (eds.), *Reforming Britain's Economic and Financial Policy*, London, Palgrave.

—————— (2002), *Trend Growth: Recent Developments and Prospects*, London, H.M.Treasury.

—————— (2003), *Fiscal Stabilisation and EMU: A Discussion Paper*, London, H.M.Treasury.

—————— (2003), *Long-term Public Finance Report: Fiscal Sustainability with an Ageing Population*, London, H.M.Treasury.

—————— (2003), *End of Year Fiscal Report*, London, H.M.Treasury.

—————— (2004), *Budget 2004,* London, H.M.Treasury.

—————— (2004), *The Stability and Growth Pact: A Discussion Paper*, London, H.M.Treasury.

Horne, J. (1991), "Indicators of Fiscal Sustainability", IMF, Working Paper, No. 91/5, Washington (D.C.).

Institute for Fiscal Studies (2004), *The IFS Green Budget*, London.

International Monetary Fund (1998), *Manual on Fiscal Transparency*, Washington (D.C.).

———— (2003): "Public Debt in Emerging Markets: Is it Too High?", *World Economic Outlook,* September, chapter III, Washington (D.C.).

Janssen, N. and C. Nolan (2001), "Debt and Deficits in the UK: A Long-Run Perspective", Working Paper.

Janssen, N., C. Nolan and R. Thomas (2002), "Money, Debt and Prices in the UK, 1705-1996", *Economica*, No. 69, pp. 461-79.

Keech, W.R. (1985), "A Theoretical Analysis of the Case for a Balanced Budget Amendment", *Policy Sciences*, No. 18, pp.157-68.

Mendoza, E.G. and P.M. Oviedo (2003), "Public Debt Sustainability under Uncertainty", Research Department Inter-American Development Bank (unpublished).

Musgrave, R.A. (1959), *The Theory of Public Finance*, McGraw Hill, New York.

Robson, W.B.P. and W.M. Scarth (1997), "Out Front on Federal Debt Reduction: Programs and Payoffs", Toronto, C.D. Howe Institute.

Smyth, D.J. and Y. Hsing (1995), "In Search of an Optimal Debt Ratio for Economic Growth", *Contemporary Economic Policy*, No. 13, pp. 51-59.

Zee, H.H. (1988), "The Sustainability and Optimality of Government Debt", IMF, Staff Papers, No. 35, pp. 658-85.