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1. For a more detailed account of the short-term implications of these projections, see John B. Carlson (1985).

2. The framework can in no way determine consistency among assumptions; this depends on the model of the economy used.

3. In practice, year-to-year changes in the federal debt do not precisely equal the corresponding annual federal budget deficits. The inequality results because Congress borrows to finance net spending on certain off-budget programs, and because the Treasury finances a small portion of the deficit through changes in various assets such as its cash balances. Here we use the term deficit to refer to both on-budget and off-budget items; we ignore the small changes in Treasury assets.

The National Debt: A Secular Perspective

by John B. Carlson
and E. J. Stevens

Recently, interest payments on the national debt have been growing faster than the economy (figure 1). Since 1977, there has been an 11.5 percent average annual increase in interest payments. If this difference between growth rates were to continue unchanged until the year 2013, the federal government would be forced to borrow or tax the equivalent of the entire gross national product simply to service its existing debt.

This alarming possibility may not seem likely, because Congress and the administration are seeking deficit reductions that would slow future growth of the national debt and debt service. Unfortunately, even a large deficit reduction might not be sufficient to prevent continued cancerous growth of interest payments if the interest rate cost of existing debt were to continuously exceed the growth rate of the economy. However, independent projections by both the Office of Management and Budget and the Congressional Budget Office have suggested that net interest payments are not likely to grow faster than the economy for very long!

Even putting aside the alarming possibility of an economic disaster 30 years from now, the fact still remains that the national debt and debt service costs have been growing very rapidly. In all but one of the past 10 years, the federal government has had to borrow not only the entire amount needed to pay the interest on the national debt, but also additional funds for non-interest expenditures. Moreover, this situation would continue for as far as the eye can see under all but the most sanguine projections discussed in this article.

This is not the first time that federal deficits have been large or that debt service needs have loomed large in federal budgets. This *Economic Review* offers two perspectives on the current federal debt situation. One is a historical view of the past 40 years, during which federal debt initially declined slightly from its wartime peak, and then began to accelerate. The other perspective is of the future, including several scenarios of what the next 40 years

could be like. The framework for looking at both the past and the future is provided by investigating the relative values of economic growth, interest rates, tax rates, and seigniorage. The analysis shows that the factors favorable to a net reduction in debt relative to GNP during the past 40 years are not likely to recur in the next 40 years. Substantial expenditure and/or tax changes are the only certain methods for preventing unprecedented peacetime levels of the national debt in the future.

I. Debt Dynamics

The behavior of debt over time is complex; it involves the interaction of deficits, interest rates, and economic activity. Nevertheless, the government budget constraint provides a straightforward accounting basis for examining dynamic consequences of alternative assumptions as well as their consistency with certain expected long-run characteristics of the economy.[2] The logic of accounting requires that the change in total outstanding govern-

A Primer on Government Debt

References to "the public debt" mask many details that, upon closer inspection, are qualitatively important but quantitatively small. The lion's share of $1.577 trillion dollars of the federal debt outstanding at the close of fiscal year 1984 has been issued by the Treasury to finance budget deficits and, with the exception of savings bonds, is in marketable form held by the general public. The debt would be 21 percent greater if one were to include $331 billion of outstanding interest-bearing securities issued by non-government institutions (privately owned, not federally guaranteed, but with a special relationship to the government, for example, federal intermediate credit banks). Seventy-three percent of public and agency debt outstanding in 1984 was held by the public, U.S. government accounts held another 17 percent ($264 billion), and the Federal Reserve held the remaining 10 percent. Of the $1.577 trillion of federal debt, only about 11 percent was held by foreigners, and 80 percent of that was in the portfolios of foreign central banks and other official institutions. The inference that can be drawn from these calculations is that about 62 percent, or $1.0 trillion, of federal debt is directly held by domestic private owners, over 90 percent of which is in the form of marketable interest-bearing instruments and 10 percent in nonmarketable U.S. savings bonds.

Granted, a sizable federal debt exists, and most of it is willingly bought in the market and held by domestic private owners. What difference does it make whether the debt becomes larger or smaller, either absolutely or relative to the income and wealth of U.S. citizens? Three different approaches to thinking about this question can be identified, emphasizing the role of federal debt in cyclical stabilization of the economy, in meeting the portfolio needs of wealth owners, and as an alternative to taxation.

Federal debt can be a cyclical necessity. Even if the Treasury had no debt outstanding on average over a

long sweep of years, debt might be issued in lean years, then retired in fat years to serve a useful public purpose. Cyclical variations in national income and output, originating from sources outside the federal budget, give rise to corresponding variation in tax receipts and inversely corresponding variations in expenditure, and thereby to federal deficits and debt outstanding. The result is a federal budget that acts as an automatic stabilizer as compared with one in which receipts were required to balance expenditures at all times. If the federal government is to act as an automatic stabilizer, then some government debt may be a cyclical necessity.[a]

Federal debt supplies a perfectly safe interest-bearing asset for private wealth owners' portfolios.[b] An increase in outstanding federal debt will make a difference to the functioning of the economy, because portfolio managers must be induced to substitute less risky federal debt for more risky private assets that directly or indirectly finance real capital. In this way, rapid growth of government debt would retard investment in new productivity-enhancing capital, thus slowing the growth rate of real income per capita.

Finally, there is the view that "we owe it to ourselves." Government can finance its operations either through taxes or through debts. The argument is that, given a level of government expenditures, the economy is essentially unaffected by the choice between these two methods of finance, because issuing debt rather than taxing to finance government expenditures implies that citizens would expect to pay future taxes necessary to service the new debt. Recognizing those increased future tax obligations, citizens would be expected to increase their saving as taxes are reduced.

a The same function could be served by the Treasury accumulating holdings of private assets in fat years and reducing them in lean years.
b. "Perfectly safe," of course, within a non-revolutionary environment.

ment debt, D, equal the budget deficit, which is the difference between federal government expenditures, E, and total government revenues, R.[3] This is expressed as:

$$D_t - D_{t-1} = E_t - R_t.$$

Public discussion about growth of the national debt typically focuses on the budget deficit. To better appreciate the dynamic elements of deficits and debt, it is useful to break the budget deficit into two components. One is the primary deficit (or surplus), defined as the difference between non-interest outlays and total revenues. The other component is interest outlays net of recoupments from federal taxes and the Federal Reserve. Combining these two components, we have:

$$D_t - D_{t-1} = X_t + i(1-m)(1-b)D_{t-1},$$

where X is the primary deficit, i is the average interest rate on Treasury debt, m is the average marginal tax rate, and b is the proportion of debt held by the Federal Reserve?

This dichotomy between the primary deficit and interest payments is useful because it highlights the importance of interest payments in determining debt momentum, that is, the tendency of the debt to grow on its own. Debt momentum is to a large extent predetermined by the level of current debt and by the market rates of interest at the various times that existing debt issues were sold. Federal revenues recouped from interest payments on the debt reduce the effective interest cost and thereby retard debt's momentum. These revenues include taxes on private holders' interest income from federal debt and the portion of interest income on Federal Reserve holdings of Treasury debt (seigniorage) that is returned to the U.S. Treasury? While tax rates and System holdings of Treasury debt can be altered to influence debt momentum, practical constraints limit the extent to which policymakers can change them. For example, non-inflationary monetary policy clearly implies some upper limit on Federal Reserve accumulation of Treasury debt. Tax rates may be easier to change, but any politically acceptable policy probably could not greatly alter the *average* marginal tax rate. Nevertheless, over long periods, these factors can change.

The primary deficit (or surplus), of course, also plays a role in debt dynamics by reinforcing or offsetting debt momentum. The size of the primary deficit is directly altered by changes in the budget, such as the policy initiatives embodied in the recent Congressional Budget Resolution for 1986. The primary deficit also includes the cyclical elements of the budget deficit that arise from the effects of the business cycle on revenues and income maintenance programs. Thus, the primary deficit tends to reinforce debt momentum during economic slowdowns and to offset momentum during economic recoveries.[6]

The magnitude of debt momentum by itself is not very instructive. What is relevant is its size relative to growth of the economy. Economic growth eases the burden of servicing

Fig. 1 Interest Payments
Percent of GNP
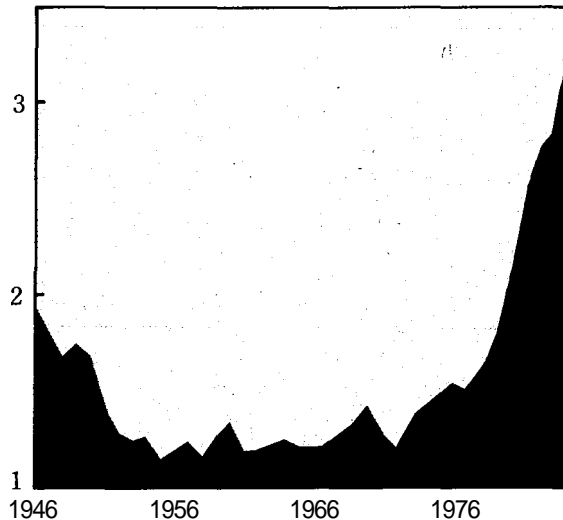
SOURCE: Congressional Budget Office.

debt. Additional national income and output can add to revenues and can reduce spending on social programs. The combination—sometimes called a fiscal dividend—can be used to make interest payments and, if sufficiently large, to pay down outstanding debt. In this sense, the burden of debt in the economy diminishes if its growth lags the growth of nominal national income. Thus, analyses concerned with economic implications of debt dynamics typically concentrate on the ratio of debt to income, measured by GNP.

Much attention has been given to the potential for runaway debt, that is, the possibility that the debt-to-GNP ratio will grow without limit. Sufficient conditions for runaway debt are that: 1) there be a primary deficit, and 2) the interest rate on Treasury debt net of taxes and adjusted for Federal Reserve holdings be greater than the trend growth rate of nominal GNP.[7] Realistically, this situation could not persist, because it would ultimately require that more than all of the income generated in the economy be used to purchase annual additions to the federal debt. The structure of runaway debt conditions therefore suggests that the budget and/or economic assumptions are untenable—that somehow something must "give."

Even if the trend growth rate of nominal GNP were greater than the net interest rate, debt could still grow for a time relative to GNP. This situation arises when the primary deficit adds to the debt faster than the excess of the

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Box 1 Federal Debt Dynamics

The steady-state properties of federal debt are derived from the government budget constraint, which requires that the change in total outstanding Treasury debt (including Federal Reserve holdings) be equal to the budget deficit. This is expressed as:

$$D_t - D_{t-1} = E, - R,,$$

where D is outstanding interest-bearing Treasury debt, E is government expenditures, and R is government revenues.[a] For simplicity, we abstract from government transfers and assume that the average marginal tax rate, m, is the same for all types of income and constant over time.

Expenditures can be divided into non-interest outlays, E' and interest payments net of taxes and adjusted for seigniorage:

$$i^a = i(1 - m)(1 - b)D_{t-1},$$

where i is the nominal interest rate on Treasury securities, and b is the proportion of Treasury debt held by the Federal Reserve. This allows separation of the budget deficit into two components—the primary deficit:

$$X_t = (E'_t - R_t),$$

and interest payments adjusted for taxes and seigniorage.[b] Thus we have:

$$D_t - D_{t-1} = X_t + i^a D_{t-1}.$$

At time t, then, the level of federal debt equals:

$$D_t = xY_t + (1 + i^a)D_{t-1},$$

where $x = X/Y$ and is assumed fixed by fiscal policy.

Assuming nominal GNP grows at trend rate g, the time path of debt-to-GNP (d) is given by:

$$d_t = x + [(1 + i^a)/(1 + g)d_{t-1}],$$

since

$$D_{t-1} = d_{t-1}[y_t/(1 + g)].$$

When the debt-to-GNP ratio is stable:

$$d_t = d_{t-1} = d^*.$$

Hence:

$$d^*[1 - (1 + i^a)/(1 + g)] = x,$$

also when i and g are small

$$(1 + i^a)/(1 + g) \simeq 1 + i^a - g,$$

and

$$d^* = x/(g - i^a).$$

The level of d_t changes when $d_0 \neq d^*$. At any subsequent time t:

$$d_t = d^* + (d_0 - d^*)(1 + i^a - g)^t.$$

It can be seen from this last equation, that if $i^a > g$, the debt-to-output ratio grows without bound. Also, it is interesting to note debt grows relative to income when:

$$d^* > d_0 \text{ and } i^a < g.$$

a. For alternative derivations of these properties, see Congress of the United States, Congressional Budget Office (February 1985), Tobin (1982), and Wallich and Cohen (1985).
b. Because interest payments are net of tax recoupments and seigniorage, government revenues here are exclusively tax receipts on nominal income.

economic growth rate over the net interest rate subtracts. Nonetheless, this situation would not continue forever, because the algebraic value of the debt-to-GNP ratio would eventually reach a steady-state level, even if a primary deficit were allowed to persist at something like its current size. That steady-state level can be shown to be approximated by the ratio of the primary deficit (relative to GNP) to the economic growth rate/net interest-rate differential (see box 1). There is no a *priori* basis, however, for thinking that the portfolio of the private sector could accommodate every possible algebraic value of the steady-state debt-to-income ratio and still be consistent with general equilibrium in the economy. Of course, if the primary deficit were reduced sufficiently, then the debt-to-GNP ratio would fall, until a low algebraic value of the

steady-state ratio were reached—again, if that were consistent with general equilibrium.

II. Debt Dynamics: 1946 to Present

During World War II, enormous primary deficits caused a five-fold increase in the level of federal debt (see box 2). Immediately after the war, the large primary deficits ceased, and the level of debt began an extended decline relative to GNP. Not until 1974 did the combined influence of primary deficits and interest rates begin to generate another sustained increase in the federal debt relative to GNP!

Figure 2 shows the absolute amount of the federal debt held in the private sector (excluding the Federal Reserve) and that same amount relative to GNP, both indexed to their 1946 levels. Although the dollar value of debt trended upward slightly until 1974, the debt-to-GNP ratio fell over the same period. This decline—from a little more than one year's output to less than one quarter's output—persisted through the Kennedy tax cut and even through the Vietnam military buildup. Reversal of the decline in the mid-1970s was initially a consequence of enlarged primary deficits resulting from the severe 1973–1975 recession, augmented by a one-time tax rebate in 1975. By the peak of the business cycle in 1979, however, at least the primary deficit had been eliminated (see figure 3).

An important characteristic of debt dynamics during the 28-year period of declining debt ratios, was the frequent occurrence of primary surpluses that actually produced a small cumulative net primary surplus from 1946 through 1974.8 While many factors could account for surpluses, an important factor was the budget's response to inflation. From 1946 to 1974, the GNP deflator rose at an average annual rate of 5.5 percent, but until 1972, few federal spending programs were indexed. Benefits from large entitlement programs, such as Social Security, did not increase automatically with inflation? On the other

Box 2 Debt Buildup in World War II
Large deficits in the United States typically have been limited to wartime. The deficits during World War II offer the most extreme example: they averaged 25 percent of GNP! The conditions for financing those deficits were unique to wartime. Economic resources were shifted from producing consumer goods to military uses. To implement this reallocation, the federal government instituted controls, including price controls and food and gasoline rationing. Individuals accepted these controls as requirements of patriotism, if not for their own long-term interest. Although credit controls were imposed to reduce demand for housing, automobiles, and appliances, these items simply were not available, because steel, wood, and labor were diverted to the war effort.

Individuals not in military service during the war typically worked a substantial amount of overtime. While their incomes were high, there was little to spend it on. Savings rates averaged 25 percent from 1942 to 1945, compared with a peacetime average of 6 percent. Thus, while the federal debt increased five-fold during the war, the government found many willing to purchase debt at very low rates of interest. To help keep rates low, the Federal Reserve was prepared to buy government securities not purchased by individuals. But the proportion of debt monetized by the Federal Reserve did not increase sharply, because private demand was sufficient. To promote private purchases of U.S. savings bonds, the government mounted an extensive advertising campaign that appealed to the people's patriotism.

hand, tax rates were not indexed until 1985. Revenues tended to grow proportionately more
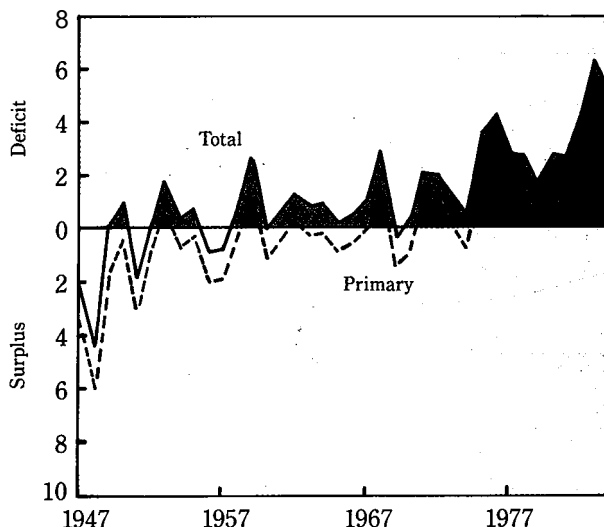
than income, as inflation placed more and more taxpayers in higher tax brackets. Thus, even a relatively low inflation rate was doubly favorable for restraining the primary deficit, because, without explicit federal action, it tended to increase revenues faster than non-interest expenditures.

Since 1974, the budget has produced a cumulative primary deficit of about $430 billion. This turnaround owes largely to the Economic Recovery Tax Act (ERTA) of 1981, a tax initiative that sharply reduced the rate of growth of tax revenues. Large tax cuts were instituted with the expectation that there would be subsequent spending reductions in nonmilitary programs as well as additional revenues generated by more rapid economic growth. Subsequent output growth was relatively strong and generated proportionately more revenues, but the impact of ERTA fell short of supply-sider claims that it would produce sufficient revenue growth to eliminate the deficit. Moreover, Congress did not accept all the spending cuts initially sought by the administration. Because an important feature of ERTA was to index tax rates for inflation, the imbalance is likely to persist if substantial deficit cuts are not achieved.

Another aspect of postwar debt dynamics was the apparent failure of interest rates to rise rapidly enough to anticipate the persistent, accelerating inflation beginning in the late 1960s. Relative price stability of the 1950s and early 1960s set a favorable tone for credit markets before the onset of more rapid inflation. Most federal debt had been auctioned at rates under 5 percent prior to 1966. When inflation began to accelerate in the late 1960s, it was apparently unanticipated. With a sizable portion of debt "locked in" at lower rates, the interest-rate cost of servicing debt adjusted only slowly to the higher rates of inflation (see figure 4).

This inertial resistance essentially could account for the continued decline of the debt-to-GNP ratio after the mid-1960s. Figure 5 shows
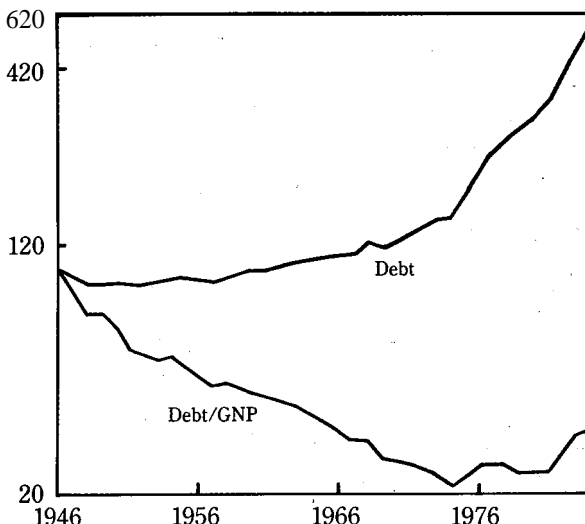
Fig. 2 Federal Debt Held by Public

Percent of 1946 level

Fig. 3 Primary and Total Deficit[a]

Percent of GNP

a. Primary deficit assumes a marginal tax rate of 12 percent.

a rough estimate of what might have happened to the debt if inflation had been fully antici-

pated after 1965. It presumes that the average real interest rate would have equaled its average *ex post* rate during the low inflation period of 1954–1963, and then adds actual inflation rates for periods equal to the average maturity of the debt. Multiplying interest payments on the debt by the ratio of the adjusted interest rate to the actual rate provides an approximation of debt payments and the debt-to-GNP ratio, if inflation had been fully anticipated. On this basis, debt would have stabilized relative to GNP near its mid-1960s level, rather than declining further into the mid-1970s.

Taxes are another reason that, until recently, interest-rate costs of government debt were low relative to growth in nominal GNP (see figure 6). Estimates of the average marginal tax rate typically fall in the range of 12 percent to 25 percent. Even assuming the average marginal tax rate was only 12 percent, the annual interest-rate cost of the debt adjusted for taxes heretofore has never exceeded the five-year average growth rate of GNP.[10] The momentum of debt growth was never augmented by interest-rate costs in excess of the longer-term nominal growth rate of the economy.

When debt was declining relative to nominal GNP, seigniorage also played an increasingly important role in slowing the momentum of debt. The monetary policy that accompanied economic growth with low inflation in the 1950s and early 1960s produced, as a byproduct, an increase in Federal Reserve holdings of Treasury securities almost proportional to the increase in nominal GNP.[11] With debt declining relative to GNP, and Federal Reserve holdings rising proportionately with GNP, private sector holdings of the debt necessarily declined relative to GNP (see figure 7). In fact, Federal Reserve holdings increased to almost 19 percent of all outstanding federal debt in the postwar period. This meant that by the early 1970s, seigniorage was paying roughly one-fifth of the interest cost of all debt held outside the federal government itself.

Fig. 4   Average Interest Rate on Debt and Inflation[a]

Percent

Change in deflator   Interest payments/debt
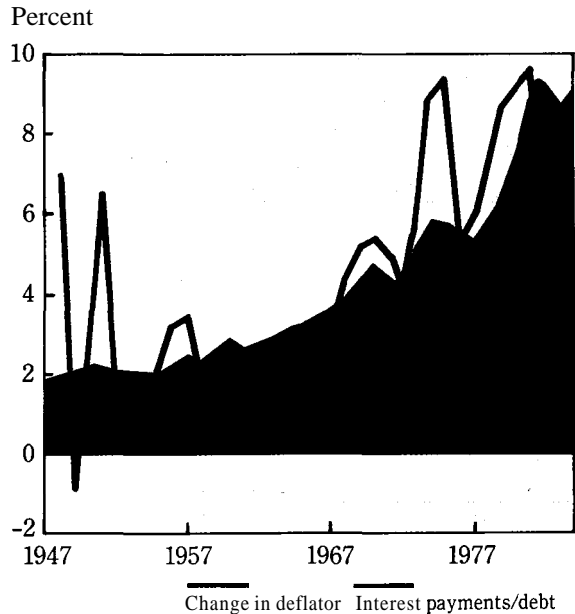
a. Debt is adjusted for Federal Reserve holdings.
SOURCE: Congressional Budget Office.

Fig. 5   Actual and Hypothetical Debt

Percent of GNP
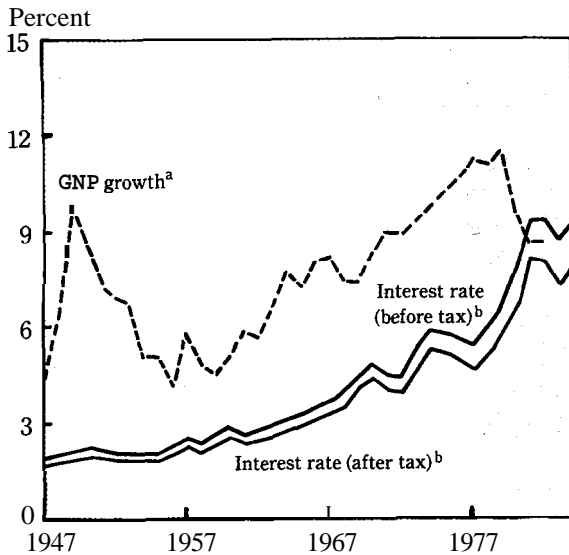

Actual debt   Hypothetical debt
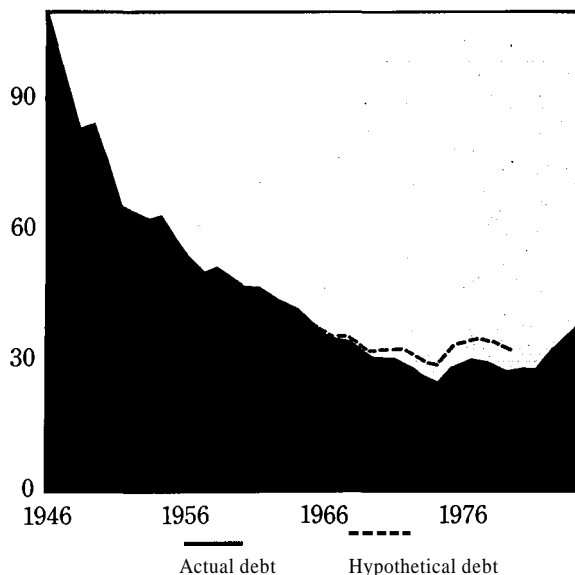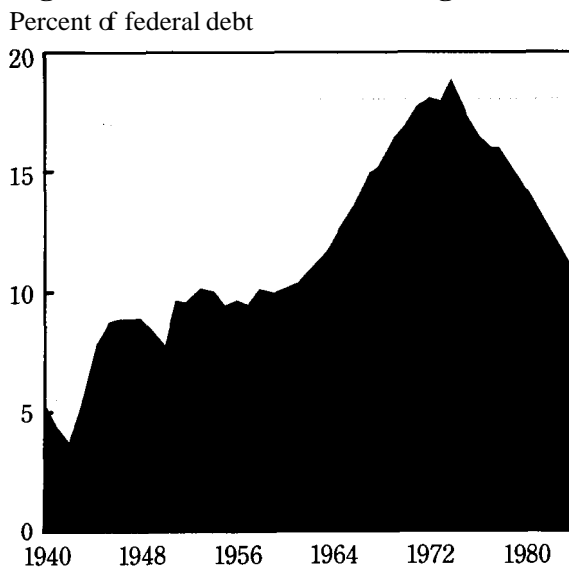
SOURCE: Congressional Budget Office.

The turnaround and rapid growth of debt since 1974 has not been matched by momentum-

Fig. 6 Interest Rates and GNP Growth

Percent

a. Five year average growth rate.
b. Interest payments/federal debt.
SOURCE: Congressional Budget Office.

Fig. 7 Federal Reserve Holdings

Percent of federal debt

SOURCE: Congressional Budget Office.

dampening seigniorage. Disinflationary monetary policy since 1979 has constrained money growth and the seigniorage it produces. As debt has grown abruptly relative to GNP, the share held by the Federal Reserve has dropped sharply. Moreover, the Monetary Control Act of 1980 reduced overall required reserves on deposits. This, in turn, reduced the demand for monetary base (and hence, Federal Reserve holdings of debt) for a given level of nominal GNP. Thus, the effects of seigniorage, so important to debt dynamics before the 1980s, have withered.

This historical perspective emphasizes some unique conditions that influenced debt dynamics in the postwar period. Of particular importance were frequent primary surpluses, low interest rates, and (relatively) high returns from seigniorage. Recreating the social and political forces leading to those same conditions is not possible. History, therefore, offers a poor basis for anticipating the future federal debt situation. But history does provide a kind of benchmark. If future debt-to-GNP levels are within the range of past experience, at least we know that these levels once proved manageable.

III. The Next 40 Years

Long-term projections of the national debt, using the framework of primary deficits and net interest payments, rest on assumptions about the trend growth rate of nominal GNP, on the size of the primary deficit relative to GNP, on the level of interest rates, and on marginal tax rates and seigniorage. To be meaningful, a set of these assumptions must be mutually consistent with attainable future states of the economy. Lacking a generally accepted quantitative, long-run, macroeconomic model by which to generate a unique plausible set of those assumptions, we consider several different sets of assumptions to produce various debt scenarios. These scenarios should not be viewed as forecasts, but simply as

11. It is true that the monetary base grew less rapidly than GNP. However, Federal Reserve holdings of Treasury debt tended to increase more rapidly than the monetary base until the 1980s, after which there seems to be no clear trend.

potential levels of the debt-to-GNP ratio that can be compared to levels experienced over the past 40 years. Levels that fall outside the range of past experience are, *ipso* facto, alarming. Moreover, the projections can be examined in the context of widely accepted beliefs, or "stylized facts:' about other long-run economic relationships that are thought to characterize the U.S. economy.

Table 1 contains an array of points along various steady-state paths of the debt-to-GNP ratio. Alternative values of the ratio for a common time horizon correspond to alternative assumptions about (1) the size of future primary deficits and (2) the differential between the rate of economic growth and the net rate of interest on Treasury debt. The steady-state

values, based on the formula in box 1, extend in time to horizons of five, 10, and 40 years. A final array, based on an infinite horizon, approximates eventual steady-state values toward which the debt-to-GNP ratio tends in the very long run.

Two characteristics of these arrays are notable. First, the longer-run values of the debt-to-GNP ratio are clearly sensitive to what appear to be small differences in the values chosen for the assumptions. Second, however, the time paths of the alternative steady states are somewhat slow to distinguish themselves from one another. After five years, the debt-to-GNP ratio appears relatively unaffected by the indicated range of differences in the growth/net interest assumption; after 40 years

Table 1 Debt-Output Ratio: Sensitivity to Changes in the Primary Deficit and Growth-Interest Differential

After 5 Years

$g - i^a$ \ x	0.5	1.0	1.5	2.0	2.5
1.5	.36	.38	.41	▓	.46
1.0	.37	.39	.42	.44	.46
0.5	.38	.40	.42	.45	.47
0.1	.38	.41	.43	.46	.48

After 10 Years

$g - i^a$ \ x	0.5	1.0	1.5	2.0	2.5
1.5	.36	.40	.45	▓	.55
1.0	.37	.42	.47	.52	.56
0.5	.39	.44	.48	.54	.59
0.1	.41	.46	.51	.56	.61

After 40 Years

$g - i^a$ \ x	0.5	1.0	1.5	2.0	2.5
1.5	.35	.50	.65	▓	.95
1.0	.41	.57	.74	.90	1.07
0.5	.47	.66	.84	1.02	1.20
0.1	.54	.74	.93	1.13	1.33

Long-Run Steady State

$g - i^a$ \ x	0.5	1.0	1.5	2.0	2.5
1.5	.3	.7	1.0	▓	1.7
1.0	.5	1.0	1.5	2.0	2.5
0.5	1.0	2.0	3.0	4.0	5.0
0.1	5.0	10.0	15.0	20.0	25.0

Legend:
x: Primary deficit relative to nominal GNP (percent).
$g - i^a$: Growth-interest differential (percent).

the effect is quite significant (measured as a percent of either the low or high value), although nowhere near as substantial as in the ultimate steady state. The same pattern is evident when the effect of differences in assumed values of the primary deficit is traced. In this case, however, even the difference between the indicated high and low values at the end of five years is quite noticeable—equivalent to 10 percent of GNF!

Three paths of the debt-to-GNP ratio appear in figure 8, corresponding to three particular sets of assumptions. The first, scenario A, is *not* drawn from sets of values in table 1, but is based on our extrapolation of Congressional Budget Office (CBO) estimates that assume the July 1985 budget resolution is **achieved**.[12] The CBO analysis only contained projections through 1990 and was based on two important additional assumptions: that the economy would achieve an average real growth rate of 3.4 percent and that market interest rates would decline, in part because of continuing low inflation. The projections indicate that the *primary* deficit would be eliminated by 1988, and, in the absence of any rebound in the pri-

mary deficit and of any deviation from the economic assumptions, our extrapolation shows continuing decreases in debt and interest payments as a percent of GNP over the next 40 years—a refreshing outcome indeed.

Scenario B, also examined by the CBO, assumes that *none* of the budget savings included in the July 1985 budget resolution is achieved. Again, the CBO projections only extended through 1990. Without budget cuts, the CBO projects that the primary deficit would decline from the 1984 level of 3 percent to about 1.5 percent in 1990, as the economy would approach its assumed full-employment growth trend. In extrapolating, we have taken 2 percent as the value in the long run, representing an average of lower and higher values that might be achieved during future business **cycles**.[13] The other CBO assumption was that while the level of market interest rates would be slightly higher than the growth rate of nominal GNP (as has been the case for the past year), rates would nonetheless fall short of the growth rate of nominal GNP by 1.5 percent, after adjusting for the marginal tax rate on interest income and seigniorage. If the primary deficit and the growth/net interest-rate relationship were to stabilize at these average levels, our extrapolations show that the federal debt would continue to increase relative to GNP until it eventually stabilized at about one and one-third times nominal GNP (shaded values in table 1). This result would advance only gradually, however; at the end of 40 years, the federal debt would be "only" 90 percent of a year's nominal GNF!

Scenarios A and B suggest a range of possible outcomes, extrapolating from medium-term projections that were based on commonly used methodology. Where in this range of outcomes the future might lie depends on the extent to which deficit reductions are achieved and maintained.

Neither of these scenarios is entirely satisfactory. The assumptions are drawn from averages of medium-term projections as proxies for long-run equilibrium values. Moreover, the projections themselves are derived from

Fig. 8 Federal Debt
Percent of GNP
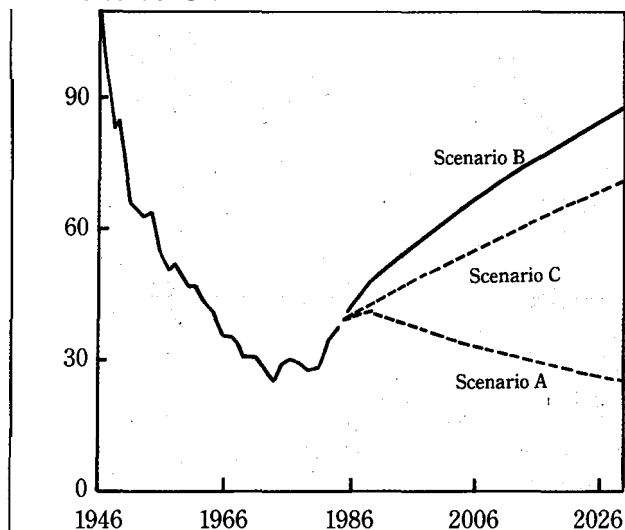
macroeconomic models and economic "rules of thumb" heavily influenced by post-World War II experience. But the unique combination of secular influences of this period—demobilization, rising inflation, and high seigniorage—is not likely to be repeated. Thus, models estimated over this period could be biased and, as argued below, biased toward a high growth-rate/interest-rate differential and a consequent underestimate of future debt growth.

Scenario C is based on assumptions that are consistent with a smaller **growth-rate/interest-rate** differential. Such a hypothetical case might be described as follows: Accelerating inflation beginning in the mid-1960s apparently was to some extent unanticipated. This suggests that the interest rates of this period, on average, were low relative to their "true" equilibrium values—that is, values consistent with non-inflationary economic growth. This experience is unlikely to be repeated. Inflation awareness has grown with the experience of rising inflation, as well as with the experience of declining inflation. Furthermore, since 1979, the Federal Reserve has maintained a policy of disinflation. A major consequence has been that interest rates have varied more immediately and substantially to impulses arising in the real sector. This, in turn, makes it less likely that future interest rates will be "stuck" below their equilibrium levels.

The case for a smaller **growth-rate/interest-rate** differential seems even more plausible when one considers the productivity experience of the current expansion. Even with record levels of investment, productivity increases have been below levels for comparable stages of the cycle in the postwar period. If, in fact, trend growth of productivity is increasing around its 1970s rate of less than 1 percent, and if labor force growth were to stabilize at less than 1.5 percent, then trend output growth could be less than 2.5 percent. Moreover, as indicated in figure 6, nominal pretax interest rates recently have exceeded the growth rate of nominal income. In fact, in the third quar-

ter of 1985 nominal income grew at 6.7 percent, while nominal interest rates on Treasury securities averaged over 8.0 percent for a wide variety of maturities. All of this suggests that the equilibrium interest rate need not be less than the nominal growth rate, let alone the CBO assumption, which after tax is 1.5 percentage points lower.

A smaller **growth-rate/interest-rate** differential would produce a smaller fiscal dividend. Thus, it is likely to be associated with a higher primary deficit relative to output. It therefore seems reasonable that consistent assumptions would involve both a lower **growth-rate/interest-rate** differential and a higher primary deficit. In the context of table 1, the potential bias of secular elements would result in assumptions toward the southeast for each time horizon.

To illustrate, consider a **growth-rate/*net*** interest-rate differential of 0.5 percent. While this scenario implies a pre-tax nominal interest rate slightly above the growth rate of nominal GNP, it would still be associated with an after-tax interest rate below the growth rate. This is not as favorable as the CBO assumption and is not as likely to be associated with the vanishing primary deficit of scenario A. Suppose that the primary deficit were reduced to 1.0 percent of GNP, roughly one-third its recent level, and half the 2.0 percent of scenario B. The associated debt path appears as scenario C in figure 8. The debt-to-GNP ratio under this alternative would rewind over the next 40 years back to a level comparable to that during the Korean War. In the longer run, the ratio would tend toward the unprecedented steady-state value of two times GNP, five times its current value.

The relevance of economic assumptions may be demonstrated in another way. How could the eventual debt-to-GNP ratio be maintained at its current 0.4 value if the **growth-rate/net** interest-rate differential were the 0.5 value assumed in scenario C? The primary deficit would have to be 0.2, or the equivalent of a $7.7 billion primary deficit today, roughly

$110 billion less than its current value.

Useful projections — those with a semblance of future reality — should not be found to depend entirely on the precise values of their underlying assumptions. The three scenarios described here seem useful in that sense. The first, assuming prompt, substantial, and permanent deficit reduction, yields a declining debt-to-GNP ratio, with the speed of the decline depending on the size of the excess of the economic growth rate over the net interest rate. The second, extrapolating current short-run conditions into the long run, and the third, using relatively general long-run economic relationships and a sizable cut in the primary deficit, yield results quite different from the first. In either case, the debt-to-GNP ratio will slowly grow toward and might eventually exceed even the extreme values of the past. The higher the primary deficit and the higher the net interest rate relative to the rate of economic growth, the sooner those values will be realized.

Fig. 9 Federal Share of Total Debt
Percent of GNP

a. Total domestic nonfinancial debt.
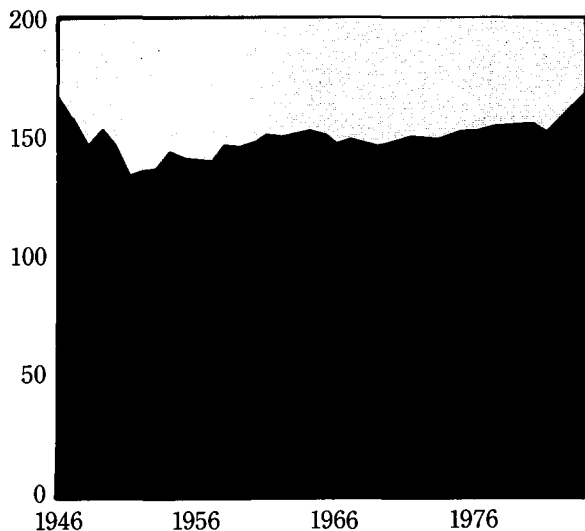SOURCE: Board of Governors of the Federal Reserve System, *Flow of Funds.*

IV. Caveats

Judging the usefulness of these projections also requires recognition that the assumptions might be interdependent. As noted above, less favorable economic assumptions might be associated with a higher primary deficit, reflecting a smaller fiscal dividend. The resulting **debt**-to-GNP ratio would be even larger than implied by the change in economic assumptions alone. Or, an assumption of greater seigniorage induced by expansionary monetary policy might produce more rapid inflation. The increase in the **growth-rate/net** interest-rate differential might be offset by a larger primary deficit as nominal federal spending grows relative to indexed tax receipts. The **growth-rate/net** interest-rate differential also might narrow as rising inflation expectations raise nominal interest rates and, perhaps, lower real economic growth. The resulting debt-to-GNP ratio could be higher than implied by increased seigniorage alone.

Bearing these possibilities in mind, what are the economic consequences of the various scenarios of the future? Are they consistent with widely held beliefs? Failure to follow through with the recent budget resolution both by actually achieving the entire deficit reduction and by extending deficit reduction beyond 1988, could mean that by early in the next century, the federal debt relative to GNP easily could exceed levels reached at the end of World War II. The challenge is to imagine how that result might be accommodated in an economic and social atmosphere less structured than the war-based economy of World War II.

An important budgetary caveat concerns the ominous debt implications of this country's commitment to Social Security, especially if demographic factors become less favorable. Recent 75-year projections published by the Social Security Administration indicate that while the old age and survivor and disability insurance (OASDI) trust funds will continue to generate surpluses into the early part of the next century, the rate of increase of these sur-

pluses relative to GNP will begin to decline in the 1990s. Because OASDI Trust Fund surpluses reduce the borrowing needs of the Treasury, the rapid buildup of these funds over the next 10 years is an important force in keeping the primary deficit from growing relative to GNP.[14] If deficit reduction measures are not sufficient to reduce the primary deficit when OASDI funds generate increasing surpluses, what will happen to primary deficits and the debt when OASDI surpluses begin to decline?

Another budgetary caveat is that tax reform legislation introduces additional uncertainties. One has to do with achieving revenue neutrality. For example, the administration has presented a plan it describes as revenue-neutral, but other analyses suggest that the plan will actually reduce revenues and thereby might widen the deficit. A second uncertainty has to do with potential indirect effects of reform on net interest payments. To the extent that average marginal tax rates were to be reduced, the momentum of debt will accelerate as the after-tax interest rate rises relative to GNP growth.

Finally, a more fundamental economic caveat is that a rising debt-to-output ratio seems inconsistent with the observed constancy of the private domestic savings rate over the postwar period in the United States. This phenomenon, sometimes called Denison's Law, is akin to another empirical regularity, the relatively stable ratio of domestic nonfinancial debt (private and government) to nominal GNP (see figure 9).[15] An oft-cited implication of this proportionality is that a decrease in the growth of federal debt augments the growth of private (nonfederal) debt relative to GNP and might enable more private domestic investment. Thus, the current concern is that federal credit demands could crowd out private credit demands and thereby stifle the private investment that is necessary to a growing economy.

Secular trends in federal and private debt from 1946 through the mid-1970s contrast strikingly with their trends over the next 40

years according to scenarios B and C. The decline in federal debt through 1973 was met with a roughly equal rise in nonfederal debt, particularly in debt of households and businesses. This decline might have helped account for robust postwar growth, particularly in the 1960s.

Projections of a rising secular trend of federal debt imply that something must give. Either the private domestic savings rate must rise, breaking Denison's Law in order to supply the extra funds required to finance higher debt-to-GNP ratios, or the nation must experience rising rates of net foreign investment, thus evading Denison's Law in order to supply the extra funds. A third possibility is that investment in private capital must decline, complying with Denison's Law to offset the government demand for extra funds.

So far in the current economic recovery, Denison's Law has been evaded. Enlarged private and public demands for credit have been met by a record inflow of net foreign capital. This is not a cost-free consequence of a rising debt-to-GNP ratio. Growing foreign indebtedness requires growing payments out of GNP to service foreign debt. Capital investment may maintain economic growth, but the fruits of that growth will be enjoyed by the foreign investors who made it possible. Moreover, substantial adjustment costs must be paid as the capital inflow drives up the foreign exchange value of the dollar and reduces the competitive position of trade-related industries. Thus the international adjustments created by the rising debt-to-GNP ratio carry significant costs, both directly, and (potentially) indirectly through inefficiencies associated with protectionist measures.

V. Conclusion

Prospects for slowing growth of the national debt improved somewhat in August 1985, when Congress passed a budget resolution for fiscal year 1986. Although subsequent analysis suggests that budget savings would be less than purported, the impact on the national debt

still would be significant if the resolution's budget targets were achieved. But budget resolutions are only resolutions and are frequently foreseaken, particularly during periods of economic stress. The more recent congressional effort to mandate a sequence of deficit reductions leading to a balanced budget early in the next decade may be viewed as building annual legislative roadblocks in the path of the growing national debt. Whether such roadblocks could be effective can only be known when future federal budgets are known.

Uncertainty about actual federal budgets for 1986 and beyond is not the only issue troubling analysts. The reliability of deficit projections based on macroeconomic models and on rules of thumb is always tenuous. Here we have provided a secular perspective that demonstrates that future economic conditions are likely to be less favorable for constraining the debt-to-GNP ratio than they were for most of the postwar period. Whether this change is embodied in the models on which deficit and debt projections are based, is not clear.

Cutting the primary deficit remains the most certain method of preventing continuing increases in the debt-to-GNP ratio. The challenge is to look beyond annual increases to the steady advance of unprecedented peacetime levels of federal debt—and then to take the budgetary initiatives required to reverse the process.

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