The Congressional Budget Office (CBO), on the other hand, has made budget projections under the assumption of no further government action to reduce the primary deficit. The CBO also assumes that interest rates, after adjusting for taxes, would remain below the growth rate of GNP. Even if the primary deficit and the interest rate on Treasury debt were to stabilize relative to GNP, the levels projected by CBO, however, federal debt would continue to grow until it was 133 percent of GNP. It would take many years for the debt-to-GNP ratio to reach such a level; 40 years from now, debt would only be 90 percent of GNP.

The differences are virtually limitless. Generally, the higher the annual primary deficit, and the higher the assumed interest rates, which is to the assumed rate of GNP growth, the higher will be the projected debt-to-GNP ratio. In evaluating such projections, one should keep two things in mind.

First, even small differences in the basic budget assumptions can make large differences in the results. A $20 billion difference in the assumed initial level of the primary deficit, followed by proportional changes in future years, would alter the projected debt-to-GNP ratio by almost 20 percent after 40 years. A $20 billion difference is smaller than differences between current forecasts of 1986 budget.

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<table>
<thead>
<tr>
<th>Chart 1</th>
<th>Primary and Total Deficit Relative to nominal GNP</th>
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<td>Percent</td>
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The current Commentary examines several secular elements of debt dynamics and their implications for the long-term consequences of debt relative to output.

2. Year-to-year changes in the federal debt do not provide a meaningful indicator of annual federal budget deficits. The inequality results because Congress borrows to finance net spending on certain budget programs, and because the Treasury finances a small portion of the deficit through changes in various assets such as its cash.
In this case, the interest rate were to exceed the GNP growth rate, the federal debt-to-GNP ratio would continue to grow, implying that the government would require a larger proportion of the nation’s output simply to service the federal debt. The debt-to-GNP ratio would be faster if the primary deficit were not zero, especially if the initial level of the outstanding debt were large.

The relevant interest rate for debt dynamics is not the stated rate on bonds, notes, and bills, but the short rate adjusted for expected changes in interest rates. These taxes enable the federal government to retain a portion of the money it pays as interest. Many economists estimate the average marginal tax rate for interest earnings to be about 25 percent. A less obvious factor influencing the growth rate of the federal debt is seigniorage. This refers to revenue the government gets as a result of the Federal Reserve System’s activities to create money. The process works like this. The Federal Reserve usually adds money to the economy by purchasing 25 percent, comparing the postwar average of only 6 percent. Thus, the federal government had little difficulty in finding individuals willing to lend it money with the expectation of an increase in the federal debt. Moreover, the Federal Reserve was committed to supporting the market for Treasury securities during the war in order to maintain a level of interest rates as low as about 3.7 percent on Treasury bills.

Immediately after World War II, the federal government trimmed the large primary deficits by reducing military expenditures, and the growth rate of the federal debt slowed. As chart 2 indicates, although the federal debt grew in absolute terms, the ratio of debt to GDP began a long-term decline through the Kennedy tax cuts and the Vietnam military buildup, until the mid-1970s.

Beginning in 1946 and 1974, the federal government actually had no primary deficit on a cumulative basis. Although the government incurred annual budget deficits, primary deficits mostly reflected the effects of the business cycle—growing during economic slowdowns and diminishing as the economy improved. The cumulative balanced primary budget contributed significantly to the decline in the debt-to-GNP ratio between 1946 and 1974.

Interest rates also influenced debt dynamics over the post-World War II period. One can think of interest rates as the Federal Reserve System’s expected inflation rate from eroding the lender’s purchasing power. The relative instability of inflation and the early 1960s resulted in very small inflation premiums. The market apparently did not fully anticipate the subsequent acceleration of inflation or did not expect it to persist. Consequently, the inflation premium in interest rates became too small to offset the rising rate of government debt service costs. As chart 3 indicates, the federal debt held by the Federal Reserve System, in fact, increased its holdings of federal debt from roughly 8 percent of the total to nearly 19 percent (see chart 4).

In the early 1980s, the Reagan administration achieved both larger tax cuts and larger increases in military spending programs, assuming that it could cut nonmilitary spending and devote the extra income to economic growth to eliminate the budget deficit. Since initiating those fiscal policies, the inflation premiums about real economic growth have proved unrealistic and Congress has not accepted all of the nonmilitary budget cuts.

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If, in this case, the interest rate were to exceed the GNP growth rate, the federal debt-to-GNP ratio would continue to grow, implying that the government would require an increasingly larger share of the nation’s output simply to service the federal debt. The debt-to-GNP ratio became especially large if the primary deficit were not zero, especially if the initial level of the outstanding debt was large.

The relevant interest rate for debt dynamics is not the stated rate on bonds, notes, and bills, but the real rate adjusted for expected inflation on interest earnings. These taxes enable the federal government to retain a portion of the money it pays as interest. Many economists estimate the average marginal tax rate for interest earnings to be about 25 percent.

A less obvious factor influencing the growth rate of the federal debt is seigniorage. This refers to revenue that the government gets as a result of the Federal Reserve System’s ability to create money. The process works like this. The Federal Reserve usually adds money to the economy by purchasing Treasury securities. When the System buys a Treasury security, it pays for it with a check and thereby injects money into the banking system. The Treasury borrows money by selling Treasury securities. The portion of the income is paid to the government, while the remaining is returned to the Treasury, which uses the funds to finance the government budget. Seigniorage thus helps reduce debt by lowering the interest rate.

Because seigniorage is a by-product of monetary policy, it links growth of the federal debt to the monetary policy activities of the Federal Reserve System. In addition to its effects on interest rates, a restrictive monetary policy that reduces growth of the money stock tends to increase seigniorage, while an expansionary monetary policy that increases growth of the money stock tends to increase seigniorage.

**History of the Deficit Since World War II**

Until 1980, the United States ran persistently large federal deficits only in wartime. During World War II, for example, deficits averaged 25 percent of GNP resulting in an increase in the federal debt. Heavy wartime government credit demands, however, did not conflict with private credit demands because of the economic conditions prevailing during the war.

The deficit, by rationing, by imposing price controls, and by directly controlling production, shifted economic resources from the manufacture of consumer goods to the manufacture of military goods. Civilians typically worked long hours, but had few consumer goods on which to spend their extra income. Private demands for products like houses, cars, and appliances declined because these items were simply unavailable to most people.

Consequently, between 1941 and 1945, savings rates skyrocketed to about 25 percent, compared to the postwar average of only 6 percent. Thus, the federal government had little difficulty in finding individuals willing to put up with the economic sacrifices that an increase in the federal debt. Moreover, the Federal Reserve was committed to supporting the market for Treasury securities during the war in order to maintain a level of interest rates as low as 0.375 percent on Treasury bills.

Immediately after World War II, the federal government trimmed the large primary deficits by reducing military expenditures, and the growth rate of the federal debt slowed. As chart 2 indicates, although the federal debt grew in absolute terms, the ratio of debt to GNP began a long-term decline that persisted through the Kennedy tax cuts and the Vietnam military buildup, until the mid-1970s.

Between 1946 and 1974, the federal government actually had no primary deficit on a cumulative basis. Although the government incurred annual total budget deficits, primary deficits mostly reflected the effects of the business cycle—growing during economic slowdowns and diminishing as the economy improved. The cumulative balanced primary budget contributed significantly to the decline in the debt-to-GNP ratio between 1946 and 1974.

Many factors accounted for this cyclical tendency. One way the budget responded to inflation was particularly important. The GNP deflator, a broad measure of price trends, rose at an annual average rate of 5.5 percent from 1946 to 1974. Until 1972, lawmakers indexed few federal spending programs against inflation. Consequently, benefits from large entitlement programs, like Social Security, did not rise automatically with the GDP. The result was a real transfer of purchasing power from the government to the recipients of Social Security benefits.

Rising prices automatically increased federal revenues, which rose even faster than inflation, as expanding incomes automatically pushed people into progressively higher tax brackets. Congress offered periodic income tax cuts, but only with a lag. Rising prices, therefore, tended to increase revenues faster than expenditures over this period and helped produce the cyclical reduction in the balanced primary budget deficit. The decline in the debt-to-GNP ratio ended in the mid-1970s and was followed by a decade-long increase. Initiating the high inflation rates reflected sharp increases in the primary deficit resulting from the severe 1973-75 recession. Economic contractions prompted tax revenues, and the federal government increased spending, leading to a more rapid growth of the debt-to-GNP ratio.

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Interest rates also influenced debt dynamics over the post-World War II period. One can think of interest rates as the real rate minus the inflation premium in interest rates. The annual interest cost, adjusted for taxes, never exceeded the debt-to-GNP ratio during the war in order to maintain a level of interest rates as low as 0.375 percent on Treasury bills.

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The Congressional Budget Office (CBO), on the other hand, has made budget projections under the assumption of no further government action to reduce the primary deficit. The CBO also assumes that interest rates, after adjusting for taxes, would remain below the growth rate of GNP. Even if the primary deficit and the interest rate on Treasury debt were to stabilize relative to GNP at the average levels projected by CBO, however, federal debt would continue to grow until it was about 133 percent of GNP.

It would take many years for the debt/GNP ratio to reach such a level; 40 years from now, debt would "only" be 90 percent of GNP. Possible exceptions are virtually limitless. Generally, the higher the annual primary deficit, and the higher the assumed interest rate, the slower the growth of GNP, the higher the debt/GNP ratio. In evaluating such projections, however, one should keep two things in mind.

First, even small differences in the basic budget assumptions can make large differences in the results. A $20 billion difference in the assumed initial level of the primary deficit, followed by proportional changes in future years, would alter the projected debt/GNP ratio by almost 20 percent after 40 years. A $20 billion difference is smaller than differences between current forecasts of 1986 budget cuts. Similarly, the small 0.6 percentage point difference between the OMB and CBO projections of real economic growth might produce a 13 percentage point difference in their projected debt-to-GNP ratios.

One should also remember that reliable projections of the debt-to-GNP ratio would have to recognize the interdependence among the variables assumed for the primary deficit, interest rates, and GNP growth rate. A lower primary deficit could, as a by-product, reduce interest rates and slow the long-term growth rate of the economy. The debt-to-GNP ratio resulting from a lower primary deficit, including these by-products, could be lower than the ratio that would result if a reduction in the primary deficit were assumed, but the by-products are not taken into account.

Nevertheless, it appears that under some fairly reasonable assumptions about the behavior of the primary deficit, interest rates, and the growth of GNP, the federal debt-to-GNP ratio could climb beyond levels reached at the end of World War II. The major uncertainty, therefore, is whether we can accommodate war-time debt ratios under peacetime conditions. In contrast to a wartime economy, a growing peacetime economy might only accommodate high levels of federal borrowing at the expense of private investment that is needed to foster continued growth and price stability. So far in the current century, nominal GNP growth (17 percent). It also assumes an average marginal tax rate of 25 percent.

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Federal Reserve Bank of Cleveland

The Dynamos of Federal Debt
by John B. Carlson and E.J. Stevens

Interest payments on the federal debt have grown faster than the economy since 1974. If this trend were to continue unchecked, by the year 2013 the government would need the nation's entire gross national product (GNP) just to pay interest on the federal debt. The enormous financial task, however, is likely to happen, because Congress and the Reagan administration are working to reduce the federal deficit. However, the national debt—and the cost of paying interest on it—still poses a threat to the economy and the federal government would require larger and larger amounts of funds relative to GNP.

In this Economic Commentary, we look at what makes the federal debt grow or decline. We examine the history of the debt since World War II and the implications of some plausible alternative assumptions for its future.

Debt Dynamics
The growth of the federal debt has four sources: 1) the size of the federal budget deficit or surplus, 2) the average level of interest rates on Treasury securities, 3) seigniorage revenue, and 4) revenues that the Federal Reserve

John B. Carlson is an economist and E.J. Stevens is an assistant vice president at the Federal Reserve Bank of Cleveland. The authors would like to thank Owen Humphage and Gary Wyckoff for their comments.

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2. Year-to-year changes in the federal debt do not provide a good indication of the underlying annual federal budget deficits. However, the definition of the budget deficit is the period in which Congress passes budgetary initiatives, and the Federal Reserve finances a small portion of the deficit through changes in various asset balances such as its cash

July 1, 1985

ECONOMIC COMMENTARY

Chart 1. Primary and Total Deficit Relative to nominal GNP
Percent

Table 1. Primary and Total Deficit Relative to Nominal GNP

<table>
<thead>
<tr>
<th>Year</th>
<th>Primary Deficit/GNP</th>
<th>Total Deficit/GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1955</td>
<td>0.00</td>
<td>0.00</td>
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<td>0.00</td>
</tr>
<tr>
<td>1980</td>
<td>0.00</td>
<td>0.00</td>
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Gain Source: Office of Management and Budget

Discussions about the growth of the national debt usually focus on the federal deficit, which is the negative difference between what the government spends and what it takes in, a) interest payments. A situation in which the average rate of interest on Treasury debt persists exceeds the rate of GNP growth is of particular concern. To understand why the primary deficit were eliminated and the maturity structure of the outstanding debt were constant. In this case, both interest payments and the outstanding federal debt would grow at a rate equal to the average interest rate on Treasury debt. That is, each year, the government would finance any additional debt by borrowing, and not by taking on additional debt to finance interest payments.