Chapter 22

FISCAL POLICY: A SUMMING UP

At the time of writing, fiscal policy is at the centre of policy discussions. In most advanced economies, the crisis has led to large budget deficits and a large increase in debt-to-GDP ratios. In Greece, the government has indicated that it will be unable to repay its debt fully and is negotiating with its creditors. The problem goes beyond Greece. In a number of countries, investors are worried about whether debt can indeed be repaid and are asking for higher interest rates to compensate for the risk of default. This calls for governments to reduce deficits, stabilise the debt and reassure investors. At the same time, however, the recovery is weak and a fiscal contraction is likely to slow it down further, at least in the short run. Thus, governments face a difficult choice. Reduce deficits rapidly and reassure markets that they will pay their debt at the risk of lower growth or even a recession, or reduce deficits more slowly to avoid further slowing the recovery at the risk of not convincing investors that debt will be stabilised.

The purpose of this chapter is to review what we have learned about fiscal policy so far, to explore in more depth the dynamics of deficits and debt, and to shed light on the problems associated with high public debt.

- Section 22.1 takes stock of what we have learned about fiscal policy so far.
- Section 22.2 looks more closely at the government budget constraint and examines its implications for the relation between budget deficits, the interest rate, the growth rate and government debt.
- Section 22.3 takes up three issues for which the government budget constraint plays a central role, from the proposition that deficits do not really matter, to how to run fiscal policy in the cycle, to whether to finance wars through taxes or through debt.
- Section 22.4 discusses the dangers associated with high government debt, from higher taxes, to higher interest rates, to default and high inflation.

22.1 WHAT WE HAVE LEARNED

Let's review what we have learned so far about fiscal policy:

- In Chapter 3, we looked at how government spending and taxes affected demand and, in turn, output in the short run.

  We saw how, in the short run, a fiscal expansion – increases in government spending, or decreases in taxes – increases output.
- In Chapter 5, we looked at the short-run effects of fiscal policy on output and on the interest rate.

  We saw how a fiscal contraction leads to lower disposable income, which causes people to decrease their consumption. This decrease in demand leads, in turn, through a multiplier, to a decrease in output and income. At a given policy rate, the fiscal contraction therefore leads to a decrease in output. A decrease in the policy rate by the central bank can, however, partially offset the adverse effects of the fiscal contraction.
- In Chapter 6, we saw how fiscal policy was used during the recent crisis to limit the fall in output.

  We saw that when the economy is in a liquidity trap a reduction in the interest rate cannot be used to increase output, and thus fiscal policy has an important role to play. Large increases in spending and cuts in taxes, however, were not enough to avoid the recession.
- In Chapter 9, we looked at the effects of fiscal policy in the short run and in the medium run.

  We saw that, in the medium run (i.e. taking the capital stock as given), a fiscal consolidation has no effect on output but is reflected in a different composition of spending. In the short run, however, output decreases. In other words, if output was at potential to start with, the fiscal consolidation, as desirable as it may be on other grounds, leads to an initial recession.
- In Chapter 11, we looked at how saving, both private and public, affects the level of capital accumulation and the level of output in the long run.

  We saw how, once capital accumulation is taken into account, a larger budget deficit and, by implication, a lower national saving rate decrease capital accumulation, leading to a lower level of output in the long run.
- In Chapter 16, we returned to the short-run effects of fiscal policy, taking into account not only fiscal policy's direct effects through taxes and government spending, but also its effects on expectations.

  We saw how the effects of fiscal policy depend on expectations of future fiscal and monetary policy. In particular, we saw how a deficit reduction may, in some circumstances, lead to an increase in output even in the short run, due to people's expectations of higher future disposable income.
- In Chapter 18, we looked at the effects of fiscal policy when the economy is open in the goods market.

  We saw how fiscal policy affects both output and the trade balance, and we examined the relation between the budget deficit and the trade deficit.
- In Chapter 19, we looked at the role of fiscal policy in an economy open in both goods markets and financial markets.

  We saw how, when capital is mobile, the effects of fiscal policy depend on the exchange rate regime. Fiscal policy has a stronger effect on output under fixed exchange rates than under flexible exchange rates.
- In Chapter 21, we looked at the problems facing policy makers in general, from uncertainty about the effects of policy to issues of time consistency and credibility. These issues arise in the analysis of fiscal policy as well as monetary policy. We looked at the pros and cons of putting restraints on the conduct of fiscal policy, from spending caps to a constitutional amendment to balance the budget.

In deriving these conclusions, we did not pay close attention to the government budget constraint – that is, the relation between debt, deficits, spending and taxes. This relation is important, however, in understanding both how we got to where we are today and the choices faced by policy makers. It is the focus of the next section.

22.2 THE GOVERNMENT BUDGET CONSTRAINT: DEFICITS, DEBT, SPENDING AND TAXES

Suppose that, starting from a balanced budget, the government decreases taxes, creating a budget deficit. What will happen to the debt over time? Will the government need to increase taxes later? If so, by how much?

The arithmetic of deficits and debt

To answer these questions, we must begin with a definition of the budget deficit. We can write the budget deficit in year t as:

$$\text{deficit}_t = rB_{t-1} + G_t - T_t \qquad [22.1]$$

All variables are in real terms:

- B_{t-1} is government debt at the end of year $t-1$, or, equivalently, at the beginning of year t; r is the real interest rate, which we shall assume to be constant here. Thus, rB_{t-1} equals the real interest payments on the government debt in year t.
- G_t is government spending on goods and services during year t.
- T_t is taxes minus transfers during year t.

In words, the budget deficit equals spending, including interest payments on the debt, minus taxes net of transfers.

Note two characteristics of equation (22.1):

- We measure interest payments as real interest payments – that is, the product of the *real* interest rate and existing debt – rather than as actual interest payments – that is, the product of the nominal interest rate and the existing debt. As the next Focus box shows, this is the correct way of measuring interest payments. Official measures of the deficit, however, use actual (nominal) interest payments and are therefore incorrect. When inflation is high, official measures can be seriously misleading. The correct measure of the deficit is sometimes called the **inflation-adjusted deficit**.
- For consistency with our definition of G as spending on goods and services, G does not include transfer payments. Transfers are instead subtracted from T, so that T stands for *taxes minus transfers*. Official measures of government spending add transfers to spending on goods and services and define revenues as taxes, not taxes net of transfers.

These are only accounting conventions. Whether transfers are added to spending or subtracted from taxes makes a difference to the measurement of G and Tr, but clearly does not affect $G - Tr$ and therefore does not affect the measure of the deficit.

The **government budget constraint** then simply states that the *change in government debt during year t* is equal to the *deficit during year t:*

$$B_t - B_{t-1} = \text{deficit}_t$$

If the government runs a deficit, government debt increases as the government borrows to fund the part of spending in excess of revenues. If the government runs a surplus, instead, government debt decreases as the government uses the budget surplus to repay part of its outstanding debt.

◀ Do not confuse the words deficit and debt. (Many journalists and politicians do.) Debt is a stock – what the government owes as a result of past deficits. The deficit is a flow – how much the government borrows during a given year.

◀ Transfer payments are government transfers to individuals, such as unemployment benefits or healthcare.

Let G represent spending on goods and services; Tr, transfers; and Tax, total taxes. For simplicity, assume interest payments rB equal zero. Then:

$$\text{Deficit} = G + Tr - Tax$$

◀ This can be rewritten in two (equivalent) ways:

$$\text{Deficit} = G - (Tax - Tr)$$

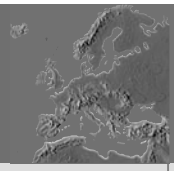
The deficit equals spending on goods and services minus net taxes – that is, taxes minus transfers. This is the way we write it in the text. Or it can be written as:

$$\text{Deficit} = (G + Tr) - Tax$$

which is the way it is decomposed in official measures (see for example Table A1.4 in Appendix 1).

FOCUS

Inflation accounting and the measurement of deficits



Official measures of the budget deficit are constructed (dropping the time indexes, which are not needed here) as nominal interest payments, iB, plus spending on goods and services, G, minus taxes net of transfers, T:

$$\text{Official measure of the deficit} = iB + G - T$$

This is an accurate measure of the cash flow position of the government. If it is positive, the government is spending more than it receives and must therefore issue new debt. If it is negative, the government buys back previously issued debt.

But this is not an accurate measure of the *change in real debt* – that is, the change in how much the government owes, expressed in terms of goods rather than dollars.

To see why, consider the following example. Suppose the official measure of the deficit is equal to zero, so the government neither issues nor buys back debt. Suppose inflation is positive and equal to 10%. Then, at the end of the year, the real value of the debt has decreased by 10%. If we define – as we should – the deficit as the change in the real value of government debt, the government has decreased its real debt by 10% over the year. In other words, it has in fact run a budget surplus equal to 10% times the initial level of debt.

More generally, if B is debt and π is inflation, the official measure of the deficit overstates the correct measure by an amount equal to πB. Put another way, the correct measure of the deficit is obtained by subtracting πB from the official measure:

$$\begin{aligned}\text{Correct measure of the deficit} &= iB + G - T - \pi B \\ &= (i - \pi)B + G - T \\ &= rB + G - T\end{aligned}$$

where $r = i - \pi$ is the (realised) real interest rate. The correct measure of the deficit is then equal to real interest payments plus government spending minus taxes net of transfers; this is the measure we have used in the text.

The difference between the official and the correct measures of the deficit equals πB. So, the higher the rate of inflation, π, or the higher the level of debt, B, the more inaccurate the official measure is. In countries in which both inflation and debt are high, the official measure may record a very large budget deficit, when in fact real government debt is decreasing. This is why you should always do the inflation adjustment before deriving conclusions about the position of fiscal policy.

Figure 22.1 plots the official measure and the inflation-adjusted measure of the (federal) budget deficit for the United States since 1969. The official measure shows a deficit in every year from 1970 to 1997. The inflation-adjusted measure shows instead alternating deficits and surpluses until the late 1970s. Both measures, however, show how much larger the deficit became after 1980, how things improved in the 1990s and how they have deteriorated in the 2000s. Today, with inflation running at about 1 to 2% a year and the ratio of debt to GDP roughly equal to 100%, the difference between the two measures is roughly equal to 1 to 2% times 100%, or 1 to 2% of GDP.

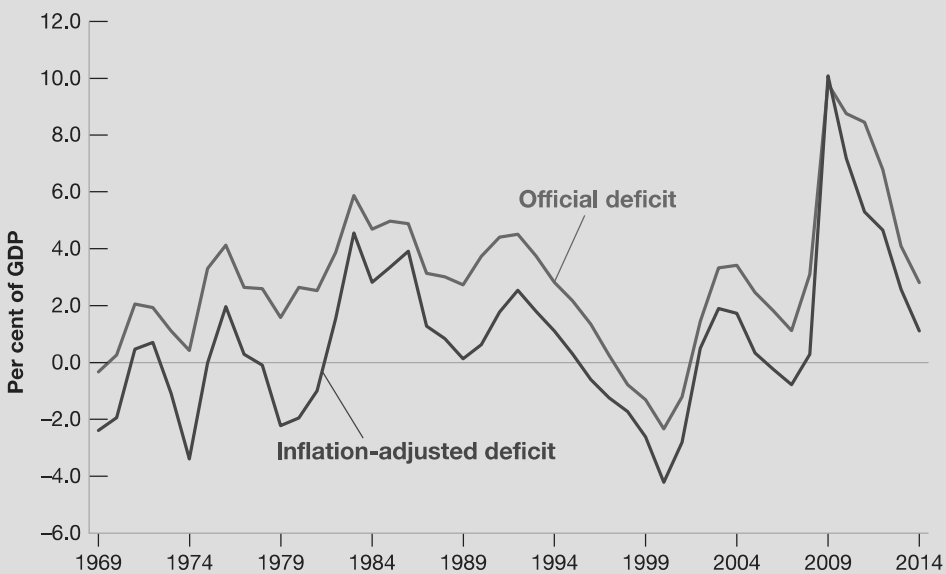


Figure 22.1

Official and inflation-adjusted federal budget deficits for the United States since 1969

Source: Official deficit as a percent of GDP, Table B-19, *Economic Report of the President*; Inflation from Series CPIAUCSL, Federal Reserve Economic Data (FRED).

Using the definition of the deficit (equation (22.1)), we can rewrite the government budget constraint as:

$$B_t - B_{t-1} = rB_{t-1} + G_t - T_t \qquad [22.2]$$

The government budget constraint links the change in government debt to the initial level of debt (which affects interest payments) and to current government spending and taxes. It is often convenient to decompose the deficit into the sum of two terms:

- Interest payments on the debt, rB_{t-1}.
- The difference between spending and taxes, $G_t - T_t$. This term is called the **primary deficit** (equivalently, $T_t - G_t$ is called the **primary surplus**).

Using this decomposition, we can rewrite equation (22.2) as:

$$\overbrace{B_t - B_{t-1}}^{\text{change in the debt}} = \overbrace{rB_{t-1}}^{\text{interest payments}} + \overbrace{(G_t - T_t)}^{\text{primary deficit}}$$

Or, moving B_{t-1} to the right side of the equation and rearranging:

$$B_t = (1 + r)B_{t-1} + \overbrace{(G_t - T_t)}^{\text{primary deficit}} \qquad [22.3]$$

This relation states that the debt at the end of year t equals $(1 + r)$ times the debt at the end of year $t - 1$ plus the primary deficit during year t, $(G_t - T_t)$. Let's look at some of its implications.

Current versus future taxes

Consider first a one-year decrease in taxes for the path of debt and future taxes. Start from a situation where, until year 1, the government has balanced its budget, so that initial debt is equal to zero. During year 1, the government decreases taxes by one (think €1 billion, for example) for one year. Thus, debt at the end of year 1, B_1, is equal to one. We take up the question: What happens thereafter?

Full repayment in year 2

Suppose the government decides to repay the debt fully during year 2. From equation (22.3), the budget constraint for year 2 is given by:

$$B_2 = (1 + r)B_1 + (G_2 - T_2)$$

If the debt is fully repaid during year 2, then the debt at the end of year 2 is equal to zero, $B_2 = 0$. Replacing B_1 by 1 and B_2 by 0 and transposing terms gives:

$$T_2 - G_2 = (1 + r)1 = (1 + r)$$

To repay the debt fully during year 2, the government must run a primary surplus equal to $(1 + r)$. It can do so in one of two ways: a decrease in spending or an increase in taxes. We shall assume here and in the rest of this section that the adjustment comes through taxes, so that the path of spending is unaffected. It follows that the decrease in taxes by one during year 1 must be offset by an increase in taxes by $(1 + r)$ during year 2.

The path of taxes and debt corresponding to this case is given in Figure 22.2(a). If the debt is fully repaid during year 2, the decrease in taxes of one in year 1 requires an increase in taxes equal to $(1 + r)$ in year 2.

◀ **Full repayment in year 2: T_1 decreases by 1 ⇒ T_2 increases by $(1 + r)$.**

Full repayment in year *t*

Now suppose the government decides to wait until year t to repay the debt. From year 2 to year $t-1$ the primary deficit is equal to zero; taxes are equal to spending, not including interest payments on the debt.

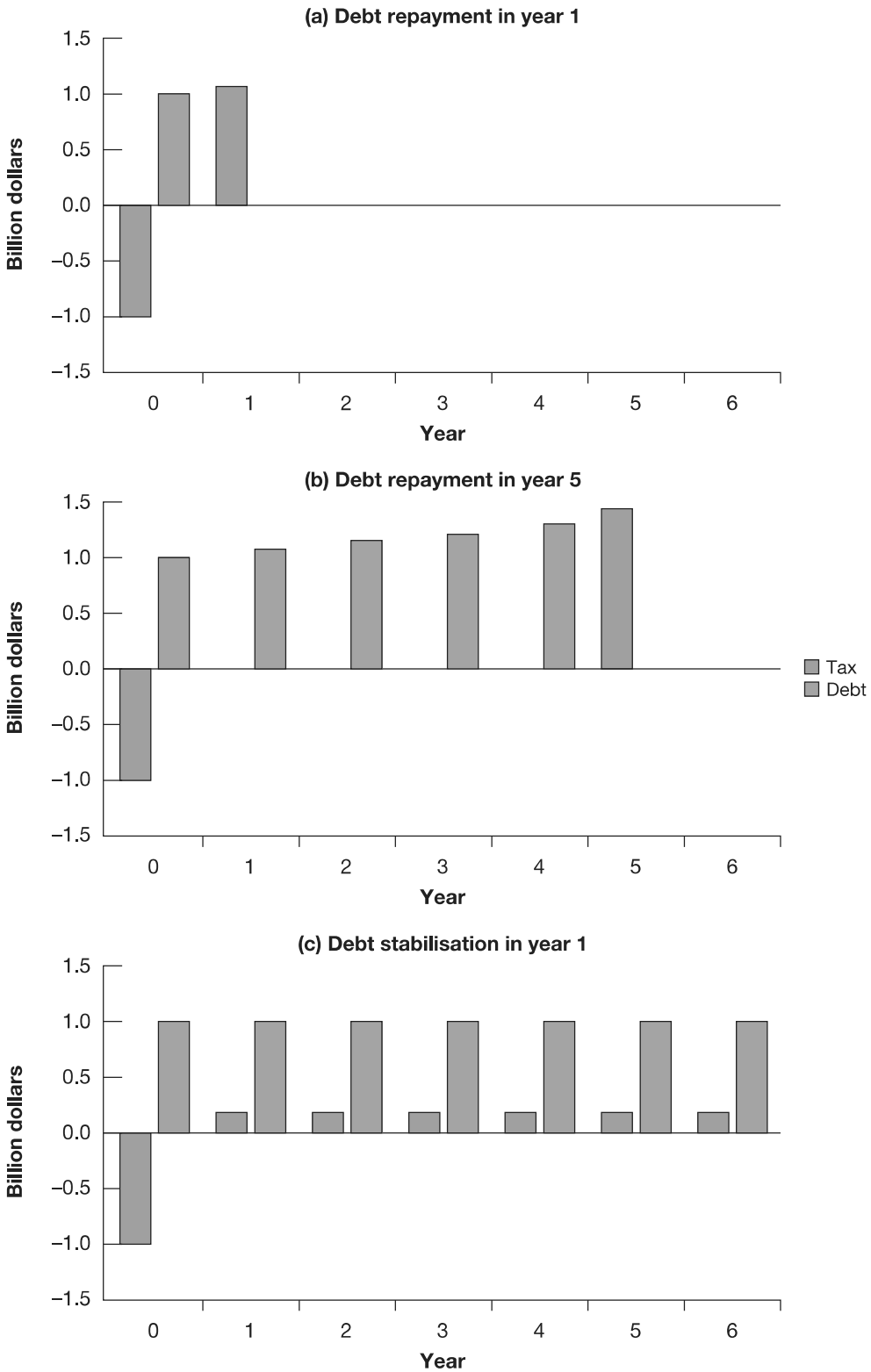


Figure 22.2

Tax cuts, debt repayment and debt stabilisation

(a) If the debt is fully repaid during year 2, the decrease in taxes of 1 in year 1 requires an increase in taxes equal to $(1 + r)$ in year 2. (b) If the debt is fully repaid during year 5, the decrease in taxes of 1 in year 1 requires an increase in taxes equal to $(1 + r)^4$ during year 5. (c) If the debt is stabilised from year 2 on, then taxes must be permanently higher by r from year 2 on.

During year 2, the primary deficit is zero. So, from equation (22.3), debt at the end of year 2 is:

$$B_2 = (1 + r)B_1 + 0 = (1 + r)1 = (1 + r)$$

where the second equality uses the fact that $B_1 = 1$.

With the primary deficit still equal to zero during year 3, debt at the end of year 3 is:

$$B_3 = (1 + r)B_2 + 0 = (1 + r)(1 + r)1 = (1 + r)^2$$

Solving for debt at the end of year 4, and so on, it is clear that as long as the government keeps a primary deficit equal to zero, debt grows at a rate equal to the interest rate, and thus debt at the end of year $t - 1$ is given by:

$$B_{t-1} = (1 + r)^{t-2} \qquad [22.4]$$

Despite the fact that taxes are cut only in year 1, debt keeps increasing over time, at a rate equal to the interest rate. The reason is simple: although the primary deficit is equal to zero, debt is now positive and so are interest payments on it. Each year, the government must issue more debt to pay the interest on existing debt.

In year t, the year in which the government decides to repay the debt, the budget constraint is:

$$B_t = (1 + r)B_{t-1} + (G_t - T_t)$$

If debt is fully repaid during year t, then B_t (debt at the end of year t) is zero. Replacing B_t by zero and B_{t-1} by its expression from equation (22.4) gives:

$$0 = (1 + r)(1 + r)^{t-2} + (G_t - T_t)$$

Rearranging and bringing $(G_t - T_t)$ to the left side of the equation implies:

$$T_t - G_t = (1 + r)^{t-1}$$

◀ Add exponents: $(1 + r)(1 + r)^{t-2} = (1 + r)^{t-1}$. See Appendix 2.

To repay the debt, the government must run a primary surplus equal to $(1 + r)^{t-1}$ during year t. If the adjustment is done through taxes, the initial decrease in taxes of one during year 1 leads to an increase in taxes of $(1 + r)^{t-1}$ during year t. The path of taxes and debt corresponding to the case where debt is repaid in year 5 is given in Figure 22.2(b).

◀ Full repayment in year 5: T_1 decreases1 by 1 $\Rightarrow$ T_5 increases by $(1 + r)^4$.

This example yields our first set of conclusions:

- If government spending is unchanged, a decrease in taxes must eventually be offset by an increase in taxes in the future.
- The longer the government waits to increase taxes, or the higher the real interest rate is, the higher the eventual increase in taxes must be.

Debt stabilisation in year *t*

We have assumed so far that the government fully repays the debt. Let's now look at what happens to taxes if the government only stabilises the debt. (Stabilising the debt means changing taxes or spending so that debt remains constant from then on.)

Suppose the government decides to stabilise the debt from year 2 on. Doing this means that the debt at the end of year 2 and thereafter remains at the same level as it was at the end of year 1.

From equation (22.3), the budget constraint for year 2 is:

$$B_2 = (1 + r)B_1 + (G_2 - T_2)$$

Under our assumption that debt is stabilised in year 2, $B_2 = B_1 = 1$. Setting $B_2 = B_1 = 1$ in the preceding equation yields:

$$1 = (1 + r) + (G_2 - T_2)$$

Rearranging and bringing $(G_2 - T_2)$ to the left side of the equation gives:

$$T_2 - G_2 = (1 + r) - 1 = r$$

To avoid a further increase in debt during year 1, the government must run a primary surplus equal to real interest payments on the existing debt. It must do so in each of the following years as well. Each year, the primary surplus must be sufficient to cover interest

payments, leaving the debt level unchanged. The path of taxes and debt is shown in Figure 22.2(c). Debt remains equal to one from year 1 on. Taxes are permanently higher from year 1 on, by an amount equal to r; equivalently, from year 1 on, the government runs a primary surplus equal to r.

Stabilising the debt from year 2 on: T_1 decreases by $1 \Rightarrow T_2, T_3, \ldots$ increase by r.

The logic of this argument extends directly to the case where the government waits until year t to stabilise the debt. Whenever the government stabilises, it must, each year from then on, run a primary surplus sufficient to pay the interest on the debt.

This example yields our second set of conclusions:

- The legacy of past deficits is higher government debt today.
- To stabilise the debt, the government must eliminate the deficit.
- To eliminate the deficit, the government must run a primary surplus equal to the interest payments on the existing debt. This requires higher taxes for ever.

The evolution of the debt-to-GDP ratio

We have focused so far on the evolution of the *level* of debt. But in an economy in which output grows over time, it makes more sense to focus instead on the *ratio of debt to output*.

To see how this change in focus modifies our conclusions, we need to go from equation (22.3) to an equation that gives the evolution of the **debt-to-GDP ratio** – the **debt ratio** for short.

Deriving the evolution of the debt ratio takes a few steps. Do not worry; the final equation is easy to understand.

First divide both sides of equation (22.3) by real output, Y_t, to get:

$$\frac{B_t}{Y_t} = (1 + r)\frac{B_{t-1}}{Y_t} + \frac{G_t - T_t}{Y_t}$$

Next rewrite B_{t-1}/Y_t as $(B_{t-1}/Y_{t-1})(Y_{t-1}/Y_t)$ (in other words, multiply the numerator and the denominator by Y_{t-1}):

$$\frac{B_t}{Y_t} = (1 + r)\left(\frac{Y_{t-1}}{Y_t}\right)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

Start from $Y_t = (1 + g)Y_{t-1}$. Divide both sides by Y_t to get $1 = (1 + g)Y_{t-1}/Y_t$. Rearrange to get $Y_{t-1}/Y_t = 1/(1 + g)$.

Note that all the terms in the equation are now in terms of ratios to output, Y. To simplify this equation, assume that output growth is constant and denote the growth rate of output by g, so Y_{t-1}/Y_t can be written as $1/(1 + g)$. And use the approximation $(1 + r)/(1 + g) = 1 + r - g$.

This approximation is derived as Proposition 6 in Appendix 2.

Using these two assumptions, rewrite the preceding equation as:

$$\frac{B_t}{Y_t} = (1 + r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t}$$

Finally, rearrange to get:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{G_t - T_t}{Y_t} \qquad [22.5]$$

This took many steps, but the final relation has a simple interpretation.

The change in the debt ratio over time (the left side of the equation) is equal to the sum of two terms:

- The first term is the difference between the real interest rate and the growth rate times the initial debt ratio.
- The second term is the ratio of the primary deficit to GDP.

Compare equation (22.5), which gives the evolution of the ratio of debt to GDP, with equation (22.2), which gives the evolution of the level of debt itself. The difference is the presence

of $r - g$ in equation (22.5) compared with r in equation (22.2). The reason for the difference is simple. Suppose the primary deficit is zero. Debt will then increase at a rate equal to the real interest rate, r. But if GDP is growing as well, the ratio of debt to GDP will grow more slowly; it will grow at a rate equal to the real interest rate minus the growth rate of output, $r - g$.

If two variables (here debt and GDP) grow at rates r and g, respectively, then their ratio (here the ratio of debt to GDP) will grow at rate $r - g$. See Proposition 8 in Appendix 2.

Equation (22.5) implies that the increase in the ratio of debt to GDP will be larger:

- the higher the real interest rate;
- the lower the growth rate of output;
- the higher the initial debt ratio;
- the higher the ratio of the primary deficit to GDP.

Building on this relation, we now turn in the next section to describe how governments that inherited high debt ratios at the end of the war steadily decreased them through a combination of low real interest rates, high growth rates and primary surpluses. The following section then shows how our analysis can also be used to shed light on a number of other fiscal policy issues.

How countries decreased their debt ratios after world wars

Historical experiences provide us with illuminating examples of how some countries have emerged from situations of high debt by taking very different solutions. We shall describe the experience of Germany, France and the United Kingdom at the end of the First World War.

Germany financed military spending during the First World War mainly through borrowing. During the war period, in fact, fiscal revenue accounted for a negligible fraction of overall spending, and the resulting budget deficit was financed by issuing debt, especially short-term debt. But how did Germany plan to repay this debt? Like all the countries that took part in the conflict, it hoped to win the war and shift the debt burden onto the defeated countries. But Germany lost the war and at the end of the conflict found itself with a very high debt stock.

After the war, the German political situation was particularly unstable. Following on from the military defeat, the old nationalistic regime, ruled by aristocrats and the military, collapsed. The Communist Party began to gain broad support but, rather than a communist revolution, what happened was the birth of a new democratic regime, the Weimar Republic. The political situation remained, however, quite unstable. The democratic regime was very weak, threatened both by the workers' unrest linked to the communist movement and, at the other extreme, by the forces of the old regime and the new movements of far-right nationalists.

In the first half of the 1920s, the debt problem was aggravated by the high budget deficits accumulated by the Weimar government. In part, these deficits were related to the reparations Germany had to pay to the winners of the war, to France in particular. In reality, reparations accounted for no more than one-third of the deficits in those years. The main reason for the deficits of the years 1920–3 was a political impasse in fiscal policy. The proposal of drastic tax reforms had further weakened an already weak political situation, making it extremely difficult for the government to collect taxes. For example, the socialists' proposal to levy an extraordinary tax on firms' capital and profits encountered violent opposition from nationalists and, obviously, from entrepreneurs. Similarly, the proposal by entrepreneurs to raise income tax was rejected by the socialists. The result was that no significant measure was introduced until 1922. The need to strike a compromise between the new and the old regime had undermined the ability and willingness of the government to increase taxes. The political and fiscal policy impasse of these years left, as the only solution, monetisation, which led to hyperinflation. One of the effects of German hyperinflation was the total cancellation of the debt that had existed at the end of the war. By the autumn of 1922, the debt did not exceed 5% of its real value in 1919. This dramatic reduction of wealth struck especially the middle class, which held the largest share of government debt. The reduction of wealth owned by the middle class worsened the income distribution, which is one of the reasons for the subsequent collapse of democratic institutions.

In France, in the decade that followed the end of the war, the question of who should pay the cost of the debt issued to finance the conflict monopolised the political debate. The debt was a particularly difficult problem due both to its size – the public debt represented about 150% of GDP – and its composition – the short-term debt constituted 32% of the total. In the years 1919–1926, the political situation in France was very unstable: in just a few years, socialist and conservative governments alternated one after another. But in the second half of the decade political instability decreased: in 1926 the right won the final fight and was able to form a stable conservative government headed by Raymond Poincaré.

At the beginning of the decade, there seemed to be an easy solution to the French public debt problem: make the Germans pay for it through reparations. It was only at the end of 1922, and after the occupation of the Ruhr, that the French began to realise that German taxpayers would not be able to pay. Then an endless debate began between the opposition, on the one hand, and the conservatives on the other. The left denounced the unfairness of the tax structure, maintaining that, although income taxes were very progressive, only 20% of tax revenue was collected through income taxes. The high incidence of indirect taxes meant that the tax burden fell mostly on the less wealthy. The left, therefore, proposed a unique and progressive tax. At the other extreme, the conservatives opposed progressive income taxes, proposing much more reliance on indirect taxes. The distributional conflict made the political situation increasingly volatile; the French franc was hit by speculation and inflation went up. In fact, the fear of a capital levy made the public unwilling to buy government bonds. As a result, the government had to repay the bonds coming to maturity with monetary financing. In 1926 France was probably on the verge of hyperinflation.

At this point, Raymond Poincaré assumed the leadership of a new Conservative government and announced a drastic stabilisation programme. The element that made this programme different from previous attempts at fiscal adjustment was simply the greater political stability. The programme was credible because the political opponents had been defeated. Inflation ended abruptly, even before the government had started the fiscal adjustment.

Even in the United Kingdom, the debt was very high at the end of the First World War: the debt-to-GDP ratio had reached 130% in 1919. The policies adopted, however, were very different from those in Germany and France. What distinguished the United Kingdom from Germany and France? The answer is simple: the degree of political stability. As we have seen, in both Germany and France the political situation at the end of the conflict was very unstable. In the United Kingdom, instead, except for two brief Labour governments, in 1924 and in 1930, the Conservative Party ruled continuously throughout the 1920s and 1930s. Democratic institutions were very solid and, despite very high unemployment, were never really threatened by the risk of a social revolt. This made it possible to introduce fiscal and monetary contractions, whose main objective was the stability of sterling and its return to its pre-war value, thus allowing a return to the gold standard. At the same time, the government produced budget surpluses in order to reduce the high public debt. The United Kingdom was one of the very few European countries where no expansionary fiscal policies were implemented to promote economic recovery.

Throughout the 1920s, and until the second half of the 1930s, fiscal surpluses, however, were not sufficient to reduce public debt. In this period, interest rates greatly exceeded the rate of growth of GDP. In 1923, the debt reached 170% of GDP and remained above 150% up to 1936. The debt-to-GDP ratio only started to decline in the second half of the 1930s, 15 years after the war.

Who bore the burden of debt reduction in the United Kingdom? Certainly not those who had bought government securities, since there was no form of repudiation, either explicitly or implicitly through inflation. The burden of adjustment was borne primarily by taxpayers. Among them, those in the less wealthy classes were especially affected, because of an increasingly regressive tax system. For example, the introduction of taxes on specific products (tea, sugar, tobacco, milk, etc.) had a significant regressive effect.

Similarly to what had happened after the First World War, also after the Second World War many countries had high debt ratios, often in excess of 100% of GDP. Yet, two or three decades later, the debt ratios were much lower, often below 50%. How did they do it? A simple answer is that it is easier to reduce a high debt when the economy is growing. And the economic recovery after the Second World War, compared with the sluggish growth in the interwar period, helped countries reduce high debt levels. For example, the debt accumulated by the United States at the end of the Second World War was very close, in relation to GDP, to the debt ratio in the United Kingdom after the First World War. In both cases, moreover, the political situation was very stable. This is how both the UK and US governments were able to start a fiscal adjustment without being forced to resort to repudiation. The United States, however, had greater success than the United Kingdom: 15 years after the end of the Second World War, the debt-to-GDP ratio was halved; in the United Kingdom, in contrast, 15 years passed before the debt ratio began to fall. What distinguished the United States in the 1950s from the United Kingdom in the 1920s was the growth rate of GDP: during the period 1948–1968, the average growth rate of GDP in the United States was 4%, while real interest rates did not exceed 0.5%. Unlike the case of the United Kingdom, in the United States budget surpluses were accompanied by rapid output growth that exceeded the level of real interest rates.

A more detailed answer is given in Table 22.1, built upon data available from a new database on public debt data compiled by the IMF, namely the Historical Public Debt Database (***https://www.imf.org/external/pubs/cat/longres.aspx?sk=24332.0***).

Table 22.1 looks at four countries: Australia, Canada, New Zealand and the United Kingdom. Column 1 gives the period during which debt ratios decreased. The first year is either 1945 or 1946. The last year is the year in which the debt ratio reached its lowest point; the period of adjustment varies from 13 years in Canada to 30 years in the United Kingdom. Column 2 gives debt ratios at the start and at the end of the period. The most striking numbers here are those for the United Kingdom: an initial debt ratio of 270% of GDP in 1946 and an impressive decline, down to 47% in 1974.

To interpret the numbers in the table, go back to equation (22.5). It tells us that there are two, not mutually exclusive, ways in which a country can reduce its debt ratio. The first is through high primary surpluses. Suppose, for example, that $(r - g)$ was equal to zero. Then the decrease in the debt ratio over some period would just be the sum of the ratios of primary surpluses to GDP over the period. The second is through a low $(r - g)$, so either through low real interest rates or through high growth, or both.

Ali Abbas and colleagues used that new database to analyse these and other historical cases of public debt reduction. All these four countries ran primary surpluses on average over the period. For example, in the United Kingdom the sum of the primary surpluses to GDP over the period was equal to 63%, accounting for less than a third of the decline in the debt ratio, which was 223% of GDP. The great part of the debt reduction was due to a favourable difference between the real interest rate and the growth rate.

Table 22.1 Changes in debt ratios following the Second World War

	1	2
Country	**Start/end year**	**Start/end debt ratio**
Australia	1946/1963	92/29
Canada	1945/1957	115/59
New Zealand	1946/1974	148/41
United Kingdom	1946/1975	270/47

Note: Columns 2 and 3: per cent of GDP; columns 4 to 6: per cent.

Source: IMF Historical Public Debt Database, https://www.imf.org/external/pubs/cat/longres.aspx?sk=24332.0.

Now look at the growth rates and the real interest rates in columns 4 and 5. Note how high the growth rates and how low the real interest rates were during the period. Take Australia, for example. The average value of $(r - g)$ during the period was -6.9% $(-2.3 - 4.6\%)$. This implies that, even if the primary balance had been equal to zero, the debt ratio would have declined each year by 6.9%. In other words, the decline in debt was not mainly the result of primary surpluses, but the result of sustained high growth and sustained negative real interest rates.

This leads to a final question: Why were real interest rates so low? The answer is given in column 6. During the period, average inflation was relatively high. This inflation, combined with consistently low nominal interest rates, are what account for the negative real interest rates. Put another way, a large part of the decrease in debt ratios was achieved by paying bond holders a negative real return on their bonds for many years.

The recent evolution of the debt ratio in some European countries

The analysis conducted so far provides the framework for studying the trend in the debt ratio of some European countries. The 1960s were a decade of strong growth throughout Europe, so strong that the average growth rate exceeded the real interest rate almost everywhere: $r - g$ was negative and most countries succeeded in reducing the debt ratio (which had increased during the Second World War) without the need to generate large primary surpluses.

The 1970s, in contrast, were a period of much lower growth, but also of very low real interest rates (sometimes negative): $r - g$ on average was still negative, and this further reduced the debt ratios. In the early 1980s (after the appointment of Paul Volker as Chairman of the Fed and the resulting shift in US monetary policy) the situation changed dramatically. Real interest rates increased and growth rates slowed down. To avoid an increase in the debt-to-GDP ratio, many countries should have created large budget surpluses. But this did not happen and the result was a sharp increase in debt ratios. Just before the crisis, the public debts in the euro area accounted on average for less than 70% of GDP, more or less the same ratio as when the euro was introduced, and 10 percentage points higher than in the early 1990s. During the crisis, the primary balance turned from positive to negative in many European countries (in the United Kingdom, it had already been negative since 2002). Therefore, from 2007 to 2011, the debt ratio increased by several percentage points, 20% on average in the euro area (from 66% to almost 86%).

Table 22.2 shows the increase in the debt-to-GDP ratio during the crisis across Europe. In some countries the increase was very large: in Ireland it increased by 83 percentage points (from 25 to 108%); in Spain the debt ratio more than doubled in just five years; in Portugal it increased from 68 to 101%.

In the EU27 outside the euro area, the experiences of individual countries were very varied. The debt ratio increased by 40 percentage points in the United Kingdom, up to 84% of GDP, but much less in countries which were less affected by the financial and economic crisis, such as Denmark (up 16 percentage points from 28 to 44%) and Sweden (where the debt ratio actually declined from 40 to 36%).

The origin of debt increases is also different country by country. Recall our discussion at the beginning of Section 22.1 that the debt ratio (B/Y) can increase for several reasons: for slow growth (which reduces Y), for $(r - g) > 0$ (which increases interest payments more than the income generated in the country), for primary deficits (which add to the stock of outstanding debt) and for public interventions in the financial system (such as the bailout of banks). When decomposing the increase in public debt into these factors, it turns out that European countries also differ as regards the origin of the increase in their debt ratios.

In the four countries with the largest increases – Spain, Portugal, Ireland and Greece – the recession explains most of the increase in the debt ratio, which was already high before the crisis. In other countries – Belgium, Italy and Germany – the main source of the debt increase

Table 22.2 Breakdown of the increase in the debt-to-GDP ratio between 2007 and 2011

			due to:				
Country	*B/Y* in 2011	Increase in *B/Y* from 2007 to 2011	Primary balance of which:	Cyclical components	Discretionary increase in the primary deficit	Interest rate and growth	Public interventions in the financial system
Ireland	87	62	36	30	6	15	12
Greece	134	38	20	25	−5	15	3
Spain	73	36	26	20	6	7	3
Portugal	91	28	16	15	1	9	2
France	89	25	16	16	6	6	3
Netherlands	70	24	7	7	6	6	11
Slovenia	45	22	12	12	4	4	6
Finland	55	20	0	−4	4	3	17
Belgium	100	17	2	0	2	9	6
Italy	119	16	−1	−2	1	15	2
Germany	82	16	2	2	1	8	6
Slovakia	44	15	15	2	13	1	−1
Austria	73	13	2	4	1	6	5
UK	87	42	28			5	9

Sources: European Commission (2010), 'Public finances in EMU – 2010', *European Economy,* 4; Barry Eichengreen, Robert Feldman, Jeffrey Liebman, Jurgen von Hagen and Charles Wyplosz, *Public Debts: Nuts, Bolts and Worries* (London: Centre for Economic Policy Research, 2011).

was unfavourable interest rates compared with the growth rates of their economies. In some countries, such as the Netherlands and Finland, most of the increase was due to the bailout (or purchase) of banks (ABN Amro was the largest case).

22.3 RICARDIAN EQUIVALENCE, CYCLICAL ADJUSTED DEFICITS AND WAR FINANCE

Having looked at the mechanics of the government budget constraint, we can now take up three issues in which this constraint plays a central role.

Ricardian equivalence

How does taking into account the government budget constraint affect the way we should think about the effects of deficits on output?

One extreme view is that once the government budget constraint is taken into account, neither deficits nor debt have an effect on economic activity! This argument is known as the **Ricardian equivalence** proposition. David Ricardo, a nineteenth-century English economist, was the first to articulate its logic. His argument was further developed and given prominence in the 1970s by Robert Barro, then at Chicago, now at Harvard University. For this reason, the argument is also known as the **Ricardo–Barro proposition**.

Although Ricardo stated the logic of the argument, he also argued there were many reasons why it would not hold in practice. In contrast, Barro argued that not only was the argument logically correct, but also a good description of reality.

The best way to understand the logic of the proposition is to use the example of tax changes from Section 22.1:

- Suppose that the government decreases taxes by one (again, think €1 billion euros) this year. And as it does so, it announces that, to repay the debt, it will increase taxes by $(1 + r)$ next year. What will be the effect of the initial tax cut on consumption?
- One possible answer is: No effect at all. Why? Because consumers realise that the tax cut is not much of a gift. Lower taxes this year are exactly offset, in present value, by higher taxes next year. Put another way, their human wealth – the present value of after-tax labour income – is unaffected. Current taxes go down by one, but the present value of next year's taxes goes up by $(1 + r)/(1 + r) = 1$, and the net effect of the two changes is exactly equal to zero.

A definition of human wealth and a discussion of its role in consumption were given earlier (see Chapter 15).

Go back to the *IS–LM* model. What is the multiplier associated with a decrease in current taxes in this case?

- Another way of coming to the same answer – this time looking at saving rather than consumption – is as follows. To say that consumers do not change their consumption in response to the tax cut is the same as saying that *private saving increases one for one with the deficit*. So the Ricardian equivalence proposition says that if a government finances a given path of spending through deficits, private saving will increase one for one with the decrease in public saving, leaving total saving unchanged. The total amount left for investment will not be affected. Over time, the mechanics of the government budget constraint implies that government debt will increase. But this increase will not come at the expense of capital accumulation.

Under the Ricardian equivalence proposition, a long sequence of deficits and the associated increase in government debt are no cause for worry. As the government is dissaving, the argument goes, people are saving more in anticipation of the higher taxes to come. The decrease in public saving is offset by an equal increase in private saving. Total saving is therefore unaffected and so is investment. The economy has the same capital stock today that it would have had if there had been no increase in debt. High debt is no cause for concern.

How seriously should we take the Ricardian equivalence proposition? Most economists would answer: 'Seriously, but surely not seriously enough to think that deficits and debt are irrelevant.' A major theme of this text has been that expectations matter, that consumption decisions depend not only on current income, but also on future income. If it were widely believed that a tax cut this year is going to be followed by an offsetting increase in taxes *next year*, the effect on consumption would indeed probably be small. Many consumers would save most or all of the tax cut in anticipation of higher taxes next year. (Replace year by month or week and the argument becomes even more convincing.)

Of course, tax cuts rarely come with the announcement of corresponding tax increases a year later. Consumers have to guess when and how taxes will eventually be increased. This fact does not by itself invalidate the Ricardian equivalence argument. No matter when taxes will be increased, the government budget constraint still implies that the present value of future tax increases must always be equal to the decrease in taxes today. Take the second example we looked at in Section 22.1 – drawn in Figure 22.2(b) – in which the government waits t years to increase taxes, and so increases taxes by $(1 + r)^{t-1}$. The present value in year 0 of this expected tax increase is $(1 + r)^{t-1}/(1 + r)^{t-1} = 1$, exactly equal to the original tax cut. The change in human wealth from the tax cut is still zero.

Recall that this assumes that government spending is unchanged. If people expect government spending to be decreased in the future, what will they do? ➤

The increase in taxes in t years is $(1 + r)^{t-1}$. The discount factor for a euro t years from now is $1/(1 + r)^{t-1}$. So the value of the increase in taxes t years from now as of today is $(1 + r)^{t-1}/(1 + r)^{t-1} = 1$. ➤

But insofar as future tax increases appear more distant and their timing more uncertain, consumers are in fact more likely to ignore them. This may be the case because they expect to die before taxes go up, or, more likely, because they just do not think that far into the future. In either case, Ricardian equivalence (Figure 22.3) is likely to fail.

So, it is safe to conclude that budget deficits have an important effect on activity, although perhaps a smaller effect than you thought before going through the Ricardian equivalence argument. In the short run, larger deficits are likely to lead to higher demand and to higher

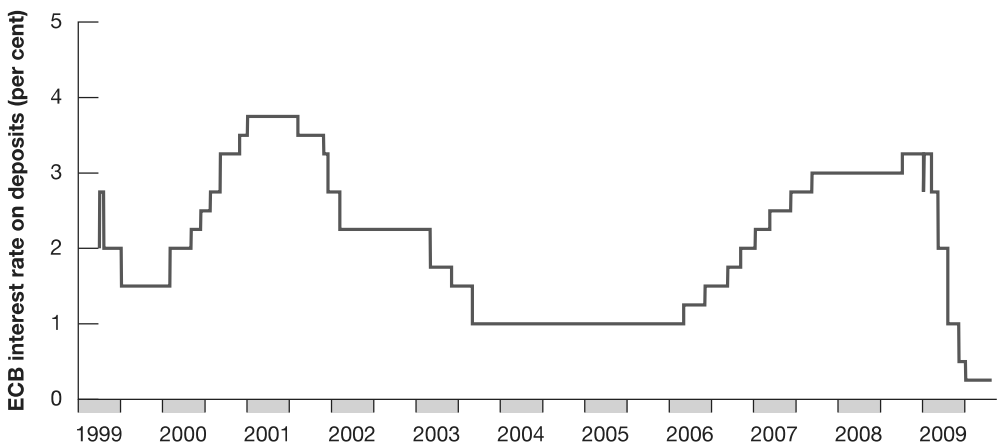


Figure 22.3
Ricardian equivalence illustrated

Source: Mark McHugh, 'Across the Street Blog: M. C. Escher - Economist', 21 February 2009.

output. In the long run, higher government debt lowers capital accumulation and, as a result, lowers output.

Deficits, output stabilisation and the cyclically adjusted deficit

The fact that budget deficits do, indeed, have long-run adverse effects on capital accumulation, and in turn on output, does not imply that fiscal policy should not be used to reduce output fluctuations. Rather, it implies that deficits during recessions should be offset by surpluses during booms, so as not to lead to a steady increase in debt.

◀ Note the analogy with monetary policy: the fact that higher money growth leads in the long run to more inflation does not imply that monetary policy should not be used for output stabilisation. We ignore output growth in this section, and so ignore the distinction between stabilising the debt and stabilising the debt-to-GDP ratio. (Verify that the argument extends to the case where output is growing.)

To help assess whether fiscal policy is on track, economists have constructed deficit measures that tell them what the deficit would be, under existing tax and spending rules, if output were at the potential level of output. Such measures come under many names, ranging from the **full-employment deficit**, to the **mid-cycle deficit**, to the **standardised employment deficit**, to the **structural deficit** (the term used by the OECD). We shall use **cyclically adjusted deficit**, the term we find the most intuitive.

Such a measure gives a simple benchmark against which to judge the direction of fiscal policy. If the actual deficit is large but the cyclically adjusted deficit is zero, then current fiscal policy is consistent with no systematic increase in debt over time. The debt will increase as long as output is below the potential level of output, but as output returns to potential, the deficit will disappear and the debt will stabilise.

It does not follow that the goal of fiscal policy should be to maintain a cyclically adjusted deficit equal to zero at all times. In a recession, the government may want to run a deficit large enough that even the cyclically adjusted deficit is positive. In this case, the fact that the cyclically adjusted deficit is positive provides a useful warning. The warning is that the return of output to potential will not be enough to stabilise the debt. The government will have to take specific measures, from tax increases to cuts in spending, to decrease the deficit at some point in the future.

The theory underlying the concept of cyclically adjusted deficit is simple. The practice of it has proven tricky. To see why, we need to look at how measures of the cyclically adjusted deficit are constructed. Construction requires two steps. First, establish how much lower the deficit would be if output were, say, 1% higher. Second, assess how far output is from potential.

- The first step is straightforward. A reliable rule of thumb is that a 1% decrease in output leads automatically to an increase in the deficit of about 0.5% of GDP. This increase occurs because most taxes are proportional to output, whereas most government spending does not depend on the level of output. That means a decrease in output, which leads to a decrease in revenues and not much change in spending, naturally leads to a larger deficit.
- If output is, say, 5% below potential, the deficit as a ratio to GDP will therefore be about 2.5% larger than it would be if output were at potential. (This effect of activity on the deficit has been called an **automatic stabiliser**. A recession naturally generates a deficit, and therefore a fiscal expansion, which partly counteracts the recession.)
- The second step is more difficult. Recall that potential output is the output level that would be produced if the economy were operating at the natural rate of unemployment (see Chapter 7). Too low an estimate of the natural rate of unemployment will lead to too high an estimate of potential output and therefore to too optimistic a measure of the cyclically adjusted deficit.

This difficulty explains in part what happened in Europe in the 1980s. Based on the assumption of an unchanged natural unemployment rate, the cyclically adjusted deficits of the 1980s did not look that bad. If European unemployment had returned to its level of the 1970s, the associated increase in output would have been sufficient to re-establish budget balance in most countries. But, it turned out, much of the increase in unemployment reflected an increase in the natural unemployment rate, and unemployment remained high during the

1980s. As a result, the decade was characterised by high deficits and large increases in debt ratios in most countries.

Wars and deficits

Look at the two peaks associated with the First and Second World Wars in Figure 21.4. ➤

Wars typically bring about large budget deficits. As we saw previously, the two largest increases in US government debt in the twentieth century took place during the First and Second World Wars (see Chapter 21). We examine the case of the Second World War further in the next Focus box below.

Is it right for governments to rely so much on deficits to finance wars? After all, war economies are usually operating at low unemployment, so the output stabilisation reasons for running deficits we just examined are irrelevant. The answer, nevertheless, is yes. In fact, there are two good reasons to run deficits during wars:

- The first is distributional. Deficit finance is a way to pass some of the burden of the war to those alive after the war because they will pay higher taxes once the war is over. It seems only fair for future generations to share in the sacrifices the war requires.
- The second is more narrowly economic. Deficit spending helps reduce tax distortions.

Let's look at each reason in turn.

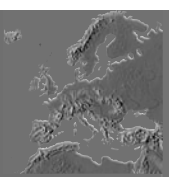
Passing on the burden of the war

Wars lead to large increases in government spending. Consider the implications of financing this increased spending either through increased taxes or through debt. To distinguish this case from our previous discussion of output stabilisation, let's also assume that output is and remains at its potential level.

- Suppose that the government relies on deficit finance. With government spending sharply up, there will be a large increase in the demand for goods. Given our assumption that output stays the same, the interest rate will have to increase enough so as to maintain equilibrium. Investment, which depends on the interest rate, will decrease sharply.

FOCUS

Deficits, consumption and investment in the United States during the Second World War



In 1939, the share of US government spending on goods and services in GDP was 15%. By 1944, it had increased to 45%! The increase was due to increased spending on national defence, which went from 1% of GDP in 1939 to 36% in 1944.

Faced with such a massive increase in spending, the US government reacted with large tax increases. For the first time in US history, the individual income tax became a major source of revenues; individual income tax revenues, which were 1% of GDP in 1939, increased to 8.5% in 1944. But the tax increases were still far less than the increase in government expenditures. The increase in federal revenues, from 7.2% of GDP in 1939 to 22.7% in 1944, was only a little more than half the increase in expenditures.

The result was a sequence of large budget deficits. By 1944, the federal deficit reached 22% of GDP. The ratio of debt to GDP, already high at 53% in 1939 because of the deficits the government had run during the Great Depression, reached 110%!

Was the increase in government spending achieved at the expense of consumption or private investment? (As we saw earlier, it could in principle have come from higher imports and a current account deficit (see Chapter 18). But

the United States had nobody to borrow from during the war. Rather, it was lending to some of its allies. Transfers from the US government to foreign countries were equal to 6% of US GDP in 1944.)

- It was met in large part by a decrease in consumption. The share of consumption in GDP fell by 23 percentage points, from 74 to 51%. Part of the decrease in consumption may have been due to anticipations of higher taxes after the war; part of it was due to the unavailability of many consumer durables. Patriotism also probably motivated people to save more and buy the war bonds issued by the government to finance the war.
- It was also met by a 6% decrease in the share of (private) investment in GDP – from 10 to 4%. Part of the burden of the war was therefore passed on in the form of lower capital accumulation to those living after the war.
- Suppose instead that the government finances the spending increase through an increase in taxes – say income taxes. Consumption will decline sharply. Exactly how much depends on consumers' expectations. The longer they expect the war to last, the longer they will expect higher taxes to last, and the more they will decrease their consumption. In any case, the increase in government spending will be partly offset by a decrease in consumption. Interest rates will increase by less than they would have increased under deficit spending, and investment will therefore decrease by less.

In short, for a given output, the increase in government spending requires either a decrease in consumption or a decrease in investment. Whether the government relies on tax increases or deficits determines whether consumption or investment does more of the adjustment when government spending goes up.

Assume that the economy is closed, so that $Y = C + I + G$. Suppose that G goes up and Y remains the same. Then $C + I$ must go down. If taxes are not increased, most of the decrease will come from a decrease in I. If taxes are increased, most of the decrease will come from a decrease in C.

How does this affect who bears the burden of the war? The more the government relies on deficits, the smaller the decrease in consumption during the war and the larger the decrease in investment. Lower investment means a lower capital stock after the war, and therefore lower output after the war. By reducing capital accumulation, deficits become a way of passing some of the burden of the war onto future generations.

Reducing tax distortions

There is another argument for running deficits, not only during wars but also, more generally, in times when government spending is exceptionally high. Think, for example, of reconstruction after an earthquake or the costs involved in the reunification of Germany in the early 1990s.

The argument is as follows. If the government were to increase taxes to finance the temporary increase in spending, tax rates would have to be very high. Very high tax rates can lead to very high economic distortions. Faced with very high income tax rates, people work less or engage in illegal, untaxed activities. Rather than moving the tax rate up and down so as always to balance the budget, it is better (from the point of view of reducing distortions) to maintain a relatively constant tax rate – to *smooth taxes*. **Tax smoothing** implies running large deficits when government spending is exceptionally high and small surpluses the rest of the time.

22.4 THE DANGERS OF HIGH DEBT

We have seen how high debt requires higher taxes in the future. A lesson from history is that high debt can also lead to vicious cycles, making the conduct of fiscal policy extremely difficult. Let's look at this more closely.

High debt, default risk and vicious cycles

Return to equation (22.5):

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r - g)\frac{B_{t-1}}{Y_{t-1}} + \frac{(G_t - T_t)}{Y_t}$$

Take a country with a high debt ratio, say 100%. Suppose the real interest rate is 3% and the growth rate is 2%. The first term on the right is (3% − 2%) times 100% = 1% of GDP. Suppose further that the government is running a primary surplus of 1% of output, so just enough to keep the debt ratio constant (the right side of the equation equals (3% − 2%) times 100% + (−1%) = 0%).

Now suppose financial investors start to worry that the government may not be able to repay the debt fully. They ask for a higher interest rate to compensate for what they perceive as a higher risk of default on the debt. But this in turn makes it more difficult for the government to stabilise the debt. Suppose, for example, that the interest rate increases from 3% to, say, 8%. Then, just to stabilise the debt, the government now needs to run a primary surplus of 6% of output (the right side of the equation is then equal to (8% − 2%) × 100 + (−6) = 0. Suppose that, in response to the increase in the interest rate, the government indeed takes measures to increase the primary surplus to 6% of output. The spending cuts or tax increases that are needed are likely to prove politically costly, potentially generating more political uncertainty, a higher risk of default and thus a further increase in the interest rate. Also the sharp fiscal contraction is likely to lead to a recession, decreasing the growth rate. Both the increase in the real interest rate and the decrease in growth further increase $(r - g)$, requiring an even larger budget surplus to stabilise the debt. At some point, the government may become unable to increase the primary surplus sufficiently and the debt ratio starts increasing, leading investors to become even more worried and to require an even higher interest rate. Increases in the interest rate and increases in the debt ratio feed on each other. In short, the higher the ratio of debt to GDP, the larger the potential for catastrophic debt dynamics. Even if the fear that the government may not fully repay the debt was initially unfounded, it can easily become self-fulfilling. The higher interest that the government must pay on its debt can lead the government to lose control of its budget and lead to an increase in debt to a level such that the government is unable to repay the debt, thus validating the initial fears.

This should remind you of bank runs and our earlier discussion (in Chapter 6). If people believe a bank is not solvent and decide to take out their funds, the bank may have to sell its assets at fire sale prices and become insolvent, validating the initial fears. Here, investors do not ask for their funds, but for a higher interest rate. The result is the same.

This is far from an abstract issue. Let's look again at what happened in the euro area during the crisis. The increase in the debt-to-GDP ratio of many European countries during the crisis raised concerns among investors about the possibility that governments could eventually find themselves unable to repay their debts. The fear that governments could renege on their debt – a possibility that is referred to as sovereign default – started to make it increasingly difficult for some countries to find investors willing to buy newly issued bonds, unless the return on those bonds were to rise enough to compensate them for the risk they were taking upon by buying them. This is how it was that returns on bonds issued by some countries – those countries whose debt-to-GDP ratios had increased the most during the crisis, namely Ireland, Greece and Portugal – started to increase to very high levels (Figure 22.4).

In normal times, returns on sovereign debt are below 6%. A return of 6% or more indicates that investors have serious doubts about the ability of a country to repay its debt, and therefore on the merit of credit of that country – also known as creditworthiness. Usually the

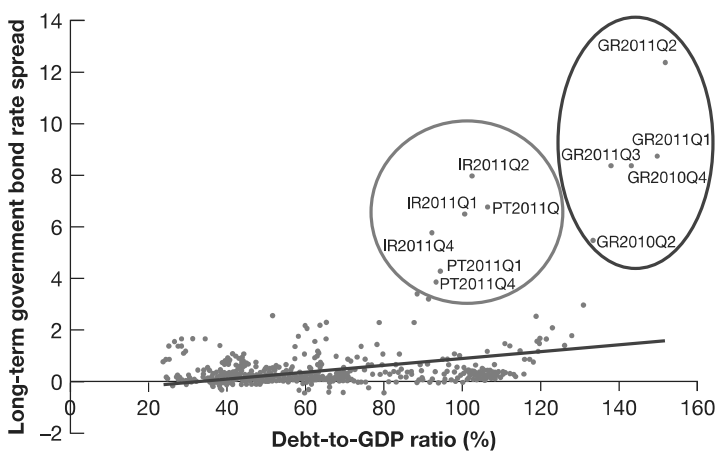


Figure 22.4

Long-term sovereign bond spread in Ireland, Portugal and Greece, 2010–2011

Source: 'Mispricing of sovereign risk and multiple equilibria in the Eurozone', Paul De Grauwe, Yuemei Ji, Voxeu.org, 23 January 2012.

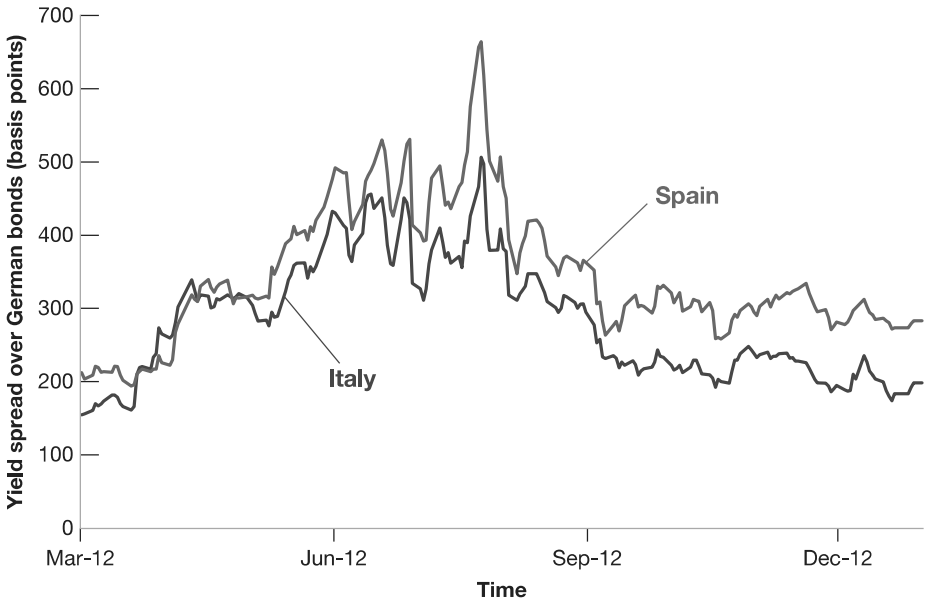


Figure 22.5

The increase in European bond spreads

The spreads on Italian and Spanish two-year government bonds over German two-year bonds increased sharply between March and July 2012. At the end of July, when the European Central Bank stated that it would do whatever was necessary to prevent a break-up of the euro, the spreads decreased.

Source: Haver Analytics.

return on bonds issued by a country are benchmarked against that of the most creditworthy country – Germany among European countries. The difference between the return on a German bond (called Bund) and the return of bonds issued by another country is called 'spread' or 'sovereign spread'.

Similarly, Figure 22.5 shows the evolution of interest rates on Italian and Spanish government bonds from March to December 2012. For each country, it plots the **spread** between the two-year interest rate on the country's government bonds and the two-year interest rate on German government bonds. The spreads are measured, on the vertical axis, in **basis points** (a basis point is a hundredth of a per cent).

Both spreads started rising in March 2012. Towards the end of July, the spread on Italian bonds reached 500 basis points (equivalently, 5%); the spread on Spanish bonds 660 basis points (6%). These spreads reflected two worries: first, that the Italian and the Spanish governments may default on their debt; and, second, that they may devalue. In principle in a monetary union, such as the euro area, nobody should expect a devaluation, unless markets start thinking that the monetary union might break up and that countries might reintroduce national currencies at a devalued exchange rate. This is exactly what happened in the spring and summer of 2012. We can understand why by going back to our discussion of self-fulfilling debt crises previously. Consider Italy, for instance. In March the interest on Italian two-year bonds was below 3%; this was the sum of the interest on German two-year bonds, slightly below 1%, plus a 2% risk spread due to investors' concerns about the Italian government's creditworthiness. The country had at the time (and still has) a debt-to-GDP ratio above 130%. With interest below 3% such a high debt burden was sustainable; Italy was generating primary budget surpluses sufficient to keep the debt stable, albeit at that high level. Italy was fragile (because the debt was so high) but in a 'good equilibrium'. At this point investors started asking themselves what would happen if, for some reason, interest rates in Italian bonds were to double, reaching 6%. They concluded that if that happened, it was unlikely that Italy would be able to raise its primary surplus high enough to keep the debt stable. It was more likely that the country would enter a debt spiral and end up defaulting. At that point it might decide to abandon the monetary union and rely on a devaluation to improve its competitiveness and support growth because defaults are usually accompanied by sharp recessions. The fear that this might happen shifted Italy from a 'good' to a 'bad' equilibrium. As investors recognised that a default and an exit from the euro were a possibility, interest rates jumped to 6% and the increase in interest rates validated the initial fears. Eventually, it was the European Central Bank (ECB) that shifted Italy back to a good equilibrium. On 26 July 2012, the president of the ECB, Mario Draghi, said clearly that a break-up of the euro

◀ Go back to Section 20.2 for a discussion of how, under fixed exchange rates, the expectation of a devaluation leads to high interest rates.

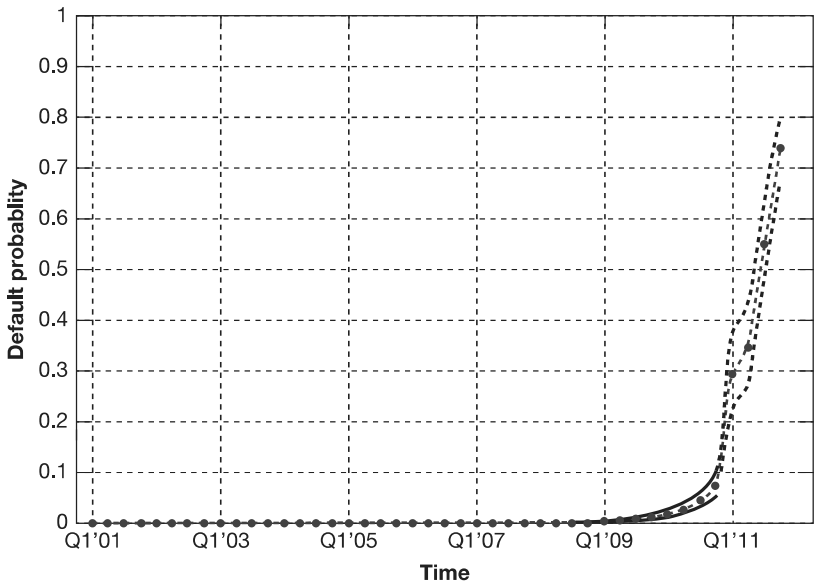


Figure 22.6

Model-implied sovereign default probabilities for Greece

Solid lines denote the median and 90% confidence interval probabilities for in-sample debt-to-GDP ratios. Dashed lines denote the median and 90% confidence interval probabilities for out-of-sample debt-to-GDP ratios.

was out of question and that the ECB would do whatever was necessary to avoid it. Investors believed the promise and Italy shifted back to a good equilibrium.

➤ By this, Mario Draghi meant that the ECB would be ready to buy Spanish or Italian bonds so as to maintain a low yield and get back to the 'good equilibrium'. In the event, the commitment was enough to decrease rates and the ECB did not have to intervene at all.

We can go a step further and ask whether sovereign spreads can inform us of what investors think about the possibility that a government might not repay its debt. Let us go through an example by considering Greek sovereign spreads. In 2012, investors who bought a 10-year Greek government bond (in euros) received a 25% return, 23 percentage points more than the return on a 10-year bond issued by the German government (and also denominated in euros). We can compute investors' expectations of a default in a simple way.

Assume that in case of default Greece repaid nothing. Then – calling p the probability of default and assuming that investors were indifferent between Greek and German bonds, provided that they had the same expected return - we can write:

$$2\% = (1 - p) \times 25\% + p \times 0$$

which implies $p = 92\%$. The term on the left-hand side is the (sure) return on German bonds and that on the right-hand side is the expected return on a Greek bond.

Figure 22.6 uses the above expression to show how investors' expectations of a Greek default have evolved since the start of the Greek crisis in early 2010. The expectation of a Greek default was around 66% in January 2010. An 'orderly' (i.e. agreed with investors) Greek default eventually happened in 2012.

What if a government does not succeed in stabilising the debt and enters a debt spiral? Then, historically, one of two things happens. Either the government explicitly defaults on its debt, or the government relies increasingly on money finance. Let's look at each outcome in turn.

Debt default

At some point, when a government finds itself unable to repay the outstanding debt, it may decide to default. Default is often partial, however, and creditors take what is known as a **haircut**. A haircut of 30%, for example, means that creditors receive only 70% of what they were owed. Default also comes under many names, many of them euphemisms – probably to make the prospects more appealing (or less unappealing) to creditors. It is called **debt restructuring** or **debt rescheduling** (when interest payments are deferred rather than cancelled), or, quite ironically, **private sector involvement** (the private sector, i.e. creditors, are asked to *get involved* – to accept a haircut). It may be unilaterally imposed by the government,

or it may be the result of a negotiation with creditors. Creditors, knowing that they will not be fully repaid in any case, may prefer to work out a deal with the government. This is what happened to Greece in 2012 when private creditors accepted a haircut of roughly 50%.

When debt is very high, default would seem to be an appealing solution. Having a lower level of debt after default reduces the size of the required fiscal consolidation and thus makes it more credible. It lowers the required taxes, potentially allowing for higher growth. But default comes with high costs. If debt is held, for example, by pension funds, as is often the case, the retirees may suffer very much from the default. If it is held by banks, then some banks may go bankrupt, with major adverse effects on the economy. If debt is held instead mostly by foreigners, then the country's international reputation may be lost, and it may be difficult for the government to borrow abroad for a long time. So, in general, and rightly so, governments are very reluctant to default on their debt.

Money finance

The other outcome is money finance. So far we have assumed that the only way a government could finance itself was by selling bonds. There is, however, another possibility. The government can finance itself by, in effect, printing money. The way it does it is not actually by printing money itself, but by issuing bonds and then forcing the central bank to buy its bonds in exchange for money. This process is called **money finance** or **debt monetisation**. Because, in this case, the rate of money creation is determined by the government deficit rather than by decisions of the central bank, this is also known as **fiscal dominance** of monetary policy.

◀ For a refresher on how the central bank creates money, go back to Section 4.3.

How large a deficit can a government finance through such money creation? Let H be the amount of central bank money in the economy. (We shall refer to *central bank money* simply as *money* in what follows.) Let ΔH be money creation; that is, the change in the nominal money stock from one month to the next. The revenue, in real terms (i.e. in terms of goods), that the government generates by creating an amount of money equal to ΔH is therefore $\Delta H/P$ – money creation during the period divided by the price level. This revenue from money creation is called **seignorage**:

◀ The word is revealing. The right to issue money was a precious source of revenue for the seigneurs of the past. They could buy the goods they wanted by issuing their own money and using it to pay for the goods.

$$\text{Seignorage} = \frac{\Delta H}{P}$$

Seignorage is equal to money creation divided by the price level. To see what rate of (central bank) nominal money growth is required to generate a given amount of seignorage, rewrite $\Delta H/P$ as:

$$\frac{\Delta H}{P} = \frac{\Delta H}{H}\frac{H}{P}$$

In words, we can think of seignorage ($\Delta H/P$) as the product of the rate of nominal money growth ($\Delta H/H$) and the real money stock (H/P). Replacing this expression in the previous equation gives:

$$\text{Seignorage} = \frac{\Delta H}{H}\frac{H}{P}$$

This gives us a relation between seignorage, the rate of nominal money growth and real money balances. To think about relevant magnitudes, it is convenient to take one more step and divide both sides of the equation by, say, monthly GDP, Y, to get:

$$\frac{\text{Seignorage}}{Y} = \frac{\Delta H}{H}\left(\frac{H/P}{Y}\right) \qquad [22.6]$$

Suppose the government is running a budget deficit equal to 10% of GDP and decides to finance it through seignorage, so (deficit/Y) = (seignorage/Y) = 10%. The average ratio of

central bank money to monthly GDP in advanced countries is roughly equal to 1, so choose $(H/P)/Y = 1$. This implies that nominal money growth must satisfy:

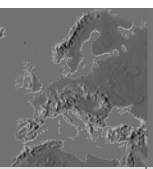
$$10\% = \frac{\Delta H}{H} \times 1 \Rightarrow \frac{\Delta H}{H} = 10\%$$

Thus, to finance a deficit of 10% of GDP through seignorage, given a ratio of central bank money to monthly GDP of 1, the monthly growth rate of nominal money must be equal to 10%.

This is surely a high rate of money growth, but one might conclude that, in exceptional circumstances, this may be an acceptable price to pay to finance the deficit. Unfortunately, this conclusion could be wrong. As money growth increases, inflation typically follows. And high inflation leads people to want to reduce their demand for money and, in turn, the demand for central bank money. In other words, as the rate of money growth increases, the real money balances that people want to hold decrease. If, for example, they were willing to hold money balances equal to one month of income when inflation was low, they may decide to reduce it to one week of income or less when inflation reaches 10%. In terms of equation (22.6), as $(\Delta H/H)$ increases, $(H/P)/Y$ decreases. And so, to achieve the same level of revenues, the government needs to increase the rate of money growth further. But higher money growth leads to further inflation, a further decrease in $(H/P)/Y$ and the need for further money growth. Soon, high inflation turns into **hyperinflation**, the term that economists use for very high inflation – typically inflation in excess of 30% per month. The next Focus box describes some of the most famous episodes. Hyperinflation only ends when fiscal policy is dramatically improved and the deficit is eliminated. By then, the damage has been done.

This is an example of a general proposition. As the tax rate (here the rate of inflation) increases, the tax base (here real money balances) decreases. ➤

FOCUS
Money financing and hyperinflation



We have seen in the text how the attempt to finance a large fiscal deficit through money creation can lead to high inflation, or even to hyperinflation. This scenario has been played out many times in the past. You have probably heard of the hyperinflation that took place in Germany after the First World War. In 1913, the value of all currency circulating in Germany was 6 billion marks. Ten years later, in October 1923, 6 billion marks was barely enough to buy a kilo of rye bread in Berlin. A month later, the price of the same bread had increased to 428 billion marks. But this German hyperinflation is not the only one. Table 22.3 summarises seven major cases of hyperinflation that followed the First and Second World Wars. These cases share a number of features. They were all short (lasting a year or so)

Table 22.3 Seven cases of hyperinflation in the 1920s and 1940s

Country	Start	End	P_T/P_0^*	Average monthly inflation rate (%)	Average monthly money growth (%)
Austria	Oct. 1921	Aug. 1922	70	47	31
Germany	Aug. 1922	Nov. 1923	1.0×10^{10}	322	314
Greece	Nov. 1943	Nov. 1944	4.7×10^{6}	365	220
Hungary 1	Mar. 1923	Feb. 1924	44	46	33
Hungary 2	Aug. 1945	July 1946	3.8×10^{27}	19,800	12,200
Poland	Jan. 1923	Jan. 1924	699	82	72
Russia	Dec. 1921	Jan. 1924	1.2×10^{5}	57	49

* Price level in the last month of hyperinflation divided by the price level in the first month.

Source: Philip Cagan, 'The monetary dynamics of hyperinflation', in Milton Friedman (ed.), *Studies in the Quantity Theory of Money* (Chicago: University of Chicago Press, 1956), Table 1.

but intense, with money growth and inflation running at 50% *per month* or more. In all, the increases in price levels were staggering. As you can see, the largest price increase actually occurred not in Germany, but in Hungary after the Second World War. What cost one Hungarian pengö in August 1945 cost 3,800 trillions of trillions of pengös less than a year later!

Hungary has the distinction of having not one, but two cases of hyperinflation in this period, following both the world wars.

Inflation rates of that magnitude have not been seen since the 1940s. But many countries have experienced high inflation as a result of money finance. Monthly inflation ran above 20% in many Latin American countries in the late 1980s. The most recent example of high inflation is Zimbabwe, where, in 2008, monthly inflation reached 500% before a stabilisation package was adopted in early 2009.

It will come as no surprise to learn that hyperinflation has enormous economic costs:

- The transaction system works less and less well. One famous example of inefficient exchange occurred in Germany at the end of its hyperinflation. People actually had to use wheelbarrows to cart around the huge amounts of money they needed for their daily transactions.
- Price signals become less and less useful. Because prices change so often, it is difficult for consumers and producers to assess the relative prices of goods and to make informed decisions. The evidence shows that the higher the rate of inflation, the higher the variation in the relative prices of different goods. Thus, the price system, which is crucial to the functioning of a market economy, also becomes less and less efficient. A joke heard in Israel during the high inflation of the 1980s was: 'Why is it cheaper to take a taxi rather than a bus? Because, on the bus, you have to pay the fare at the beginning of the ride. In the taxi, you pay only at the end.'
- Swings in the inflation rate become larger. It becomes harder to predict what inflation will be in the near future, whether it will be, say, 500% or 1,000% over the next year. Borrowing at a given nominal interest rate becomes more and more of a gamble. If we borrow at, say, 1,000% for a year, we may end up paying a real interest rate of 500% or 0% – a large difference! The result is that borrowing and lending typically come to a halt in the final months of hyperinflation, leading to a large decline in investment.

As inflation becomes very high, there is typically an increasing consensus that it should be halted. Eventually, the government reduces the deficit and no longer has recourse to money finance. Inflation stops, but not before the economy has suffered substantial costs.

Today, debt is indeed high in many advanced economies, often in excess of 100% of GDP. So what should governments do? The answer is that there is no easy solution. In some cases, for example in Greece, it is clear that debt is unsustainable, and thus debt restructuring in one form or another is needed. In other cases, debt is probably sustainable, but the dangers we just described are still there. Should governments generate large primary surpluses to reduce it rapidly? We discussed the dangers of such a policy previously. A large increase in the primary surplus at a time when the policy rate is at the zero lower bound and monetary policy cannot offset the adverse effects of fiscal consolidation is dangerous and likely to be self-defeating. It is indeed now widely accepted that the strong fiscal consolidation which took place in Europe from 2011 on, known as **fiscal austerity**, was excessive, particularly because it was mainly implemented by raising taxes. There is a large consensus today that debt should be stabilised, but that substantial fiscal consolidation should wait until interest rates are again positive, and monetary policy has enough room to decrease them to offset the adverse effects of consolidation. The path for fiscal policy in Europe is a narrow one, with too much fiscal consolidation potentially triggering another recession, and too little leading to explosive debt dynamics. In any case, the adjustment to lower debt is likely to take a long time. (You may ask whether we should worry also about the US fiscal position. This is discussed in the next Focus box below.)

◀ See the discussion of fiscal policy at the zero lower bound, in Section 9.3.

By the end of the Napoleonic Wars in 1815, England had run up a debt ratio in excess of 200% of GDP. It spent most of the nineteenth century reducing it. By 1900 the ratio stood at only 30% of GDP.

FOCUS
Should you worry about US public debt?

US public debt increased a lot during the financial crisis, from below 40% of GDP in 2006 to 74% in 2015.

The budget deficit, although much smaller than at the height of the crisis, is still large, equal to 2.7% of GDP. Should we worry about sustainability of the US public debt?

A tentative answer is given in the work done by the **Congressional Budget Office (CBO)**. The CBO is a non-partisan agency of the US Congress that helps Congress assess the costs and the effects of fiscal decisions. One of the CBO's tasks is to prepare projections of revenues, spending and deficits under current fiscal rules. Figure 22.7 presents these projections, by fiscal year, as of January 2015, from 2015 to 2050, for spending, revenues and debt, all as ratios to GDP. (The fiscal year runs from 1 October of the previous calendar year to 30 September of the current calendar year.) The figure yields two clear conclusions.

The United States does not have a debt problem in the short run. Under current laws and economic projections, the deficit-to-GDP ratio remains roughly constant until 2020, and so does the debt-to-GDP ratio.

But it has a potential debt problem in the medium and long run. From 2020 on, the deficit steadily increases and so does debt. By 2050, the deficit reaches 6.2% of GDP and the debt-to-GDP ratio reaches 117%. The deterioration is due to three main factors, all on the spending side:

- Interest rates are projected to increase from their unusually low levels, leading to an increase in net interest payments from 1.4% of GDP in 2015 to 2.4% in 2020 and to 4.9% in 2050.
- Social security payments (which provide benefits to retirees) are projected to increase from 4.9% of GDP in 2015 to 5.2% in 2020 and to 5.9% in 2050, reflecting the aging of the population: the rapid increase in the proportion of people older than 65 that will take place as the Baby Boomers begin to reach retirement age. The old-age dependency ratio – the ratio of the population 65 years old or more to the population between 20 and 64 years of age – is projected to increase from about 20% in 2000 to above 40% in 2050.
- Medicaid (which provides healthcare to the poor) and Medicare (which provides health care to retirees) are projected to increase from 5.2% of GDP in 2015 to 5.5% in 2020 and 9.1% in 2050. This large increase reflects the increasing cost of healthcare in the case of Medicaid, together with the increasing number of retirees in the case of Medicare.

Note that, by themselves, these three factors would lead to an increase in the deficit of 8.4% of GDP between 2015 and 2050, whereas the projected deficit is only 3.5%. The reason is that these increases are partly compensated by an increase in revenues as a percentage of GDP and by cuts in other programmes. But these tax increases and spending cuts are not enough to avoid deterioration of the fiscal position.

What should you conclude? Recall that CBO projections are projections *under existing rules.* So, the rules will have to be changed. Social security benefits may have to be reduced (relative to projections) and the provision of medical care will have to be limited (again, relative to projections). There is also little doubt that taxes, such as the payroll taxes used to finance social security, will have to be increased. If such changes are not achieved, there will be good reasons to worry about US debt dynamics. But there is no reason to worry quite yet.

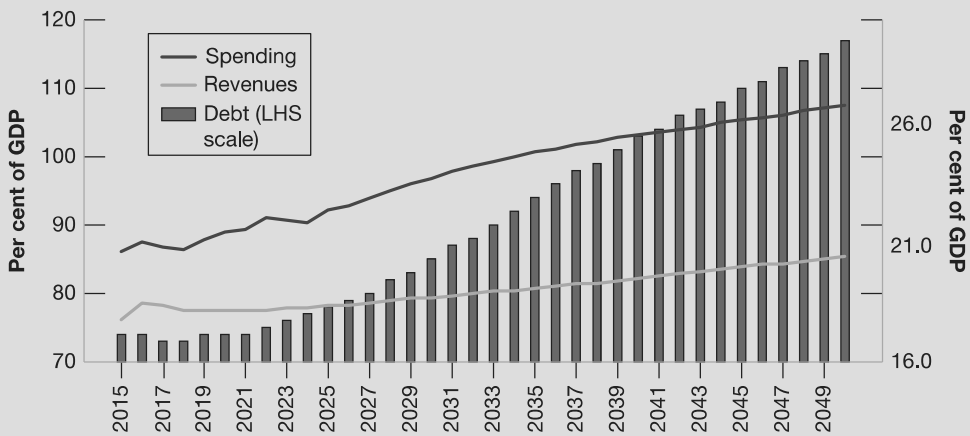


Figure 22.7

US spending, revenues and debt projections (ratios to GDP, in per cent) from 2015 to 2050

SUMMARY

- The government budget constraint gives the evolution of government debt as a function of spending and taxes. One way of expressing the constraint is that the change in debt (the deficit) is equal to the primary deficit plus interest payments on the debt. The primary deficit is the difference between government spending on goods and services, G, and taxes net of transfers, T.
- If government spending is unchanged, a decrease in taxes must eventually be offset by an increase in taxes in the future. The longer the government waits to increase taxes, or the higher the real interest rate, the higher the eventual increase in taxes.
- The legacy of past deficits is higher debt. To stabilise the debt, the government must eliminate the deficit. To eliminate the deficit, it must run a primary surplus equal to the interest payments on the existing debt.
- The evolution of the ratio of debt to GDP depends on four factors: the interest rate, the growth rate, the initial debt ratio and the primary surplus.
- Under the Ricardian equivalence proposition, a larger deficit is offset by an equal increase in private saving. Deficits have no effect on demand and on output. The accumulation of debt does not affect capital accumulation. In practice, however, Ricardian equivalence fails and larger deficits lead to higher demand and higher output in the short run. The accumulation of debt leads to lower capital accumulation and thus to lower output in the long run.
- To stabilise the economy, the government should run deficits during recessions and surpluses during booms. The cyclically adjusted deficit tells us what the deficit would be, under existing tax and spending rules, if output were at its potential level.
- Deficits are justified in times of high spending, such as wars. Relative to an increase in taxes, deficits lead to higher consumption and lower investment during wars. They therefore shift some of the burden of war from people living during the war to those living after it. Deficits also help smooth taxes and reduce tax distortions.
- High debt ratios increase the risk of vicious cycles. A higher perceived risk of default can lead to a higher interest rate and an increase in debt. The increase in debt can in turn lead to a higher perceived risk of default and a higher interest rate. Together, both can combine to lead to a debt explosion. Governments may have no choice other than to default or to rely on money finance. Money finance may in turn lead to hyperinflation. In either case, the economic costs are likely to be high.

KEY TERMS

inflation-adjusted deficit 455
government budget constraint 455
primary deficit 457
primary surplus 457
debt-to-GDP ratio 460
debt ratio 460
Ricardian equivalence 465
Ricardo–Barro proposition 465
full-employment deficit 467
mid-cycle deficit 467
standardised employment deficit 467
structural deficit 467
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automatic stabiliser 467
tax smoothing 469
spread 471
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QUESTIONS AND PROBLEMS

QUICK CHECK

All 'Quick check' questions and problems are available on MyEconLab.

1. *Using information in this chapter, label each of the following statements true, false or uncertain. Explain briefly.*

a. The deficit is the difference between real government spending and taxes net of transfers.

b. The primary deficit is the difference between real government spending and taxes net of transfers.

c. The United States has experienced wide fluctuations in the ratio of debt to GDP in the past century.

d. Tax smoothing and deficit finance help spread the burden of war across generations.

e. The government should always take immediate action to eliminate a cyclically adjusted budget deficit.

f. If Ricardian equivalence holds, then an increase in income taxes will affect neither consumption nor saving.

g. The ratio of debt to GDP cannot exceed 100%.

h. A haircut reduces the value of outstanding government debt.

i. The cyclically adjusted deficit is always smaller than the actual deficit.

j. The inflation-adjusted deficit is always smaller than the actual deficit.

k. When the ratio of debt to GDP is high, the best policy is fiscal consolidation.

l. Hyperinflation is an inflation rate greater than 30% per month.

m. Hyperinflation may distort prices, but it has no effect on real output.

2. *Consider the following statement:*

A deficit during a war can be a good thing. First, the deficit is temporary, so after the war is over the government can go right back to its old level of spending and taxes. Second, given that the evidence supports the Ricardian equivalence proposition, the deficit will stimulate the economy during wartime, helping to keep the unemployment rate low.

Identify the mistakes in this statement. Is anything in this statement correct?

3. *Consider an economy characterised by the following:*

i. The official budget deficit is 4% of GDP.

ii. The debt-to-GDP ratio is 100%.

iii. The nominal interest rate is 10%.

iv. The inflation rate is 7%.

a. What is the primary deficit/surplus ratio to GDP?

b. What is the inflation-adjusted deficit/surplus ratio to GDP?

c. Suppose that output is 2% below its natural level. What is the cyclically adjusted, inflation-adjusted deficit/surplus ratio to GDP?

d. Suppose instead that output begins at its natural level and that output growth remains constant at the normal rate of 2%. How will the debt-to-GDP ratio change over time?

4. *Assume that money demand takes the form:*

$$M/P = Y[1 - (r + \pi^e)]$$

where $Y = 1{,}000$ *and* $r = 0.1$.

a. Assume that, in the short run, π^e is constant and equal to 25%. Calculate the amount of seignorage for each annual rate of money growth, AM/M, listed:
   i. 25%
   ii. 50%
   iii. 75%

b. In the medium run, $\pi^e = \pi =$ AM/M. Compute the amount of seignorage associated with the three rates of annual money growth in part (a). Explain why the answers differ from those in part (a).

DIG DEEPER

All 'Dig deeper' questions and problems are available on MyEconLab.

5. *Consider the economy described in Problem 3 and assume that there is a fixed exchange rate,* $\bar{E}$. *Suppose that financial investors worry that the level of debt is too high and that the government may devalue to stimulate output (and therefore tax revenues) to help pay down the debt. Financial investors begin to expect a devaluation of 10%. In other words, the expected exchange rate,* E^e_{t+1}, *decreases by 10% from its previous value of* $\bar{E}$.

a. Recall the uncovered interest parity condition:

$$i_t = i_t^* \frac{E^e_{t+1} - \bar{E}}{\bar{E}}$$

If the foreign interest rate remains constant at 10% a year, what must happen to the domestic interest rate when E^e_{t+1} *decreases by 10%?*

b. Suppose that domestic inflation remains the same. What happens to the domestic real interest rate? What is likely to happen to the growth rate?

c. What happens to the official budget deficit? What happens to the inflation-adjusted deficit?

d. Suppose the growth rate decreases from 2 to 0%. What happens to the change in the debt ratio? (Assume that the primary deficit/surplus ratio to GDP is unchanged, even though the fall in growth may reduce tax revenues.)

6. Ricardian equivalence and fiscal policy

First consider an economy in which Ricardian equivalence does not hold.

a. Suppose the government starts with a balanced budget. Then there is an increase in government spending, but there is no change in taxes. Show in an *IS–LM* diagram the effect of this policy on output in the short run when the central bank keeps the real interest rate constant. How will the government finance the increase in government spending?

b. Suppose, as in part (a), which the government starts with a balanced budget and then increases government spending. This time, however, assume that taxes increase by the same amount as government spending. Show in an *IS–LM* diagram the effect of this policy on output in the short run. (It may help to recall the discussion of the multiplier (see Chapter 3). Does government spending or tax policy have a bigger multiplier?) How does the output effect compare with the effect in part (a)?

Now suppose Ricardian equivalence holds in this economy. (Parts (c) and (d) do not require the use of diagrams.)

c. Consider again an increase in government spending with no change in taxes. How does the output effect compare with the output effects in parts (a) and (b)?

d. Consider again an increase in government spending combined with an increase in taxes of the same amount. How does this output effect compare with the output effects in parts (a) and (b)?

e. Comment on each of the following statements:
   i. 'Under Ricardian equivalence, government spending has no effect on output.'
   ii. 'Under Ricardian equivalence, changes in taxes have no effect on output.'

EXPLORE FURTHER

7. *Consider an economy characterised by the following:*

i. The debt-to-GDP ratio is 40%.

ii. The primary deficit is 4% of GDP.

iii. The normal growth rate is 3%.

iv. The real interest rate is 3%.

a. Using your favourite spreadsheet, compute the debt-to-GDP ratio in 10 years, assuming that the primary deficit stays at 4% of GDP each year; the economy grows at the normal growth rate in each year; and the real interest rate is constant at 3%.

b. Suppose the real interest rate increases to 5%, but everything else remains as in part (a). Compute the debt-to-GDP ratio in 10 years.

c. Suppose the normal growth rate falls to 1% and the economy grows at the normal growth rate each year. Everything else remains as in part (a). Calculate the debt-to-GDP ratio in 10 years. Compare your answer with part (b).

d. Return to the assumptions of part (a). Suppose policy makers decide that a debt-to-GDP ratio of more than 50% is dangerous. Verify that immediately reducing the primary deficit to 1% and that maintaining this deficit for 10 years will produce a debt-to-GDP ratio of 50% in 10 years. Thereafter, what value of the primary deficit will be required to maintain the debt-to-GDP ratio of 50%?

e. Continuing with part (d), suppose policy makers wait 5 years before changing fiscal policy. For 5 years, the primary deficit remains at 4% of GDP. What is the debt-to-GDP ratio in 5 years? Suppose that, after 5 years, policy makers decide to reduce the debt-to-GDP ratio to 50%. In years 6 to 10, what constant value of the primary deficit will produce a debt-to-GDP ratio of 50% at the end of year 10?

f. Suppose that policy makers carry out the policy in either part (d) or (e). If these policies reduce the growth rate of output for a while, how will this affect the size of the reduction in the primary deficit required to achieve a debt-to-GDP ratio of 50% in 10 years?

g. Which policy – the one in part (d) or the one in part (e) – do you think is more dangerous to the stability of the economy?

8. The fiscal situation in the United States and in other countries

From the FRED economic database at the Federal Reserve Bank of St. Louis, you can retrieve two series: General Government Gross Debt of the United States (GGGDTAUSA188N) and a measure of the primary deficit of all governments in the United States (USAGGXONLBGDP). These are measures that incorporate all levels of government. This data is constructed by the International Monetary Fund (IMF). Using data from the IMF or other international organisations helps make a better comparison across countries. The data is often presented in a less political way.

a. What is the ratio of debt to GDP in the United States in the latest year of this data? Describe the path of this variable in the last decade.

b. What is the change in the ratio of debt to GDP in the last year of the data? Can the debt-to-GDP ratio fall if the primary deficit is positive?

c. Use the information on the change in the debt-to-GDP ratio and the primary deficit ratio to infer the missing term in equation (22.5) in the last year of the data. Did your calculation make sense to you?

d. Similar data is compiled for all countries. A convenient source that compares the fiscal situation for the overall government sector in the G7 countries is published by Canada's Department of Finance in a document called the 'Fiscal Reference Tables'. The section titled

'International Fiscal Comparisons' at the end of the document presents the most recent data. Which large economy has the highest and lowest ratio of gross debt to GDP? Which country has the highest and lowest deficit as a percentage of GDP? Are these overall deficits or primary deficits?

*Log on to **MyEconLab** and complete the study plan exercises for this chapter to see how much you have learnt, and where you need to revise most.*

MyEconLab

FURTHER READING

- The modern statement of the Ricardian equivalence proposition is Robert Barro's 'Are government bonds net wealth?', *Journal of Political Economy*, 1974, 82(6), 1095–117.
- Each year, the Congressional Budget Office publishes *The Economic and Budget Outlook* for the current and future fiscal years. The document provides a clear and unbiased presentation of the current US budget, of current budget issues and of budget trends available at: ***http://www.cbo.gov/***
- For more on German hyperinflation, read Steven Webb, *Hyperinflation and Stabilization in the Weimar Republic* (New York: Oxford University Press, 1989).
- A good review of what economists know and do not know about hyperinflation is given in Rudiger Dornbusch, Federico Sturzenegger and Holger Wolf, 'Extreme inflation: dynamics and stabilization', *Brookings Papers on Economic Activity*, 1990, (2), 1–84.
- For the debate on 'fiscal austerity' in Europe, see ***http://www.voxeu.org/debates/has-austerity-gone-too-far***