BUDGET DEFICITS AND GOVERNMENT ACCOUNTING

by

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28-91

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October 1991

* This paper has been prepared for the November 1991 Carnegie-Rochester Conference on Public Policy. I am grateful to the macroeconomics group at the University of Pennsylvania for helpful comments and I wish to thank Stephen Goss (Social Security Administration) and John Musgrave (Bureau of Economic Analysis) for providing important data.

ABSTRACT

The paper discusses the economic relevance and the empirical measurement of government debt and budget deficits. I find that recent arguments about the irrelevance of labeling government payments and in favor of generational accounting (e.g., Kotlikoff, 1989) are critically dependent on the availability of lump-sum taxation. If all taxes are distortionary on the margin, government debt and the labeling of government payments are relevant not just for excess burden and solvency issues, but also for intergenerational redistribution.

The empirical part of the paper derives U.S. government balance sheets for 1947-89 and a set of simple income statements. For 1989, I find that net government liabilities are more than $1000 billion above the official value for publicly-held federal debt. Most of the difference is due to unfunded government employee pension obligations, which have been ignored in previous studies (e.g., Eisner, 1986). I argue that employee pensions are unambiguously a government liability, while social security claims have a different status. Nonetheless, social security is important for government finance: Over time, the government has given the social security system a more and more secure franchise to levy payroll taxes, which constrains government finance in a similar way as a very large liability.

I. Introduction

Government accounting has traditionally been preoccupied with cash-management, focusing on the government's cash outlays, receipts, and borrowing needs. Economists have a long tradition of adjusting the resulting debt and deficit data, e.g., by computing cyclically- and inflation-adjusted deficits, in order to obtain values that are economically more relevant. Recently, a number of authors have raised much more fundamental questions about government accounting and about the economic meaning of the budget deficit (e.g., Boskin, 1982, 1988; Buiter, 1983, 1990; Eisner and Pieper 1984; Eisner 1986; Kotlikoff 1986, 1989; Auerbach and Kotlikoff, 1987; Auerbach et al., 1991). This paper will examine what information an economically relevant government accounting system should provide and it will derive new estimates of U.S. government balance sheets and income statements for the period 1947-89.

I will focus on two lines of critique of current government accounting. First, Robert Eisner and others (e.g., Eisner and Pieper 1984; Boskin, 1982) have complained about gross inadequacies and omissions in the current accounting system. The main point is that economically relevant government accounting should be financial accounting on an accrual basis, rather then cash accounting. The relevant measure of the government budget deficit should therefore be the (negative) change in the government's net worth, which is measured as the difference of government-owned assets minus government liabilities at market prices.[1] Second, Larry Kotlikoff and his coauthors (e.g., Auerbach and Kotlikoff, 1987; Auerbach et al., 1991; Kotlikoff, 1986, 1989) have argued that *no* measure of government debt (or deficit) has *any* economic meaning, because many payments from the government to individuals cannot unambiguously be labeled as debt repayments or transfers. Kotlikoff advocates that a government accounting system should instead be designed so that it measures the government's impact on the intergenerational distribution of wealth.

Starting with a discussion of Kotlikoff's more radical critique, the paper examines why economists should care about government debt and deficits and under what conditions Kotlikoff's generational accounting is appropriate. The main result is that lump-sum taxation is essential for Kotlikoff's claims about the irrelevance of labeling government payments. The nature of taxation is crucial, because debt is never a relevant constraint on the government in a setting with lump-sum taxes. The government could simply levy a lump-sum tax on debt-holders equal to the amount of outstanding debt to eliminate the debt. On the other hand, if all taxes are distortionary on the margin and if there are *some* promises on which the government cannot default, then government debt is well defined and economically relevant. Moreover, I will argue that governments in developed, democratic societies are subject to sufficient constitutional, reputational, and informational constraints that lump-sum taxation is virtually unavailable. Hence, there *are* a number of practically relevant government promises—properly called liabilities—on which the government cannot default.

In a setting where all taxation is distortionary on the margin, I find that government debt is not just relevant for excess burden and solvency issues, but also for intergenerational redistribution. If government decisions are made in a discretionary way, the living generations can redistribute resources in their favor by issuing government debt to their members or by distributing government assets to them. Subsequent governments will generally not be able to undo such actions. Thus, even if one concedes—for the sake of argument—that "the conceptual issue associated with the word 'deficit' is the intergenerational distribution of welfare" (Auerbach et al., 1991; p.1), the labeling of government payments is highly relevant.

A simple overlapping generations model with three periods and three generations is used to illustrate these arguments. First, in a version with lump-sum taxes, I verify Kotlikoff's point about the irrelevance of labeling government payments and I examine under what conditions generational accounting is appropriate. The irrelevance of labeling applies even with Ricardian bequest motives and with liquidity constraints. But generational accounting is appropriate only in a setting without liquidity constraints and without Ricardian bequests, while the traditional, cash flow-based budget deficit is a relevant determinant of aggregate demand in a "Keynesian" setting with liquidity-constraints—all this assuming lump-sum taxes. Second, I show that government debt is economically relevant, if all taxes are distortionary on the margin. Most importantly in the context of intergeneration redistribution, early generations can use government debt as a strategic variable to constrain the actions of later governments and thereby to redistribute wealth in their favor. In addition, individual consumers will consider government debt in forming expectations about future fiscal policy.

For the empirical analysis, the model with distortionary taxation suggests that the government should collect accrual-based data about its net debt and net worth. Changes in net worth should be decomposed into a primary (operating, non-interest) balance and the returns on initial assets and liabilities. Government net debt—the difference of all government liabilities minus *financial* assets—is economically relevant for distributional questions. Government net worth—the difference of total government assets and liabilities—is relevant for solvency and excess burden issues. The primary deficit measures the direct government payouts to the current generation of taxpayers. In addition, the theoretical analysis suggest that all contractual obligations of the U.S. government should generally be considered government liabilities. This includes the federal debt and government employee pensions, but not social security.

To construct time series for government net debt and net worth, I follow the basic approach of Eisner-Pieper (1984) and Eisner (1986), but I revalue many of the balance sheet items and I add measures of unfunded government employee pension obligations and unbooked deposit insurance liabilities. The resulting numbers on government net debt differ significantly from Eisner (1986). The quantitatively most significant differences are due to unfunded federal employee pension liabilities, which add almost $1000 billion to net debt in 1989. (Deposit insurance liabilities of about $150 billion may appear small in comparison.)

Historically, the difference between government net debt and the official series of publicly-held federal debt has grown in absolute terms and as GNP-percentage. Net debt was close to federal debt until about 1955, but now exceeds the official series by more than $1000 billion. The value of tangible assets (and hence, net worth) depends significantly on whether one includes military equipment and inventories, which amount to almost 70% of GNP in 1945. If they are included, the net worth series is essentially flat until 1980, offsetting most of the early postwar decline in net debt. If not, net debt dominates the series. In any case, net worth declines sharply after 1981.

For computing primary deficits, I start from National Income and Product Account (NIPA) data rather than the U.S. budget, because the NIPA accounts remove a number of financial transactions that distort the budget data. To be consistent with the accrual-based balance sheet, additional adjustments are needed to account for capital investment, pension fund accruals, and miscellaneous other items. For the post-war U.S., the adjustments happen to be largely offsetting, so that the final accrual-based primary surplus is close to the basic NIPA-based primary surplus for most years. However, the high military spending in the 1980s produces adjusted surpluses significantly above the NIPA values.

All these calculations exclude the social security system, which requires a separate analysis. The main issues are whether or not social security creates a government liability, and if so, how to value it. I will argue that one should distinguish between a social security system in its start-up phase, where the first generation of participants received substantial "unearned" benefits, and a more mature system. Since promises to make gifts are generally unenforceable, the benefits promised in the start-up phase cannot be considered government liabilities (cf. Feldstein, 1974). On the other hand, it is difficult to imagine that a government could cancel the social security benefits of retirees who have made social security contributions throughout their life. More formally, a comparison of Tabellini (1990) and (1991) suggests that debt and social security may be secured by very similar political mechanisms. In this sense, a mature social security system creates entitlements that can be as safe as government debt. In practice, such claims are acknowledged by the government when it "grandfathers" older cohorts in social security reforms. Hence, I find that social security is not a liability of the same nature as, say, Treasury bonds—because it is backed mainly by political mechanisms while the repayment of other liabilities is enforced by market-based mechanisms—but that the government is effectively obliged to maintain an established social security system.

For the United States, I will argue that the start-up phase of the social security system ended at least with the 1983 reform (but perhaps earlier). A government obligation to maintain social security should therefore be recognized since at least 1984. This government commitment to maintain social security is best interpreted as an obligation to grant social security a franchise to levy payroll taxes (which restricts the government's ability to levy general taxes on the same tax base). For estimating its present value, the key issue is the choice of discount rates. Since all social security contributions and most future benefits of current participants are contingent on wage growth, the appropriate discount rate is above the safe interest rate. The present value of social security liabilities is therefore significantly below the actuarial estimates produced by the Social Security Administration. Rough estimates indicate that the adjusted present values are still huge, amounting to between 50% and 90% of GNP for 1990.

The paper is organized as follows. Section II examines the conceptual issues raised by Kotlikoff, and it shows that government debt matters in an economy with distortionary taxation. Section III discusses the empirical measurement of U.S. government balance sheets and income statements. Section IV comments on the role of the social security system. Section V concludes.

II. Government Debt, Aggregate Demand, and Intergenerational Distribution

This section will examine the economic relevance of measuring government debt and budget deficits. Section II.1 will discuss Kotlikoff's claims about the irrelevance of labeling government payments and about the importance of generational accounting in a setting with lump-sum taxes. In Section II.2, I will argue that the labeling of government payments and the measuring of government debt are conceptually important in a setting with limited government powers and distortionary taxation. Section II.3 will show that—in a setting with distortionary taxation—government debt is practically important for the very issue of intergenerational redistribution that is the focus of Kotlikoff's critique.

II.1. Government Policy and Aggregate Demand

Consider an overlapping generations model with three generations and three periods. The three generations are labeled the old (generation i=0), the young (i=1), and the unborn (i=2). The old live only in period 1, the young are born in period 1 and live in periods 1 and 2, and the unborn will be alive in periods 2 and 3. Generation i living in period t has exogenous income Y_t^i, pays taxes T_t^i, and consumes C_t^i. Individuals can invest in government debt D_t and store commodities, K_t. The notation is summarized in Table 1.

The three generation setting is sufficient to capture the key issues in the current debate about the relevance of government debt and deficits, in particular the issues raised by Kotlikoff (1986, 1989) and Auerbach, Gokhale, and Kotlikoff (1991) (AGK for short). Since AGK treat all currently unborn generations equally in their generational accounting, I model them as a single generation and let the world end in period 3. (In the appendix, I show that the results extend to an infinite horizon setting.)

The main macroeconomic issue in this context is the question of whether government financial policy matters for aggregate demand, and if yes, in what way. To simplify, assume that storage has a zero real return and that preferences (ignoring bequests for now) are

(Generation i=0—old) $U^0 = u(C_1^0)$,

(Generation i=1—young) $U^1 = u(C_1^1) + u(C_2^1)$,

(Generation i=2—unborn) $U^2 = u(C_2^2) + u(C_3^2)$,

where $u(\cdot)$ is increasing and concave.[2] Then the real interest rate on government bonds will also be zero and generations 1 and 2 will—or would like to—consume 1/2 of their lifetime after-tax income in each period, i.e., $C_1^1 = C_2^1 = C^1$ and $C_2^2 = C_3^2 = C^2$. Questions about the effects of government policy on consumption are then questions about bequest motives, borrowing opportunities, and taxation. Several cases may arise.

First, if one assumes lump-sum taxes, no bequest motive, and no liquidity constraints, then results consistent with AGK are obtained. The allocation of consumption is

$$C_1^0 = Y_1^0 + K_0 + [D_0 - T_1^0] \tag{1a}$$

$$C^1 = \frac{1}{2} \cdot [(Y_1^1 + Y_2^1) - (T_1^1 + T_2^1)] \tag{1b}$$

$$C^2 = \frac{1}{2} \cdot [(Y_2^2 + Y_3^2) - (T_2^2 + T_3^2)]. \tag{1c}$$

The government has to satisfy the intertemporal budget constraint

$$T_1^0 + [T_1^1 + T_2^1] + [T_2^2 + T_3^2] = \sum_t G_t + D_0. \tag{2}$$

The left hand side of equation (2) shows the present values of taxes for each of the three generations. Inspection of equations (1b, 1c) reveals that government policy affects the behavior of generations 1 and 2 only through these present values, which are AGK's generational accounts. In addition, the consumption of generation i=0 depends on government policy only through the difference $[D_0 - T_1^0]$, so that it is irrelevant for consumption whether a government payment to generation i=0 is labeled a debt repayment or a transfer. Hence, the model supports AGK's two key claims in favor of generational accounting: First, the labeling of government payments is economically irrelevant. Hence, efforts to identify which claims against the government should be called a government debt are pointless. Second, intergenerational redistribution is the only relevant consideration for government financial policy.

As second case, assume a Ricardian bequest motive and continue to assume lump-sum taxes. Then consumption is

$$C_t^i = \frac{1}{5} \cdot [\sum_{t,k} Y_t^k - \sum_t G_t + K_0], \tag{3}$$

for all (i,t). Hence, all government financial policy is irrelevant, as in Barro (1974). Thus, a different assumption about bequest motives is the key feature that distinguishes AGK from Ricardian equivalence.

As third case, consider a "Keynesian" scenario with liquidity constraints. Liquidity constraints can be motivated by intra-generational heterogeneity and transactions cost. Specifically, assume that 1/2 of the consumers of generations 1 and 2 like to consume in the first period of life (early), the others in the second period (late). Utility in the less valued period is $\xi \cdot u(C)$, where $0<\xi<1$. There is no bequest motive. Without liquidity constraints, *aggregate* consumption would still be given by equations (1a-c). But now assume that private loan contracts are not enforceable (e.g., prohibitively costly) so that individuals cannot borrow against next period income or taxes. Then the early consumers will be constrained to $C_i^i \leq Y_i^i - T_i^i$, i=1, 2, while the late consumers remain unaffected. A shift in taxation from T_1^1 to T_2^1 or from T_2^2 to T_3^2 (i.e., levied on the same generation, but later) would increase consumption of the liquidity-constrained households one-for-one, and it would yield an aggregate marginal propensity to consume of 50% (since half the households are constrained).

Thus, the intertemporal distribution of taxes on each generation matters in this setting. Government accounting requires more than generational accounts. Moreover, a policy of high government borrowing that concentrates all taxation in the second period of life is strictly Pareto-preferred to any other allocation of taxes. Hence, this setting supports Buiter's (1983, 1990) claims about the advantages of government borrowing as compared to private borrowing.[3]

Note, however, that this Keynesian setting does *not* invalidate AGK's claim about the irrelevance of labeling government debt: Consumption still depends only on the total cash flows between individuals and the government and not how they are labeled. (For example, the consumption of the old, debt-holding generation depends on government policy only through the difference $[D_0 - T_1^0]$.)

Overall, the analysis with lump-sum taxes shows that the irrelevance of labeling government payments appears to be a fairly general result that does not rely on a specific macroeconomic model. Assumptions about the macroeconomic model determine which government variables are important for aggregate demand. The next section will show, however, that the assumption of lump-sum taxation is crucial for the irrelevance result.

II.2. Distortionary Taxation

In this section, I will argue that one should be very cautious in invoking the assumption of lump-sum taxation, because models with lump-sum taxes are unable to address important policy issues that make the labeling of government payments economically relevant.

The key point is that with lump-sum taxes, debt is never a relevant constraint on the government, because the government could simply levy a lump-sum tax on debt-holders equal to the amount of outstanding debt to eliminate the liability. More generally, a government that is unconstrained in its use of lump-sum taxes effectively controls the resources of the entire economy and it can shift arbitrary amounts of wealth from one person to another. Thus, there are no meaningful sectorial, generational, or individual budget constraints, except those imposed by government fiat.

I do not find this view of government particularly attractive. In most modern democracies, there are legal and constitutional guarantees that protect private property rights and prevent arbitrary government taxation. Such guarantees put severe constraints on the availability of non-distortionary taxation. In practice, most taxes are therefore tied to some specific economic activity, which results in individually rational—although perhaps socially inefficient—substitution away from the taxed activities. Taxes are generally distortionary.

To be precise, two lines of argument are needed to rule out non-distortionary taxation. First, consider lump-sum taxes. A lump-sum tax can be defined as a government order to (all or some) individuals to pay a certain tax at some point in the future, which is not conditional on current wealth or on income up to that point. Such taxes are limited by individuals' civil rights, because they are only feasible (and the order credible), if the government can impose draconian penalties when individuals are unable to pay. Otherwise, the government cannot prevent individuals from substituting towards leisure or from consuming or concealing their wealth. In addition, the revenue from per-capita taxes is limited by the innate ability to pay of the least productive tax-payer, unless the government has a priori information on how the innate ability to pay varies across individuals. Perhaps because of such problems and constraints, lump-sum taxes are almost non-existent in practice.

Second, consider the taxation of current or past stocks of real or financial assets, which includes a default on government debt as a special case. Such taxes can be non-distortionary ex post (if one abstracts from efforts to conceal assets), but they almost certainly not non-distortionary ex ante. If no assets are safe from ex post taxation, the distortionary effect will be on savings incentives. If some assets are better protected than others, asset allocation will be distorted. As the time-consistency literature has discussed in detail, the government will have strong incentives to provide guarantees against discretionary ex post taxation.[4]

Provided blanket capital levies can be ruled out, taxes on specific private assets are tightly constrained, because individuals will only hold the specific, potentially taxed asset, if it offers an expected return equal to the return on alternative assets. This applies to government debt in particular, if one interprets a default as a specific tax. If individuals have reason to suspect that government debt is less secure than other assets, government debt will have to be issued at a sufficiently low price that the expected return equals the return on comparable private sector liabilities. Thus, the possibility of government defaults might create some uncertainty about its rate of return, but defaults cannot be viewed as a source of government revenue. For the United States, an outright default on Treasury debt seems unthinkable, although the returns are subject to inflation risk. (The time-consistency implications of nominal debt have been examined elsewhere; see Rogoff 1987, Bohn, 1988.)

This detailed analysis of taxation is needed, because it is crucial for government accounting: The labeling of government payments is no longer irrelevant, if all taxation is distortionary on the margin. When the government needs funds, it matters whether debt is issued or taxes are levied, because taxation distorts individual economic decisions.[5] Debt causes no distortions in the current period, but its repayment will likely require distortionary taxes in the future. The government has also an incentive to keep track of its real and financial assets, because earnings, asset sales, and repayments of government-held private debts provide opportunities to obtain funds in a non-distortionary way.

In the other direction, the repayment of government debt must be distinguished carefully from unilateral transfer payments, because the government cannot cancel debt repayments with impunity, while it may be able to cancel transfer programs. The argument is that to issue debt, i.e., to motivate individuals to turn over funds to the government voluntarily, the government must convince individuals that repayment is assured.[6] To be credible, a default on such a promise must have a significant cost for the government.[7] Moreover, the government will have to promise repayment irrespective of what other payments occur between the government and the debt-holder of the claim. Hence, debt will normally imply a gross cash flow from the government to the debt-holders that cannot be canceled or offset against other government payments.

Overall, I conclude that the labeling of government payments in either direction is economically relevant in a setting with a government that is subject to reasonable constitutional and legal constraints. It is important to emphasize that the relevance of distortionary taxation is not limited to the fairly obvious excess burden and solvency issues.[8] To the contrary, the absence of non-distortionary taxation is crucial for analyzing a number of significant policy questions that can only be addressed if the government is an economic agent with limited powers, who faces its own non-trivial budget constraint and who cannot manipulate net wealth positions through lump-sum taxation. The next section will provide one example of such an analysis in the context of intergenerational redistribution. Other examples are discussed, e.g., in Alesina-Tabellini (1991).

Before that, one has to respond, however, to Kotlikoff's (1986, 1989) additional claim that government debt is empirically not well defined, because some payments may be interpreted as either debt repayments or transfers. Three comments are appropriate.

First, the time-consistency literature shows that uncertainty about the credibility of government promises has often undesirable welfare effects. Hence, one should make an effort to clarify the status of ambiguous government promises. (For example, social security contributions should have a less distortionary effect than regular taxes if they are credibly linked to later social security benefits. Any uncertainty about this link will unnecessarily distort labor-leisure choices.) Second, even if there are some government promises with ambiguous status, it is important to know how many unambiguous liabilities the government has incurred and how much assets it holds, because that will provide a lower bound on the amount of future distortionary taxation.

Third, the theoretical analysis suggests a criterion to identify which claims against the government should be considered government liabilities. As discussed above, a private claim against the government *is* a government liability, if the government cannot cancel it without incurring a (direct or reputational) cost that is sufficient to make a default prohibitively expensive under normal circumstances. One may add that if the claim against the government is created in the context of a contractual relationship in which individuals participated voluntarily, the presumption should be that the claim is a government liability. Otherwise, rational individuals would not have contracted with the government.

A key question in the empirical analysis will be which claims arising out of contractual and other relationships are government liabilities. One may already note that the government maintains a variety of contractual relationships with voluntarily participating private parties—not only with the holders of Treasury debt, but also with its employees and suppliers. In contrast, social security is not a voluntary program, which explains why I will examine it separately. Conceptually, the key point is that one should model the government as an entity that has the ability to make *some* binding promises, which constitute well-defined government liabilities.

II.3. Discretionary Policy, Intergenerational Redistribution, and Expectations

This section will show that government debt is important for the very issue of intergenerational redistribution that is the subject of AGK, provided one assumes that the government has to honor its debt and cannot resort to lump-sum taxation.

For simplicity, consider again the three period model of Section II.1. In period 3, we know that generation i=2 owns all national wealth, including the net assets of the government sector. In period 2, the economic issue is the allocation of resources between generations 1 and 2 and the government sector, where it is common knowledge that all net assets left in the government sector will eventually accrue to generation i=2. In period one, the issue is again the allocation of resources between the government sector and the generations alive at that point, but this problem involves more than just "dividing the pie:" Generations i=0 and i=1 have to form expectations about who will eventually obtain control of the resources left in the government sector. In case of net government liabilities, a key distributional question is which generation(s) will have to pay them off.

In macroeconomics, this expectational problem is often assumed away with the assumption that government actions follow some predetermined policy plan. Then policy is common knowledge, which trivially solves the problem of forming policy expectations. In practice, however, government behavior is often discretionary, so that the expectational problem is non-trivial. Precommitments are particularly unrealistic in the intergenerational context because the issue involves very long time horizons.

Here I will show that the current level of government assets and liabilities is an important determinant of future government policy in setting with discretionary government and distortionary taxation. Typically, higher initial debt will lead to somewhat higher taxes on all generations living in the next period, including the currently young. Hence, government assets and liabilities will influence expectations and thereby current consumption. In addition, government assets and liabilities are variables that can be used strategically by the current generations to influence future policy and thereby the intergenerational distribution of resources.[9]

For the formal argument, I will slightly modify the three-period model of Section II.1 by assuming that income taxes are the only feasible form of taxation. Due to the cost of tax-avoidance efforts, pre-tax income is assumed to be a declining function of the tax rate τ_t^i, namely $Y_t^i = \theta_t^i \cdot \phi(\tau_t^i)$, where θ_t^i is a scale factor and where $\phi'<0$, $\phi''\leq 0$, and $\phi(1)=0$. The scale factor allows second period, "retirement" income to be below first period income: I will assume $\theta_t^t = 1$ and $\theta_t^{t-1} = \theta\ \forall t$, where $\theta \in [0,1]$ is a parameter. Tax revenues are $T_t^i = \tau_t^i \cdot Y_t^i$. Given that taxable income converges to zero as the tax rate approaches one, tax revenue will be bounded and it will reach a maximum at some tax rate $\tau^{max} \in (0,1)$. Capital levies and defaults on government debt are ruled out.[10]

Concerning government behavior, I assume that policy variables at time t are set optimally by the generations alive at that time, which captures the notion of a discretionary but systematic (hence predictable) policy. Specifically, I assume that the government in period 2 maximizes the linear combination of utilities

$$W_2 = x \cdot U^1 + (1-x) \cdot U^2, \tag{4}$$

where $x \in [0,1]$ is known. The weight x may reflect direct influence of the two generations on government policy, but it may also include altruistic elements of the type modeled by Abel (1987). (An appeal to some form of intergenerational altruism seems inevitable, because a high-debt corner solution will otherwise be likely in any multi-period setting; see below.)

Expectations can then be formed by solving the model recursively. No government decisions are made in period 3. Given inventories K_2 and government debt D_2 carried over from period 2, period 3 consumption will be $C_3^2 = Y(\tau_3^2) - T(\tau_3^2) + D_2 + K_2$, where the tax rate τ_3^2 is implied by $T(\tau_3^2) = G_3 + D_2$. In period 2, the government maximizes (4) subject to the budget constraint

$$D_1 + G_2 = D_2 + T(\tau_2^1) + T(\tau_2^2), \tag{5}$$

taking initial government debt D_1 and inventories K_1 as given. This yields optimal period-2 taxes rates τ_2^1 and τ_2^2 and optimal debt D_2 as functions of the state variables D_1 and K_1. It is straightforward to show (see the appendix) that both tax rates and debt D_2 are strictly increasing in government debt D_1, if both generations have an impact on government decisions (i.e., if $x \in (0,1)$) and if $\theta>0$. In other words, debt D_1 held by generation 1 is not taxed away. It is at least partially paid off by generation 2.

The non-trivial impact of government debt on period-2 government decisions has clear implications for expectations and for period-1 policy. For individuals, government debt is relevant for predicting period-2 taxes and period-2 consumption opportunities. For policy, the implication is that debt can be used strategically to influence the decisions of later governments.

The limiting cases of $x=0$, $x=1$, and $\theta=0$ are also insightful. If generation 1 controls policy in period 2 ($x=1$), taxes on generation 2 will always be at the revenue-maximizing level ($\tau_2^2 = \tau^{max}$), regardless of initial debt. Hence, government debt is relatively unimportant. On the other hand, if generation 2 controls period-2 policy ($x=0$), taxes on generation 1 will always be at the revenue-maximizing level ($\tau_2^1 = \tau^{max}$). On the margin, higher initial debt will be paid by generation 2, while the consumption of generation 1 in period 2 will increase with debt one-for-one. The same is true if $\theta=0$ (regardless of x), because generation 2 will then have to pay all taxes. Thus, the strategic role of debt is relatively important, if the currently young have little control over future governments and if they have low taxable incomes in the second (retirement) period.

Finally, the government problem in period 1 raises interesting questions on how the level of government debt is determined in a model with representative governments. On the one hand, a government representing generations 0 and 1 will have a strong incentive to set debt D_1 very high, because part of the debt will generally be paid off by generation 2. On the other hand, high debt will also imply high—and therefore highly distortionary—period-2 taxes on generation i=1 (provided $\theta>0$), so that generation 1 has a tax-smoothing incentive not to set debt in a way that tax rates would be too unequal in the two periods. In addition, individuals may have preferences over the welfare of their successor generation, which would reduce the government's incentive to burden generation 2. Different equilibrium levels of debt arise for different values of old-age income (θ), different values for the political influence of the old (x, and its period-1 counterpart), and different degrees of altruism.

It is left for future research to disentangle these factors and perhaps to introduce additional considerations that may be needed for a complete "positive theory of government debt and intergenerational redistribution." (Some observations are in the appendix.) But this simple model should be sufficient to justify the claim that government debt is far from being irrelevant for intergenerational issues (cf. AGK). To the contrary, I find that keeping track of government debt and its change over time—the budget deficit—is a precondition for understanding the process of how national wealth is allocated among different generations.[11]

II.4. Extensions and the Implications for Government Accounting

The main implication from the previous analysis is that the government should keep track of its assets and liabilities, i.e., that there should be an accrual-based government balance sheet. In moving from the theoretical results to empirical analysis, at least three additional issues must be considered: Infinite horizons, government capital, and uncertainty.

First, it is straightforward to generalize the model to an infinite horizon setting. To assure the existence of all present value expressions in the governments' intertemporal budget constraint, one would then have to assume that the real rate of return on capital, R, is high enough to guarantee dynamic efficiency. In a setting with discretionary government policy, end-of-period government debt D_t will be determined by an optimization problem similar to the period-1 problem of the three period model. Initial debt $(1+R)\cdot D_{t-1}$ and the mechanism by which future government decisions will be made are taken as given. The primary budget deficit $D_t - (1+R)\cdot D_{t-1} = G_t - [T_t^{t-1}+T_t^t]$ is then a concise summary measure of how the discretionary decisions of the current government affect the government's net wealth position. It indicates how much government resources the current generations distribute to themselves. (Note that with accrual accounting for government investment, G_t can be interpreted as a service flow that benefits the current generations.)

Second, government assets can easily be included formally, at least in the deterministic models discussed above. To clarify the meaning of the variable D, denote government tangible assets by K^G, financial assets by A^G, and total government liabilities (Treasury securities and others) by L^G. Basic balance sheet concepts are then government net debt, $ND = L^G - A^G$, and government net worth, $NW = K^G - ND$. (Both definitions follow Eisner, 1986.) If $K^G=0$, the variable D can be interpreted as net debt ND. But the analysis above can also be applied for $K^G \neq 0$, if one interprets D as negative net worth -NW and replaces K by the national capital stock $K+K^G$. That is, the allocation of an economy with government capital can be obtained by pretending that the government has sold off K^G to individuals and consolidated all financial claims.

In practice, the returns on government assets and liabilities are not just non-zero, but also variable over time and often uncertain. Then the change in government net worth between periods consists of the primary deficit, interest payments, and capital gains. A capital gain on net debt implies a redistribution between the government and its creditors/debtors. A gain on real government capital increases government net worth without directly affecting the distribution of private wealth, and it will be allocated at the discretion of the next government. Excess burden and solvency issues will therefore still depend on net worth, but for examining redistributional questions, one may have to distinguish between tangible government assets and financial claims (net debt).[12]

For government accounting, these decompositions of net worth and of its first difference suggest that net debt is an important balance sheet concept in addition to net worth, and that government accounting should produce a simple income statement that indicates how much of the changes in government net worth are due to direct payouts to the living generations (as measured by the primary budget balance) as opposed to being a return on initial assets.

III. Balance Sheets and Income Statements for the U.S. Government

From the theoretical analysis, one concludes are that the government accounting system should deliver values for government net worth and net debt and that it should include a simple income statement. This section will derive balance sheets and income statements for the U.S. government for 1947-1989.

In discussing practical government accounting, one should acknowledge that government accounting may be economically and politically important for reasons that are not directly related to macroeconomics. For example, government accounting may be crucial for holding government officials accountable to voters for their management of government assets and liabilities—including the difficult to measure contingent obligations (Towe, 1991). One might hope that better accountability will also improve economic efficiency in the public sector. The accrual-based accounting system described in this section will deliver improved accountability as an extra benefit.

III.1. Government Balance Sheets—Review and Summary

This section will summarize my results on government net debt and net worth and compare them with Eisner's (1986) values and with official U.S. government data. The balance sheets will be explained in more detail in the following three subsections.

The current U.S. government accounting system is largely based on cash-accounting. The *Budget of the United States* and related Treasury publications record cash inflows from taxes, debt sales, and other revenues and they record the cash outflows for debt retirement and current outlays. The balance sheet implications can be summarized by the time-series on publicly-held federal debt, which is the debt series associated with the unified budget. Although this accounting system was obviously not designed to produce a government balance sheet, data on government debt are often used as if they were statements about the government's net worth.

Separately, the U.S. Treasury Department is publishing a surprisingly complete and detailed set of accrual-based financial accounts, the *Consolidated Financial Statements* (CFS). Unfortunately, the accounting conventions and the layout have been changed several times, which makes intertemporal comparisons difficult, and many of the valuations are based on historical book values rather than market prices. Still, it should be acknowledged that there is a federal accounting system that provides a complete listing of all government assets and liabilities on an accrual basis.[13]

Market value estimates of the government's net wealth position have been derived by Eisner and Pieper (1984) and Eisner (1986). (See also Ott and Yoo, 1980, Boskin et al., 1989, and the *Economic Report to the President*, 1982.) The Eisner-Pieper balance sheets for the U.S. government are available for 1945-84. They include the assets and liabilities of the Federal Reserve System and of federally sponsored credit agencies, government capital, inventories, and land holdings, and market-par adjustments for government debt, mortgages, and gold holdings. Contrary to standard accounting principles, however, Eisner and Pieper fail to net out offsetting items so that the result cannot be interpreted as a consolidated balance sheet.[14]

Since the theoretical analysis suggests that government accounting should use accrual accounting and market values, I find that the Eisner-Pieper approach to setting up a government balance sheet is basically correct. However, I disagree with several of their valuation decisions and with the consolidation of federally sponsored credit agencies (which fails to recognize their private ownership), and I find that some balance sheet items are omitted, notably unfunded government employee pension liabilities—which are included in the CFS—and unbooked losses of the deposit insurance system.

I have therefore re-estimated the major balance sheet items and constructed U.S. government balance sheets for 1947-89. Table 2 shows a summary of the 1989 balance sheet and it provides a comparison of my results with Eisner's values and with the CFS for 1984 (the last year covered by Eisner, 1986). Time series for net debt and net worth are shown in Figures 1-4. The complete set of balance sheets for 1947-89 is provided in the appendix, Table A1. The individual balance sheet entries will be explained below. For clarification, note that "net debt" will always refer to the difference of all liabilities minus all financial assets, while "debt" will refer to the actual debt securities. Net worth is defined as tangible assets minus net debt.

The first question about the balance sheets is what they tell us about the U.S. government's finances that we did not already know from the official data on federal debt. For December 1989, the answer is that net debt amounts to more than \$3300 billion, i.e., that it exceeds the official value for publicly-held federal debt by more than \$1000 billion. Since about half of this is offset by tangible government assets, net worth is "only" –\$1680 billion. This is substantially less negative than federal debt. But assuming, say, a 3% real interest rate, future governments will still have to extract \$50 billion annually in real terms from future tax-payers to satisfy the intertemporal budget constraint. Figures 1-2 show that the gap between net debt and federal debt has widened over the 1947-89 period. Figures 3-4 show that net worth has generally been smaller in absolute value than federal debt.

Second, one may ask which of the balance sheet items are responsible for these results. The most striking observation in this context is that net debt would be very close to the official series on federal debt, if one excluded unfunded government employee pensions. This observation applies throughout the sample period (see "ND excluding pensions" in Figure 1) and it also applies for the comparison of my data with Eisner and the CFS (see Table 2, 1984 data), provided one also excludes social security from the CFS. Thus, the treatment of unfunded federal employee pensions and of social security are the quantitatively most relevant issues in computing government net debt. The CFS have always included unfunded employee pensions and they have had shifting views on social security, including estimates of social security obligations for early years but excluding them since 1986. For all years, CFS net debt far exceeds federal debt. In contrast, Eisner ignores both unfunded pensions and social security. Hence, his net debt estimates are not much different from federal debt.

I agree with Eisner and the recent CFS that social security should be treated as a special case, because it is not a liability in the same sense as other items listed in Table 2. Therefore, I will exclude social security for now and discuss it separately in Section IV. Concerning unfunded employee pension obligations, I agree with the CFS and I will argue below that they are a government liability that should undoubtedly be included on the balance sheet.

The other components of net debt have had a much smaller impact on net debt over the post-war sample. But they still deserve a careful analysis, because any one of them may become large at any time. (The obvious example is deposit insurance.) As I will explain below, the differences between my results and Eisner's data concern the market-par adjustment on federal debt (where Eisner omits the accrued interest), FSLIC liabilities, and the treatment of federally sponsored credit agencies. For interpreting Table 2, one should note that Eisner has inflated both sides of the balance sheet by adding up assets and liabilities of the U.S. government, the Federal Reserve System, and credit agencies without canceling offsetting items. Eisner's values in lines 2 and 7 are therefore much larger than mine, while the values obtained by taking the difference of line 2 and line 7 are very similar.

For computing net worth, the valuation of tangible assets matters in addition to the estimates for net debt. My series on tangible assets differs from Eisner's mainly because I have included estimates for federal mineral rights due to Boskin et al. (1985). (The CFS are far too low, because they are based on book values.) The main issue in valuing tangible assets is the status of military capital and inventories, in particular for the period immediately after World War II. For 1945, military capital and inventories as valued by the Bureau of Economic Analysis (BEA) amount to almost 70% of GNP. If one accepts these values, then the negative net worth in the 1940s is much smaller than without military assets and the decline in federal debt as share of GNP over the 1950s and 60s is largely offset by a similar decline in military assets as share of GNP (see Figure 3). Since I have some doubts about the valuation of military assets, net worth data with and without military capital and inventories are provided (see Figures 3 and 4).

This completes the summary of the balance sheet results. As the summary shows, my results differ significantly from the literature. In the next three sections, I will therefore explain how the main elements of the balance sheet are valued and why they are included. (Readers less interested in the detailed explanations may jump to Section III.5.)

III.2. Government Employee Pension Funds

This section will examine the obligations of government employee pension funds. The key issue is whether or not claims to government employee pensions *should* be counted as government liabilities. If they are, net debt calculations should include some actuarial estimates of these liabilities. If not, the fact that there is a trust fund holding Treasury securities should not make a difference. (Otherwise, trust funds for, say, highways or airports would deserve the same special treatment, which does not seem sensible.) In any case, Eisner's decision to include pension reserves—i.e., obligations "funded" by government securities held by the government pension funds—as liabilities and to exclude all unfunded pension obligations is odd in that it assigns economic significance to the act of issuing special issue Treasury securities to a government fund.

Should claims to government employee pensions be considered government liabilities? In light of the theoretical analysis, the presumption should be that accrued employee pensions are indeed liabilities, because a promise to pay deferred compensation is a straightforward contractual obligation to employees. To confirm this presumption, one may ask more directly what considerations might prevent the government from defaulting on its pension obligations.

There are at least two answers. First, any attempt to reduce pension payments would be subject to a judicial review, which might lead to a court ruling that such employee benefits are a commitment on which the government cannot legally default. Second, one may apply a reputational argument due to Cole and Kehoe (1991) to show that a default may be a suboptimal strategy even if the U.S. government can find a legal way to reduce retirement benefits. The argument is that since the government is engaged in many ordinary business activities that involve deferred payments, a reputation for being a reliable business partner is highly valuable. If the government defaulted on one type of contractual commitment—the obligation to pay deferred employee compensation—other business partners will probably have less confidence in government promises to pay for, say, a contract to develop an airplane, or other long-term contracts. As Cole and Kehoe have shown, such reputational concerns alone can be sufficient to make a default prohibitively costly.

Thus, the original presumption that the accrued liabilities of government employee pension funds are liabilities on which the government cannot default with impunity appears well justified. For the empirical estimation, note that the reputational argument applies equally to the military retirement fund and to the civilian retirement funds, since the promise of generous pension benefits is used very openly in attracting military personnel. The relevant government employee pension funds are therefore the civilian retirement funds (the civil service retirement system (CSRS), the relatively new federal employee retirement system (FERS), and miscellaneous smaller funds) and the military retirement fund. Note that the arguments above do not apply to social security, since participation in the social security system is not voluntary and not based on a contract. Hence, government employee pension benefits are *not* comparable to social security benefits.[15]

Well-documented historical valuations exist unfortunately only for CSRS and FERS, and even these estimates are not always intertemporally consistent. I have therefore adjusted the official estimates to obtain a consistent time series of actuarial liabilities for 1947-89, using the standard entry-age normal accounting method. The key assumption in constructing this series concerns the real discount rate. I have used a fairly high real discount rate of 3% throughout, because up to the point of retirement, pension rights are contingent claims that depend on the future growth rate of salaries, and not safe assets.[16]

For the military retirement system, I have been able to construct a series of relatively rough estimates for 1970-1990, but I was unable to find any actuarial estimates for earlier years. For 1947-1969, I have therefore extrapolated military retirement obligations assuming a constant ratio of military retirement obligations to CSRS liabilities. Since the ratio of military to civilian obligations was presumably much higher in the aftermath of World War II than in 1970, the extrapolated values probably underestimate the government's military retirement obligation. Figure 5 shows the total pension obligations with and without this extrapolation. For the miscellaneous smaller funds, CFS valuations were taken at face value for simplicity.

Overall, it is remarkable how few data there are on government employee pension funds, even though they appear to be a quantitatively very significant class of government obligations. A more detailed analysis should be a high priority for future research. Even under my rather low estimates, federal employee pension obligations have amounted to more than 20% of GNP since at least the 1970s and to more than $1200 billion in 1989.

III.3. Other Financial Assets and Liabilities

This section will examine the other components of net debt. The key issues are the market-par adjustments on government debt, the valuation of deposit insurance guarantees, and the conceptual question to what extent various government-supported agencies should be consolidated into the government budget constraint. For other, relatively uncontroversial balance sheet items, I largely follow Eisner-Pieper (1984) and Eisner (1986). The basic data source are the Federal Reserve Flow of Funds Accounts (FOF). (See the appendix for more detailed explanations.)

Government debt is by far the largest item on the government balance sheet. To obtain market values, Eisner (1986) applies Cox's (1985) index for marketable debt to federal debt excluding savings bonds. Separately, Cox's Treasury note index (1-5 year) is applied to savings bonds. I disagree with both valuations. For debt excluding savings bonds, the Cox index is appropriate in principle, but one has to recognize that Cox's bid-quotes do not include accrued interest. Since Eisner apparently omits accrued interest, his market value series understates government debt, sometimes to an extent that par-values are closer to market values than his series. For savings bonds, the market-par index is inappropriate in principle, since savings bonds have systematically lower coupon rates than Treasury notes with similar maturities, suggesting a lower valuation. On the other hand, most savings bonds can be redeemed on demand, which means that any valuation below par would be questionable. Thus, the par value is almost always the correct valuation. Figure 6a shows the market values of publicly-held federal debt including accrued interest and using par values for savings bonds. For most years, my values are above Eisner's. Due to the fall in nominal interest rates in the 1980s, market values of government debt have recently risen significantly above par, while they were somewhat below par throughout the 1960s and 70s.

An important conceptual issue in deriving net debt is the question which entities should be included on the consolidated federal government balance sheet. Eisner (1986) includes both the Federal Reserve and the agencies in the Flow of Funds sector "federally sponsored credit agencies." But because of their private ownership, these are not "subsidiaries" of the U.S. government for which one could justify consolidation based on standard corporate accounting principles.

Concerning the Federal Reserve System, it seems reasonable to argue that the private ownership is a facade that should not be allowed to cover the economic reality that the Federal Reserve System is controlled by the federal government. Most importantly, Federal Reserve earnings are automatically transferred to the Treasury (except for a fixed 6% dividend to shareholders), which effectively makes the federal government the residual claimant on Federal Reserve assets. In practice, the net market value of Federal Reserve assets is the sum of a (large positive) market-par adjustment on monetary gold plus a (small) market-par adjustment on security holdings. Since it is much easier to compute this sum than to produce a fully consolidated government balance sheet that includes all Federal Reserve assets, I simply add the market-par adjustments to the asset side of the government balance sheet (see Table A1).[17]

Concerning federally sponsored credit agencies, I find their inclusion on the government balance sheet questionable. Sponsored credit agencies are typically set up for the benefit of the borrowers, who are often also the shareholders (e.g. the Federal Home Loan Banks, Federal Land Banks). Thus, a positive net asset value will likely be used for the benefit of the private shareholders and/or the borrowers (e.g., through below market interest rates). The private ownership is more than a facade. On the other hand, the federal government as sponsor is explicitly or implicitly responsible for negative net asset values.[18] The government balance sheet should reflect this asymmetry: For credit agencies with negative net asset value *at market prices*, the negative net value represents a government liability. A positive market value, however, constitutes private net worth that cannot be counted as government asset. In practice, this approach to valuation implies that private equity acts as a buffer that insulates the government balance sheets against agency losses. Indeed, I find that the sum of private equity capital in the FOF sector "federally sponsored credit agencies" plus the market-par adjustment on agency-held mortgages has always been positive, except for a small negative balance in 1981.[19] Thus, sponsored credit agencies had a negligible impact on net debt (cf. Eisner, 1986).

In contrast, the deposit and pension insurance agencies are government-owned public enterprises. Their net value at market prices should therefore be recognized on the government balance sheet.[20] Note that it would be inappropriate to recognize future losses in this context. By definition, the market value of a deposit, pension, or credit agency reflects the values at which assets and liabilities—including contingent liabilities—could be sold to the private sector. If the government passed a law to reorganize or liquidate the agency and to deny any further deposit, pension, or credit guarantees, the market value would measure the expected cost of honoring of the accumulated old liabilities. Thus, market value losses after the valuation date are due to the failure to take corrective action, which should be debited to the period in which the agency is allowed to operate at a loss.

The key empirical problem lies in estimating market values of the different agencies. Quantitatively most significant are the substantial negative market values of the Federal Savings and Loan Insurance Corporation (FSLIC). My estimates of the unbooked liabilities are based on Kane (1991) for 1985-89, and on Brumbaugh (1988) and Kane (1985, 1989) for earlier years; see Figure 6b. Before 1983, fluctuation in the market value of Savings&Loan institutions were mainly driven by interest rate induced fluctuations in the value of mortgages (Kane, 1989, p.76). Due to rising interest rates, my estimates of the FSLIC net value turn persistently negative since the mid-1970s and they rise sharply from 1978 to 1981 to more than $100 billion, before falling to about $70 billion in 1984. Since 1983, problems of asset quality and moral hazard have created significant additional losses, resulting in an government liabilities of more than $150 billion in 1988 and 1989. (See the appendix for details.) The Federal Deposit Insurance Corporation and the Pension Benefit Guarantee Corporation may have created additional unbooked government liabilities, but due to a lack of reliable data, estimates are not included on the balance sheet.[21]

Overall, if one adds together all the financial assets and liabilities discussed in this section, one obtains a series for government net debt *excluding* unfunded government employee pension liabilities that is conceptually comparable to Eisner's (1986) series. For the period studied, my estimates for net debt excluding unfunded employee pension are close to or slightly below the official series on federal debt, but not as low as Eisner's series; see Figures 1-2.

If the estimated unfunded pension obligations from Section III.2 are added, one obtains the complete series on government net debt; see Figures 1-2. Since about 1960, net debt is much higher than federal debt, which is clearly due to unfunded employee pensions that more than offset all the (net downward) adjustments discussed in this section. (Even if military pension liabilities were omitted because of their questionable accuracy, civil service pensions alone would push net debt above federal debt since 1960.) Overall, one has to conclude that the ratio of net debt to GNP has increased since 1969, that it declined much less than federal debt over the period 1950-70, and that at 65% in 1989, net debt has now returned to the level of 1950-51.

III.4. Tangible Government Assets and Government Net Worth

Tangible assets are not a component of net debt, but they are a quantitatively very significant component of net worth. Their omission is an obvious flaw in standard government accounting.

Tangible assets consist of the fixed reproducible capital stock, inventories, land, and mineral rights. For fixed reproducible capital and for inventories, the BEA has constructed long-run series on net stocks at current prices (see Musgrave, 1986).[22] The key issue in this context is the accounting for military capital stocks and inventories, which are more than half of the total amounting to $677 billion in 1989 (13% of GNP) and $149 billion or about 70% of GNP in 1945; see Figure 7. I am somewhat skeptical about the BEA data, especially for the early post-war period. The BEA assumptions of straight line depreciation and fixed service lives may be correct for estimating physical obsolescence, but one might suspect that the economic value of used military equipment declines rather sharply at the end of a major war. The BEA estimates may therefore overstate the value of military capital. On the other hand, it is undisputable that many military capital items are long-lived and valuable, e.g., as evidenced by sales of second-hand military hardware to other countries. Lacking better data, I will generally use the BEA data including military assets, but I will also show all results without the military component.[23]

For government-owned land and mineral rights (oil and gas), I use series constructed by Boskin et al. (1985, 1989).[24] Since the valuation uses a number of simplifying assumptions, both series should be interpreted as best guesses with substantial standard errors (see the appendix and Table A1 for details). To question the estimates on a conceptual level, one may ask whether the market values could be realized in a sale. Since oil and gas rights are auctioned off regularly and land is also being sold or leased, the valuation at market prices seems correct, at least at the margin. The valuation is more questionable with regard to land that will almost certainly never be sold, such as national parks. Nonetheless, since such land could be sold—perhaps even to the tourist industry at prices far above average price for rural land—it is appropriate to account for the opportunity cost of not selling. The fact that a sale seems inconceivable simply reflects a judgement that such land is far more valuable in public use than in any commercial use.

Valuations for total tangible assets—with and without military capital and inventories—are provided in Figure 8. The graph shows the enormous importance of military assets relative to GNP immediately after World War II. During the 1970s and 80s, changes in oil and gas prices explain most of the increase and later decrease of in the value of tangible assets. Eisner's series is substantially below my values, largely because Eisner does not include mineral rights.

Complete government balance sheets (see Table A1) and the estimates for government net worth in Figures 3-4 are obtained if one combines tangible assets with the net debt estimates from the previous section. If one includes military assets, net worth has been less negative than federal debt throughout the period. If one excludes military assets, net worth has been close to federal debt in absolute value in recent years. Regardless of which series is used, the graphs indicate a steep decline in government net worth for the 1980s.

III.5. Simple Income Statements for the U.S. Government

From the balance sheets derived above, one can directly infer the year-to-year changes in government net debt and in government net worth. These changes consist of capital gains, interest payments, and the primary (operating) balance, which have different economic implications. This section will decompose the change in net worth into a primary component and the returns on tangible assets and net debt. A primary deficit is most obviously a net payout of government resources to the currently living generations. Returns on net debt are mainly a compensation for making purchasing power available to the government, but any stochastic component would generate a random redistributions between government and debt-holders. Finally, returns on tangible assets reflect an increase in national wealth.

The starting point for the analysis is the NIPA deficit for the U.S. government excluding net interest on the government debt (the NIPA primary deficit). The NIPA data are clearly preferable to data from the U.S. budget, because they exclude borrowing/lending transactions and (most) asset sales. In recent years, the difference between NIPA deficits and the deficit computed in the U.S. budget were substantial, largely because of deposit insurance outlays. Such outlays should be excluded from the current deficit because they reflect capital losses on old insurance commitments.[25] However, additional adjustments are needed to obtain an accrual-based measure of the primary balance.

An adjustment is required for each of the main balance sheet items; see Table 3. First, with accounting for tangible assets, capital expenditures have to be excluded from current outlays and the user cost of government capital has to be included instead. A key issue in computing the user cost is whether one should impute a non-zero rate of return government capital (see, e.g., Ott and Yoo, 1980; Boskin et al., 1989; Carson and Honsa, 1990). Since many federal government assets provide returns in form of non-marketable public goods and services—e.g., the protection provided by a tank, the utility produced by a national park—I decided against any imputation. The adjustment to the primary balance is then equal to the amount of real net investment at current prices. (See the appendix for additional comments.)

A second adjustment is due to employee pension funds. With actuarial accounting for pension liabilities, the correct measure for current outlays is the value of newly accruing pension obligations rather than the current payments to beneficiaries. As Table 3 indicates, pension outlays were below newly accruing liabilities until the early 1970s. Since then pension outlays have been sufficient to cover new liabilities and to fund some of the accumulated prior obligations.

Finally, adjustments are needed for deposit insurance, seignorage, and some other financial assets and liabilities (summarized under "other" in Table 3; see the appendix for details). Concerning deposit insurance, the adjustment reflects that fact that if there is some ex ante probability of deposit insurance losses, the expected losses must be recognized as a cost of operating the deposit insurance system.[26] Seignorage revenues—transfers from the Federal Reserve to the Treasury—are excluded from primary receipts because they are effectively a rebate of interest on government debt. For all years, the "other" adjustments reduce the primary balance.

The adjusted, accrual-based primary deficits are shown in Figure 9 and Table 3, separately with and without adjustment for military investment. Over the period studied, the non-military adjustments had roughly offsetting effects so that the adjusted primary deficit turns out to be similar to the NIPA measure. With military investment, the adjusted balance is below the NIPA measure in the 1940s—reflecting military disinvestment following World War II—and above the NIPA measure for the 1980s—reflecting the high level of military spending. In any case, the U.S. government's primary balance has been negative from 1982-86, but it has sharply increased and turned positive for 1987-89.

As Table 3 shows, changes in net worth are often much larger than the primary balances. A substantial fraction of the changes in net worth is therefore due to the return component. The returns on tangible assets and on net debt are shown in Table 4 and Figure 10. Given the government's large holdings of oil and gas rights, the volatility of the returns on tangible assets should not surprise. More surprisingly, one finds that the rapid decline in government net worth over the 1980s was almost entirely due to negative returns on tangible assets combined with relatively high returns on net debt—due to the decline in oil prices, rising market prices for Treasury securities (falling nominal interest rates), falling gold prices, and FSLIC losses. Starting near zero in 1981, government net worth fell by more than $1600 billion from 1981 to 1989. But the cumulative primary deficit was only $12 billion, consisting of a cumulative primary deficit of $146 billion for 1982-86 followed by a cumulative primary surplus of $134 billion for 1987-89. Perhaps the government should pay more attention to the management of its assets and liabilities.

IV. Social Security

This section examines the role of social security in government accounting. The key intergenerational questions are raised by the old-age and survivor insurance and disability insurance funds (OASDI).[27] Both funds are largely run on a pay-as-you-go basis, which means that current receipts from the young pay for current outlays to the old and disabled. Thus, the social security system is a massive intergenerational redistribution scheme that can hardly be ignored in analyzing fiscal policy. However, the accounting for social security has long been disputed. Feldstein (1974) has argued that claims on social security are a government liability and part of net wealth of the beneficiaries. Others have disagreed (e.g., Boskin et al., 1989; Eisner 1989).

In evaluating a pay-as-you-go social security system, it is important to distinguish between its introductory phase and the operation of an established, mature system. When a social security system is first started, the old generation is typically granted substantial benefits without ever having made significant contributions. For OASDI, the gross imbalance of benefits to contributions for early cohorts is well documented (Boskin et al., 1987b; Hurd and Shoven, 1985). There is no convincing argument why promises to make such unilateral transfers should be considered an irrevocable government obligation. Even in the private sector, a promise to make a gift in the future is not legally enforceable.

Note, however, that a pay-as-you-go social security system must have a *negative* present value to new entrants in steady state, provided the economy is dynamically efficient.[28] The argument is simply that an intertemporal budget constraint applies to the social security system at any time. If the first generation is a net beneficiary, later generations must on average receive lifetime benefits that are below the present value of their lifetime contributions.[29] The negative present value will remain essentially unchanged over time, since each generation's contribution are used to pay for the previous generation's benefits. Whenever a generation retires, retirement benefits will have to be financed by a levy on the subsequent generations.

The negative present value for new entrants is important because it implies that social security cannot operate on a voluntary basis, and that social security benefits are not gifts. In a voluntary system, no participant would pay contributions that exceed the present value of later benefits. Hence, social security must be backed continually by governmental authority. In the U.S., this backing takes the form of a payroll tax that the social security system is allowed to impose.

For government accounting, the key question is therefore whether the fact that social security relies on payroll taxes creates a government obligation to permit and enforce such taxation in the future. In a world with distortionary taxes, such an obligation will impose constraints on other government operations, because only limited revenues can be extracted from any given tax base (without inducing excessive welfare-reducing substitution effects and tax-avoidance activities). If such an obligation exists, it is economically irrelevant whether the government permits social security system to levy a tax or whether the Treasury levies the same tax and transfers it to social security.

To what extent is there an obligation to maintain social security? It is clear that the government has the ability to change the social security system. In the past, U.S. social security legislation has been changed repeatedly. The 1977 and 1983 reforms involved significant benefit reductions (see Myers, 1985). Moreover, claims to social security benefits are non-tradeable, which is in contrast to government debt (though similar to government employee pension benefits). For government debt, any attempt to default—outright or through inflation—would imply undesirable market disruptions. Such "protection" against default does not exist for social security claims. In addition, non-tradeability implies that social security claims could be altered selectively, taking individual characteristics (e.g., income, demographics) into account.

On the other hand, political economy arguments suggest that claims to social security benefits are fairly safe. Simple median voter models predict that social security will be continued as long as most voters pay less in future taxes than they expect to receive in future benefits. This condition should be satisfied unless lifetime taxes far exceed lifetime benefits, because young cohorts enter the system by making contributions and thereby quickly develop an interest in its continuation. In the context of a more sophisticated heterogeneous-agent model, Tabellini (1990) finds that the intra-generational redistribution within social security creates a large coalition in favor of social security (consisting of the old generation and of the relatively poor young). Tabellini (1991) provides a remarkably similar argument for why a democratic government will usually not default on regular government debt. Since nominal government debt is subject to inflation risk, one might therefore argue that retirees have in practice a much more secure claim on the government's future real resources than the holders of long-term debt.[30] A separate argument for the view that social security benefits are safe can be based on a social contracting interpretation of social security (Kotlikoff et al., 1988).

Overall, I find that a mature social security system can create government obligations that are non-contractual but sufficiently protected against default (cancelation) that they should not be ignored for practical government accounting. In the U.S., it seems undeniable that social security benefits are a class of politically very well protected claims and that the government has granted a virtually irrevocable payroll tax franchise to the social security system.

This raises the question of how one should value the social security system's authority to tax.[31] For each participant, expected social security benefits are a function of past and future contributions. For most participants, the present value of remaining future contributions (if any) will be less than the expected present value of benefits. If social security lost its authority to levy payroll taxes, all participants would demand an exact match between their new voluntary contributions and their future benefits. Older participants would face a benefit reduction. On aggregate, reductions in benefits to current participants would amount to the difference between the present value of benefits (PVB) and *their own* remaining future contributions (PVC). To maintain unchanged benefits, the government must either pay transfers to the social security system amounting to the net present value PVN = PVB - PBC or grant the social security system the authority to levy taxes with an equal present value. In either case, a government obligation to maintain social security benefits to current participants is equivalent to a government liability valued at PVN.[32]

As starting point for estimating this liability, I use actuarial estimates that have been prepared by the Social Security Administration (SSA) since 1970; see Figure 11.[33] For comparison, Figure 11 also shows the "net social security wealth" estimates due to Feldstein (1974, 1982) and Lesnoy-Leimer (1982, 1985). Unfortunately, two complications arise if one wants to obtain a time series of government liabilities. First, as noted above, promised future benefits cannot be considered government liabilities in the start-up phase of a social security system. Second, all future social security contributions and most benefits are contingent claims that depend on the future path of wages, which should be taken into account in the valuation.

For the U.S., the first question is for how long after 1937 the social security systems remained in its start-up phase. To examine to what extent promised social security benefits (reflected in the actuarial valuations) in the U.S. were "earned" by earlier contributions as opposed to being "gifts" to the first generation of participants, I have computed the accumulated value of all social security contributions since the start of the system in 1937 (see Figure 11). Since the social security system will not be able to sustain benefit payments above the present value of contributions in a dynamically efficient steady state, promised benefits in excess of accumulated contributions are an indication that the system is still promising to give away first-generation benefits. Such excessive benefits are transfers that are granted unilaterally and that could be revoked at any time without loss of reputation. Accumulated contributions computed at relatively high interest rates are therefore an upper bound on the government's social security liability. Figure 11 shows such accumulated contributions at real interest rates of 2% and 5%.

Figure 11 shows that both series for "social security wealth" are far above the accumulated contributions (even at 2%), which suggests that these series cannot be interpreted as estimates of a government obligation. The SSA actuarial estimates are also far above the upper bounds for 1972-83 (after the start of inflation-indexing in 1972 and before the 1983 reform), but below the 5% real rate bound for 1970-71 and for the period since 1983. It appears that the U.S. social security system was still in its start-up phase for most of the post-war period. The system may have approached a steady-state around 1970, but in the 1972 reform, most current participants were again promised benefits far in excess of their own contributions.

Overall, I find that until 1983 social security was sufficiently different from a mature system operating in steady state that it would not be appropriate to put any value on the government's social security obligations. The government's obligations—if any—lie somewhere between zero and the accumulated benefits (see the shaded area in Figure 12).

The second question, concerning the valuation of wage-indexed claims, becomes relevant especially after 1983. The Social Security Administration discounts all future taxes and benefits at the projected interest rate on Treasury securities. However, social security contributions and most of the benefits are contingent claims. Future contributions depend on future wages, in nominal as well as real terms. Future benefits of current contributors below age 60 depend on individual and aggregate wages at the time they reach age 60. Only the benefits of participants above age 60 are fixed in real terms. Since wage-contingent claims are not currently traded on financial markets, the correct discount rate on such claims is difficult to determine, but it will likely lie above the safe rate used for the official estimates.[34] Hence, the present value of social security obligations is probably below the SSA estimates.

To assess the effect of a higher discount rate, I have recalculated the wage-indexed components of social security liabilities, using a 3.5% real discount rate on wage-indexed claims and simple assumptions about their maturity. Since this rate is still relatively low, the resulting PVN values may be interpreted as an upper bound on social security liabilities.[35] Figure 12 shows these adjusted estimates in comparison to the official estimates. After 1983, the adjusted estimates are well below the accumulated contributions, suggesting that the post-1983 estimates should be taken seriously.

There are two additional reasons to believe that the (adjusted) actuarial values can now be viewed as measures of the government's liability. First, due to increased taxes and reduced benefits, the scheduled contributions of new cohorts now exceed the average promised benefits on a present value basis, which indicates that the system has moved out of its start-up stage.[36] Second, the 1983 reforms provides lengthy phase-in periods for many changes, effectively "grandfathering" older cohorts.[37] I interpret the act of grandfathering old claims as acknowledgment that these claims have become the political equivalent of property right—claims on which the government can no longer default. Given the precedent of grandfathering in the 1983 and 1977 reforms, current participants may reasonably argue that the government owes them a similar treatment in future social security reforms.

Unfortunately, there is still a range of uncertainty in the valuation, which is due to the uncertainty about the correct discount rate on wage-contingent claims. If one takes the 3.5%-discount rate estimates as upper bound and a discount rate of infinity as lower bound (which sets the net claims of current contributors equal to zero), the value of the government's obligation to maintain social security will lie somewhere between the 3.5%-estimate and the present value of benefits to current retirees; see Figure 12 for 1984-90.[38]

Overall, Figure 12 suggests that the 1983 social security reform has substantially reduced the uncertainty about the financial status of the U.S. social security system. The implied government liability can now be measured by actuarial estimates. Perhaps more significantly, by making the system more secure and by setting precedents, the 1983 reform has firmly established a non-zero lower bound. Somewhere between 1937 and 1983, the old generation has managed to secure a "right" to receive retirement benefits from the government; but we do not know when.

Quantitatively, the government obligations associated with the social security system are huge. For 1990, the 3.5%-discount rate estimate stands at almost 90% of GNP or $4800 billion. Even the lower bound amounts to more than 50% of GNP or $2800 billion. Given the enormous magnitude and range of these values, a more detailed analysis should be an important topic for future research.

To put these estimates in perspective, Figure 13 combines official data on government debt (publicly held) for 1916-89, the 1947-89 results on net debt and on net worth, and the 1937-89 social security estimates. Before 1916, government debt was negligible; there was no social security and no public employee retirement system. For 1989, government net debt (65% of GNP) and estimated social security obligations (80% of GNP) sum up to more that 140% of GNP. Even if one picks a low estimate for government obligations by adding negative net worth plus the lower bound social security estimate, total government obligations still amount to 80% of GNP. There is little doubt that government net worth has fallen significantly between 1916 and 1989 and that net debt has increased. However, it is not clear at what time the increase happened, not even whether net worth had a local minimum during World War II.

V. Conclusions

The theoretical analysis has shown that Kotlikoff's arguments about the irrelevance of labeling government payments rely on the rather implausible assumption that the government can levy lump-sum taxes. If taxation is distortionary on the margin, the government will generally like to have the ability to borrow, i.e., to raise funds from voluntary lenders in a non-distortionary way. It will have an incentive to provide credible assurances that it will repay its debt, and—more generally—honor its contractual commitments. Doubts about the government's credibility would merely create time-consistency problems.

In a setting where the government is bound by its contractual obligations, government debt is well-defined and economically relevant, and accrual-based financial accounting is essential for keeping track of the government's assets and liabilities. In the context of intergenerational redistribution, government net debt and net worth—and their changes over time—are critical for assessing how different generations use their influence on government policy to distribute resources in their favor. Net debt summarizes the government's current financial obligations. Net worth, which takes into account the government's holdings of tangible assets, indicates to what extent future generations will have to pay taxes that exceed the government services to these generations. In addition, government net worth is clearly relevant for excess burden and solvency issues.

For the empirical analysis, the key issue is which government promises create government liabilities. I conclude that government employee pension benefits are a significant contractual liability of the U.S. government that cannot be omitted from the government balance sheet (cf. Eisner, 1986). Such pension obligations currently amount to more than $1200 billion. They are the main reason why U.S. government net debt exceeds the official number on publicly-held federal debt by more than $1000 billion.

Since social security does not create contractual liabilities, it requires a separate analysis. I find that any commitment to maintain an existing pay-as-you-go social security system will in effect be equivalent to a large government liability, because social security payroll taxes restrict the government's ability to collect general tax revenues from the same tax base. A key question for U.S. government finance is therefore whether such a commitment exists. I conclude that there was no obligation to pay the promised benefits to early social security participants who made relatively small own contributions. But since at least the 1983 social security reform (perhaps earlier), the "right" of older cohorts to be "grandfathered" in future social security reforms is sufficiently well-established to create a binding, politically-enforced government obligation. Rough estimates indicate that the value of this obligation is substantial, somewhere between 50% and 90% of GNP in 1990.

Footnotes

1 Related issues have been raised by Buiter (1983, 1990). Buiter emphasizes the role of government balance sheet measures for assessing government solvency.

2 Because of the finite horizon, the zero interest rate and zero time-discounting assumptions are conceptually insignificant. In an infinite horizon setting (see the appendix), a non-zero interest rate would be needed to guarantee the existence of some present value expressions. I abstract from corner solutions: If the optimal allocation requires $K_t<0$, one may interpret this as borrowing from abroad.

3 Note that the exact source of liquidity constraints can be important for the results (Yotsuzuka, 1987). Here, the implicit assumption is that tax collection is easier to enforce than a private loan contract.

4 See Kydland and Prescott (1977), Fischer (1980). In some cases, society may subject the government to explicit constitutional constraints against capital levies, like the takings clause of the U.S. constitution. More generally, the government may subject itself to reputational or political penalties for defaulting (see, e.g., Cole and Kehoe 1991; Tabellini, 1991).

5 Auerbach-Kotlikoff (1987) and AGK allow for the possibility of distortionary taxation, but since they also have a "lump-sum redistribution authority" (Auerbach-Kotlikoff, 1987), there is no excess burden on the margin. In their model, distortionary taxes are used to influence relative prices, but they are not essential for raising revenue.

6 This echoes MacKenzie's (1989) point that the key distinction between debt and taxes is that debt purchases are voluntary while taxes are not.

7 To be precise, the default cost have to be above the promised repayments in sufficiently many states of nature that holding debt has a positive net present value ex ante. Note that this includes risky liabilities that may default in some states of nature.

8 The implications of excess burden have been examined in detail in the literature building on Barro (1979). Barro shows that even in a model with Ricardian bequests, government debt is economically relevant with distortionary taxation. See Bohn (1991) for a recent analysis of solvency issues in a setting with limited taxation.

9 The point that government debt can be used strategically to influence future government behavior is familiar from Alesina and Tabellini (1990, 1991), Tabellini and Alesina (1990), and Persson and Svensson (1989). Here it is applied to intergenerational distribution.

10 That is, I am not explicitly modelling the time-consistency problems that might prevent capital taxes and defaults; that would require a much more elaborate model. If one accepts that capital levies and defaults cannot systematically be used as a source of revenue, ruling out such taxes just means that one abstracts from the uncertainty that might be introduced by imperfect guarantees against capital taxation.

[11] Note that I am not disputing the relevance of AGK-type simulation exercises. Regardless of how government decisions are made, individuals will form expectations about the future path of taxes, transfers, and government services. Given these expectations, one can infer private behavior (using a macroeconomic model) or discuss distributional issues. In this sense, generational accounting—or more precisely, a *simulation* of generational accounts contingent on a particular set of predictions about future government behavior—may be a very useful complement to financial accounting. But it is not a substitute. It should also be acknowledged that government debt does *not* reflect all government actions that might have an impact on intergenerational redistribution. A comprehensive assessment of redistributional government policies would be a heroic task that goes far beyond government accounting (see, e.g., Boadway-Wildasin, 1990).

[12] An analysis of how uncertainty and risk aversion will affect the strategic interaction between generations and the optimal government policy is left for future research. For the representative agent-Ricardian bequest model, optimal government policy under uncertainty has recently been studied by Lucas and Stokey (1983) and Bohn (1990).

[13] It is remarkable that the CFS are not cited in any of the major academic works on government accounting. They are available since 1974 and they are informally audited by major accounting firms (see also Arthur Anderson&Co., 1975, 1986). Because of their perfect integration with the Treasury's cash accounts, the CFS have the potential to become the preferred starting point for market-value adjustments, once they are available consistently for a longer time period.

[14] For example, Treasury securities held by the Federal Reserve appear as an assets and as a liability.

[15] The lack of comparability applies in the other direction, too: Questions about the status of social security benefits cannot be used to question the status of employee pensions as a government liability. (cf. Boskin et al., 1989, *Economic Report to the President*, 1982). The arguments do not apply to veterans benefits either, since many veterans were drafted into service by governmental fiat as opposed to having negotiated pension benefits before entering into military service voluntarily. Hence, veterans benefits were omitted from the balance sheet. This decision is quantitatively quite important: The CFS count the present value of future veterans retirement payments as liability and estimate the 1989 value at $135.2 billion. Total government obligations would be higher if veterans benefits were included. Finally, the appropriate accounting for retiree health benefits is still an unresolved issue (see *Budget of the United States*, 1992, Part 2, Section VIII.B).

[16] See the appendix for the derivation; see Section IV for more discussion about discounting.

[17] Since the Federal Reserve pays out all *accounting* earnings, the book-value of assets always equals the book-value liabilities (including private shareholder equity). Hence, net debt is not affected by adding or omitting the book values of all Federal Reserve assets and liabilities from the

balance sheet. The question of consolidation is a therefore matter of technical convenience; the book-value items of the Federal Reserve balance sheets are easily available elsewhere (e.g., the *Federal Reserve Bulletin*).

18 Even if the Treasury has no legal liability, the government has created expectations that it would take responsibility for sponsored agencies to the extent that a default would be extremely damaging to the government's reputation as creditor.

19 More recently, the Congressional Budget Office (1991a) has concluded that currently none of the federally sponsored credit agencies has a negative net worth, although the farm credit system may pose significant risks for the future.

20 Again, even though the Treasury had until recently no legal liability to bail out these "independent" agencies, the government has created expectations that it would take responsibility to an extent that a default would severely damage the government's reputation as creditor.

21 The unbooked liabilities have presumably been much smaller than the unbooked FSLIC liabilities (see *Budget of the United States, Fiscal Year 1992*, Part 2, Section VIII.A). For the FDIC, there is no strong evidence of a negative net worth for my sample period, although Barth et al. (1991) suggest that a problem may have developed recently. A more detailed analysis is left for future research.

22 I am grateful to John Musgrave for providing the unpublished data on inventories.

23 Boskin et al. (1989) also question the assumptions for depreciation allowances made by the BEA, but in the direction of increasing the values. Since Eisner (1989) is not supportive of their calculations, I use the official BEA data. The United Nations' System of National Accounts argues that the value of military assets is so uncertain that a value of zero should be assigned (see Ott and Yoo, 1980; Carson and Honsa, 1990); the series excluding military assets are consistent with this accounting convention.

24 See also Boskin and Robinson (1987). Both series were updated to 1989. Eisner (1986) uses a different series for land, but Eisner (1989) endorses the Boskin et. al series.

25 See "NIPA Treatment of the 'Bailout' of Thrift Institutions," (Survey of Current Business, December 1989, 2-4), and Eisner (1991).

26 See Boskin et al. (1987a). In contrast, NIPA does not recognize the deposit insurance losses at any time, since cash outlays are excluded as capital losses (see the previous footnote). For credit guarantees, the U.S. government has recently switched from cash to accrual accounting and correctly includes a measure of implicit subsidies as outlays (see Congressional Budget Office, 1991b). In effect, I am suggesting that a similar procedure should be adopted for deposit insurance.

27 I have not examined the hospital insurance (HI) and supplemental medical insurance (SMI) programs in detail. It appears that some of the arguments about OASDI could be applied to HI. But

since SMI requires payments from the current participants that the government could raise at any time, different considerations may apply. A more careful analysis of HI and SMI might be an important issue for future research. The Railroad Retirement System raises similar issues, but it is so small relative to social security that I have not examined it separately. (The *1992 Budget* quotes an actuarial deficiency of $34 billion.)

28 Based on the results of Abel et al. (1989), dynamic efficiency is a maintained assumption. I use "pay-as-you-go" as representative for any less than fully funded system, because partial funding does not change the conceptual argument; the empirical analysis takes the trust fund into account. "Steady-state" is also used in a wide sense, allowing, e.g., for stochastic fluctuations in population growth and productivity. I abstract from heterogeneity within generations, e.g., between high and low-income workers, because this would not change the result that a net tax must be imposed on aggregate.

29 A related argument is that new entrants loose in present value terms, if market interest rates are above the rate of economic growth, which is the rate at which social security contributions "earn interest." In a stochastic economy, this argument is non-trivial, however, because it raises the question which interest rate should be used. Since social security benefits are contingent on wage growth, I will argue below that the appropriate discount rate for social security should be above the safe interest rate. Hence, the fact that safe interest rates have often been below the U.S. growth rate does not invalidate the present value arguments.

30 In support (although insufficient on their own), a reputational argument can be applied: Since social security taxes will be less distortionary if some fraction of the tax is viewed as a contribution to a "pension fund" with a predictable return, a government might want to establish a reputation for honoring claims based on prior contributions to minimize excess burden. Conversely, given the conclusion that social security creates a liability, the government *should* link marginal contributions to marginal benefits as credibly as possible in order to minimize distortions.

31 This question would also be interesting, if one interpreted it in a simulation (rather than accounting) context and simply asked how government's budget constraint would be affected *if* the government *decided* to maintain an unchanged social security system. Very similar 'what if' questions are at the center of AGK's work.

32 Here I am abstracting from intra-generational redistribution, which may require additional taxes that could increase the government obligation further. The PVN based on current laws will generally be less than the accrued actuarial deficiency based on entry-age normal accounting, because payroll taxes must exceed the actuarial normal-cost in steady state. If this is not true at some point in time (e.g., because of a stochastic disturbance), the government's obligation should perhaps be computed with the higher normal-cost contributions instead of the contributions under

current law, because this would better reflect the government's ability to change future contributions and the rate of accrual of new claims, while respecting claims based on old contributions. For the U.S., the PVN based on current law has apparently been below the entry-age normal value since 1983.

33 I am grateful to Stephen Goss for providing these data. Note that these estimates refer to the "closed group" of current participants as opposed to the much better known "open group" estimates, which include future contributions by future participants.

34 For example, if one had an aggregate Cobb-Douglas production technology, which yields proportional payments to capital and labor, the rate of return on equity would be the correct discount rate for wage-contingent claims. The difficulties in explaining the equity premium (Mehra-Prescott, 1985) suggest, however, that one should be cautious about such theoretical estimates. Hence, I will present a range of estimates.

35 The 3.5% value is used as the lower bound, because it is somewhat above the average rate of economic growth, but well below the average historical return on equity. Abel et al. (1989) suggest that capital income should be discounted at a rate above the growth rate and the Cobb-Douglas case (see the previous footnote) suggests that capital income and labor income should be discounted at similar rates. For adjusting the SSA present values that are based on a 2% real discount rate, I assume a 10 year duration for contributions and a 20 year duration for the future benefits of current contributors, which results in a 15% reduction in PVC and a 30% reduction in the present value of benefits to current contributors. I should emphasize that the objective of making these ridiculously simple assumptions is not to obtain quantitatively accurate estimates, but to make the qualitative point that since 1983, the risk-adjusted estimates of PVN almost certainly lie below the accumulated contributions.

36 Estimates provided by Stephen Goss suggest that the benefits to current entrants could be financed with a payroll tax of 12.26% (the 1991 entry-age normal cost at a 2.3% real interest rate), as opposed to the actual OASDI payroll tax of 12.4% for employers and employees. If an adjusted, higher discount rate were used, normal cost would be substantially below 12.4%.

37 For example, the increase in the normal retirement age will not take full effect until the year 2018. The delay in inflation indexing (from June to December 1983) might be considered an exception, unless one views it in the context of the over-indexing between 1972-1977, which was caused by a technical error in drafting the 1972 law: Nobody can fault the government for reversing such an error; and a natural way to reverse an index-related error is by delaying an inflation adjustment. In this sense, the delayed inflation adjustment can be interpreted as an example where the government canceled promised benefits that were not "earned" by prior contributions.

[38] The present value of benefits to current retirees would also a reasonable lower bound, if one assumed that their benefits are much more secure than those of younger cohorts. However, this is not my preferred interpretation, because there is no justification for a discrete jump in pension accruals. Instead, the assumption underlying PVN is that social security claims are built up continuously over a lifetime of contributions. Note that this interpretation also implies the prediction that in future social security reforms, cohorts will be grandfathered roughly in proportion to their accrued pension claims (full protection at age 65, no protection at, say, age 20-30, and partial protection of benefits in between).

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Appendix

The appendix contains (1) proofs of the assertions in Section II.3, (2) an extension of the model of Section II to an infinite horizon setting, (3) a description of the balance sheet items in Table A1, and (4) a description of the series in Tables 3 and 4.

A1. Proofs of the Assertions in Section II.3

To start, note that the assumptions on $\phi(\cdot)$ can be motivated by more basic assumptions on technologies and information sets, as follows: Assume that individuals allocate a fixed total labor input over two production technologies, one of which produces an output that is not observable to the tax authorities. Without taxation, technologies are used in a way that the marginal products are equal. With taxation, there will be excessive use of the untaxed technology, which reduces overall output. If the marginal product of the taxed technology is constant and the marginal product of the untaxed technology is declining, then this example justifies the assumptions about $\phi(\cdot)$. Technology choice is a simple way to introduce distortionary taxation. Other types of distortionary taxation, e.g., a labor-leisure choice or a multi-good model with unequal consumption taxation, would require a more complicated model, but they would have similar implication for the conceptual issues.

The first point to prove is that in period 2, both tax rates and debt are strictly increasing in period-1 debt for $x \in (0,1)$. Note that generation i=2 individuals, who take tax rates as given, will always consume as indicated in (1c), while generation i=1 consumers will consume their entire wealth. In addition, τ_3 and D_2 are deterministically linked by the period-3 government budget constraint. Hence, the government's maximization problem in period 2 can be viewed as choice of τ_2^1, τ_2^2, and τ_3^2 to maximize

$$W_2 = x \cdot u(Y(\tau_2^1) - T(\tau_2^1) + D_1 + K_1) + (1\text{-}x) \cdot 2 \cdot u([Y(\tau_2^2) + Y(\tau_3^2) - T(\tau_2^2) - T(\tau_3^2)]/2) \qquad \text{(A1)}$$

subject to

$$D_1 + G_2 + G_3 = T(\tau_2^1) + T(\tau_2^2) + T(\tau_3^2), \qquad \text{(A2)}$$

for given K_1 and D_1. Defining $\varphi(\tau_t^i) = \tau_t^i \cdot \phi(\tau_t^i)$, one can write $T(\tau_t^i) = \theta_t^i \cdot \varphi(\tau_t^i)$. The first order conditions are then

$$x \cdot u'(C_2^1) \cdot \theta \cdot [\phi'(\tau_2^1)-\varphi'(\tau_2^1)] + \lambda \cdot \theta \cdot \varphi'(\tau_2^1) = 0 \tag{A3a}$$

$$(1-x) \cdot u'(C^2) \cdot [\phi'(\tau_2^2)-\varphi'(\tau_2^2)] + \lambda \cdot \varphi'(\tau_2^2) = 0 \tag{A3b}$$

$$(1-x) \cdot u'(C^2) \cdot \theta \cdot [\phi'(\tau_3^2)-\varphi'(\tau_3^2)] + \lambda \cdot \theta \cdot \varphi'(\tau_3^2) = 0, \tag{A3c}$$

where λ is the Lagrange multiplier for (A2). Equations (A3b) and (A3c) together with the convexity assumptions on taxation immediately imply $\tau_2^2 = \tau_3^2$. That is, taxes on generation i=2 are levied in a tax-smoothing way to minimize the excess burden.

For $x \in (0,1)$ and $\theta > 0$, the fact that marginal utilities are positive combined with the fact that $[\phi'-\varphi'] < 0$ implies that $\tau_t^i < \tau^{max}$ for all (i,t) and that $\lambda > 0$. Since $\varphi'(\tau_t^i) > 0$ for $\tau_t^i < \tau^{max}$, one can simplify (A3) by defining the function

$$h(\tau_t^i) = -\partial Y_t^i / \partial T_t^i = -\phi'(\tau_t^i) / \varphi'(\tau_t^i)$$

that summarizes the marginal cost (excess burden) of raising additional revenues. The assumption on taxation imply $h(\tau)=0$, $h'(\tau)=0$ for $\tau=0$, $h(\tau)>0$, $h'(\tau)>0$ for $\tau>0$, and $h(\tau)\rightarrow\infty$ as $\tau\rightarrow\tau^{max}$. Then (A3a-c) reduce to the first order condition

$$x \cdot u'(C_2^1) \cdot (1+h(\tau_2^1)) = (1-x) \cdot u'(C^2) \cdot (1+h(\tau_2^2)), \tag{A4}$$

which means that the government equates the marginal welfare impact of additional taxes on each generation, taking into account the excess burden.

The marginal effect of changes in D_1 on taxes and consumption can be computed by taking the total differential of (A2) and (A4), taking into account the dependence of C_2^1 on debt. After eliminating τ_3^2, one obtains

$$\frac{\partial \tau_2^1}{\partial D_1} = \frac{(1-x)\cdot\Omega_2 + x\cdot\omega\cdot(1+\theta)\cdot\varphi'(\tau_2^2)}{x\cdot\Omega_1\cdot(1+\theta)\cdot\varphi'(\tau_2^2) + (1-x)\cdot\Omega_2\cdot\theta\cdot\varphi'(\tau_2^1)} > 0, \tag{A5a}$$

$$\frac{\partial \tau_2^2}{\partial D_1} = \frac{x\cdot\Omega_1 - x\cdot\omega\cdot\theta\cdot\varphi'(\tau_2^1)}{x\cdot\Omega_1\cdot(1+\theta)\cdot\varphi'(\tau_2^2) + (1-x)\cdot\Omega_2\cdot\theta\cdot\varphi'(\tau_2^1)} > 0, \tag{A5b}$$

where $\omega = \varphi'(\tau_2^1) \cdot (1 + h(\tau_2^1)) \cdot (-u''(C_2^1)) > 0$, $\Omega_1 = h'(\tau_2^1) \cdot u'(C_2^1) + \omega \cdot (1+h(\tau_2^1)) > \omega > 0$ and $\Omega_2 = h'(\tau_2^2) \cdot u'(C^2) + \varphi'(\tau_2^2) \cdot (-u''(C^2)) \cdot (1 + h(\tau_2^2))^2 > 0$. The result $\partial\tau_2^2/\partial D_1 > 0$ follows from $\omega<\Omega_1$. Since D_2 and $\tau_3^2 = \tau_2^2$ are linked by the period-3 government budget constraint, this implies $\partial D_2/\partial D_1 > 0$. Thus, both tax rates and second period debt are strictly increasing in D_1, as claimed in the text.

Equations (A3) also provide immediate answers for the extreme cases x=0 and x=1. If x=0 and $\theta>0$, (A3a) implies that one either has $\lambda=0$ or $\varphi'(\tau_2^1) = 0$, which implies $\tau_2^1 = \tau^{max}$. However, (A3b) together with non-satiation ($u'>0$) implies that $\lambda>0$. Hence, generation i=1 will always be taxed to the maximum extent possible. If x=1, an analogous argument implies $\tau_2^2 = \tau^{max}$, which means that generation 2 will be taxed as much as possible. If $\theta=0$, one has $T_2^1 = T_3^2 = 0$, so that τ_2^2 is determined by the government budget constraint.

Next, consider the government problem in period 1. Following Abel (1987), I assume that an individual of generation i may care about the average level of utility of generation i, $\bar{V}_i$, and over the average level of utility of the successor generation i+1, $\bar{V}_{i+1}$, so that individual preferences are

$$V_i = U_i + \alpha \cdot \bar{V}_i + \gamma \cdot \bar{V}_{i+1} \tag{A6}$$

where $\alpha>0$, $\gamma>0$, and $\alpha+\gamma<1$; because of the finite horizon, $\bar{V}_3 = 0$. Assuming the number of individuals is large, individual behavior is the same as without altruism, while the government objective function will reflect individuals' concern about their successor generation. Denoting the average of U_i over the individuals of generation i by $\bar{U}_i$, one has $\bar{V}_2 = \bar{U} + \alpha \cdot \bar{V}_2$, hence $\bar{V}_2 = \bar{U}_2 / (1-\alpha)$. Similarly, one has

$$\bar{V}_1 = \frac{\bar{U}_1}{1-\alpha} + \frac{\gamma}{1-\alpha} \cdot \bar{V}_2 = \frac{\bar{U}_1}{1-\alpha} + \frac{\gamma_1}{1-\alpha} \cdot \frac{\bar{U}_2}{1-\alpha}, \tag{A7a}$$

$$\bar{V}_0 = \frac{\bar{U}_0}{1-\alpha} + \frac{\gamma}{1-\alpha} \cdot \bar{V}_1 = \frac{\bar{U}_0}{1-\alpha} + \frac{\gamma}{1-\alpha} \cdot \frac{\bar{U}_1}{1-\alpha} + \frac{\gamma^2}{(1-\alpha)^2} \cdot \frac{\bar{U}_2}{1-\alpha}, \tag{A7b}$$

The objective function of a government that represents the living generations is then defined as

$$\bar{W}_t = \bar{x} \cdot \bar{V}_{t-1} + (1-\bar{x}) \cdot \bar{V}_t, \tag{A8}$$

where $\bar{x} \in [0,1]$ is fixed. In period 2, the objective function (4) can be reinterpreted as a special case of (A8), noting that

$$\bar{W}_2 = \frac{\bar{x}}{1-\alpha} \cdot \bar{U}_1 + \left[\frac{\bar{x}\cdot\gamma}{1-\alpha} + \frac{1-\bar{x}}{1-\alpha}\right] \cdot \bar{U}_2.$$

Hence $\bar{W}_2$ is proportional to the objective function W_2 in (4), and the parameter x is given by $x/(1-x) = \bar{x}/[\gamma\cdot\bar{x}+(1-\bar{x})]$. In this sense, W_2 is consistent with Abel-type altruism.

In period 1, one has

$$\bar{W}_1 = \frac{\bar{x}}{1-\alpha} \cdot \bar{U}_0 + \frac{\bar{x}\cdot\gamma+1-\bar{x}}{(1-\alpha)^2} \cdot \left[\bar{U}_1 + \frac{\gamma}{1-\alpha} \cdot \bar{U}_2\right].$$

$$= z_0 \cdot \bar{U}_0 + z_1 \cdot \bar{U}_1 + z_2 \cdot \bar{U}_2, \qquad \text{(A9)}$$

where the parameters z_0, z_1, and z_2 are defined by the corresponding terms in the previous line. The government maximizes this objective function by choosing values for τ_1^0, τ_1^1, and D_1, taking as given D_0 and K_0, the fact that individuals set consumption according to (1a-b), and the fact that the period-2 allocation will be determined as function of D_1 in the way discussed above. The constraints are the budget equation

$$D_0 + G_1 = T(\tau_1^0) + T(\tau_1^1) + D_1 \qquad \text{(A10)}$$

and the solvency constraint

$$D_1 \le D_1^{max} = [1+2\cdot\theta\cdot\varphi(\tau^{max})] - [G_2 + G_3] \qquad \text{(A11)}$$

which reflects the fact that tax revenues are bounded in periods 2 and 3. The first order conditions are

$$z_0 \cdot u'(C_1^0) \cdot \theta \cdot [\phi'(\tau_1^0)-\varphi'(\tau_1^0)] + \lambda \cdot \theta \cdot \varphi'(\tau_1^0) = 0 \qquad \text{(A12a)}$$

$$z_1 \cdot u'(C^1) \cdot [\phi'(\tau_1^1)-\varphi'(\tau_1^1)] + \lambda \cdot \varphi'(\tau_1^1) = 0 \qquad \text{(A12b)}$$

$$z_1 \cdot u'(C^1) \cdot \theta \cdot [\phi'(\tau_2^1)-\varphi'(\tau_2^1)] \cdot \frac{\partial\tau_2^1}{\partial D_1} + z_2 \cdot u'(C^2) \cdot (1+\theta) \cdot [\phi'(\tau_2^2)-\varphi'(\tau_2^2)] \cdot \frac{\partial\tau_2^2}{\partial D_1} + \lambda - \mu = 0 \qquad \text{(A12c)}$$

where λ and μ are the Lagrange multipliers associated with (A10) and (A11), respectively, and $\mu \ge 0$, $(D_1 - D_1^{max}) \cdot \mu = 0$.

First, consider an interior value for $\bar{x}$, $\bar{x} \in (0,1)$, which implies $z_1 > 0$ and $z_0 > 0$, and assume $\theta>0$. Then (A12a-b) imply $\tau_1^0 < \tau^{max}$, $\tau_1^1 < \tau^{max}$, and $\lambda>0$. After eliminating λ, (A12a-b) reduce to the first order condition

$$z_0 \cdot u'(C_1^0) \cdot (1+h(\tau_1^0)) = z_1 \cdot u'(C^1) \cdot (1+h(\tau_1^1)), \qquad \text{(A13)}$$

which is analogous to (A4). In addition, (A12c) can be written as

$$z_1 \cdot u'(C^1) \cdot \left[(1+h(\tau_1^1)) - (1+h(\tau_2^1)) \cdot \frac{\partial T_2^1}{\partial D_1}\right] - z_2 \cdot u'(C^2) \cdot (1+h(\tau_2^2)) \cdot \frac{\partial T_2^2}{\partial D_1} = \mu$$

and, using (A4) and noting that $\delta = x/(1-x) \cdot z_2/z_1 < 1$,

$$z_1 \cdot u'(C^1) \cdot \left[h(\tau_1^1) - h(\tau_2^1) \cdot [\delta + (1-\delta) \cdot \frac{\partial T_2^1}{\partial D_1}]\right] = \mu. \tag{A14}$$

Two cases may arise. For some parameter combination (e.g., if the altruism parameter γ is low so that δ is small and/or if θ is low so that $\partial T_2^1/\partial D_1$ is small) the right hand side of (A14) may be positive at $D_1 = D_1{}^{max}$. Then one has a corner solution with $D_1 = D_1{}^{max}$ and $\mu>0$. Then τ_1^0 and τ_1^1 are being determined by (A13) and (A10). Otherwise, (A10), (A13), and (A14) with $\mu=0$ determine the solution for τ_1^0, τ_1^1, and D_1.

Note that $\delta<1$ and $\partial T_2^1/\partial D_1<1$ in (A14) imply that the optimal solution will satisfy $\tau_1^1 < \tau_2^1$. That is, compared to Barro's (1979) tax smoothing solution, the intergenerational model predicts that taxation is delayed and debt is increased. Generation 1 will give up on tax-smoothing in order to manipulate the intergenerational distribution of resources.

Other qualitative properties of the solution are best illustrated in the special cases. If $\bar{x} = 0$, then $z_1=z_2=0$, and the old generation will use its control of the government to extract resources from later generation, setting $D_1 = D_1{}^{max}$ and $\tau_1^1 = \tau^{max}$. If $\bar{x} = 1$, then $z_0=0$, hence $\tau_1^0 = \tau^{max}$. Moreover, it is common knowledge that the period-2 government will set $\tau_2^1 = \tau^{max}$. Hence, $\partial T_2^1/\partial D_1=0$, which implies that the value of μ in (A14) will depend on δ: If there is no altruism, so that $\gamma=z_2=\delta=0$, then $D_1=D_1{}^{max}$ holds and generation 1 will use its control of the government to extract resources from all other generations. With sufficient altruism ($\gamma>0$), however, generation 1 will set debt below the maximum for the benefit of generation 2. More generally, a high altruism parameter will raise δ on the left hand side of (A14), which means that $D_1 = D_1{}^{max}$ is less likely to occur (i.e., for fewer combinations of the other parameters). The case of $\theta=0$ is similar to the case of $\bar{x} = 1$, except that the old generations face zero taxes instead of $T(\tau^{max})$. Overall, the solution depends on the parameters characterizing preferences and political influence in intuitively plausible ways.

A2. An Infinite Horizon Version of the Model of Section II

To extend the model of Section II.1 to an infinite horizon setting, assume storage (or better, production) yields a constant return R>0 and (for simplicity) that individuals discount second period income by the factor $\rho = 1/(1+R)$. A new generation of individuals is born in each period. Individuals of generation i live in periods t=i and t=i+1 and they behave like generations 1 and 2 in the three-period model. Moreover, assume that income is such that the present value of all incomes (discounted at the rate R) is finite. Then one has a dynamically efficient economy, in which the government is subject to the intertemporal budget constraint

$$T_1^0 + \sum_{t\geq 1} \rho^{t-1} \cdot [T_t^t + \rho \cdot T_{t+1}^t] = \sum_{t\geq 1} \rho^{t-1} \cdot G_t + D_0 . \tag{A14}$$

Since consumption of generation i=0 is still given by (1a) and since (A14) depends on D_0 and T_1^0 only through their difference, in the same way as constraint (2), the irrelevance of labeling government payments still applies for all models with lump-sum taxes. In addition, $C^i = C_i^i = C_{i+1}^i$ holds for all generations $i\geq 1$. Hence,

$$C^i = \frac{1}{1+\rho} \cdot [(Y_i^i + \rho \cdot Y_{i+1}^i) - (T_i^i + \rho \cdot T_{i+1}^i)],$$

replaces (1b-c) for the case without bequests and without liquidity constraints. As in the three period model, consumption depends on government policy only through the present values of taxes, $T_i^i + \rho \cdot T_{i+1}^i$, which are Kotlikoff's generational accounts.

If one extends the model of Section II.3 to the infinite horizon, the objective function (A8) is still well-defined if one defines

$$\bar{V}_t = \frac{1}{1-\alpha} \cdot \sum_{k\geq 0} \gamma^k \cdot \bar{U}_{t+k}$$

The constraints are analogous to those in period 1, except that (A11) must be replaced by the appropriate generalization

$$D_t \leq D_t^{max} = \rho \cdot \theta \cdot \varphi(\tau^{max}) + \sum_{k\geq 1} \rho^k \cdot [\varphi(\tau^{max}) + \rho \cdot \theta \cdot \varphi(\tau^{max})] - \sum_{k\geq 1} \rho^k \cdot G_{t+k}$$

In every period, the solution is characterized by first order conditions analogous to (A12)-(A14). The path of debt is again determined by the parameters characterizing preferences (α and γ), income levels (θ), and policy influence ($\bar{x}$). Note that to explain variations in debt and deficits, one might have to allow for time variation in these parameters or in the functional forms (e.g. due to variations in cohort size or technological changes). Such extensions are left for future research. The point here is that the government debt will be a key variable for all such government optimization problems and also for individuals' expectations about future taxes.

A3. Description of the Balance Sheet Data

The complete balance sheets for 1947-89 are shown in Table A1. The series are constructed as follows.

Fixed Capital (Lines 4-5 and 41-42): Net stock of government-owned fixed capital, *Survey of Current Business*, October 1990, various earlier issues, and Musgrave (1986).

Inventories (Lines 6 and 43): Unpublished BEA data on government-owned inventories at current cost, provided to me by John Musgrave.

Land (Line 7): Estimates for real land values 1946-85 were taken from Boskin et al. (1989) and converted to nominal dollars using the GNP-deflator. Data for 1986-89 were obtained by applying Eisner's (1986) method to Federal Reserve data on private land values, using Boskin et al.'s 1985 value as starting point.

Mineral Rights (Line 8): Estimates for oil and gas rights for 1954-86 were taken from Boskin and Robinson (1987). Data for 1947-53 and 87-89 were constructed as described in Boskin et al. (1985), using estimates on oil and gas prices from the American Petroleum Institute (*Basic Petroleum Data Book*, Washington D.C, 1991) and simple assumptions about royalties and bonuses: For 1946-53, I assumed zero royalties and bonuses. For 1987-89, I used the Flow of Funds data on royalties and bonuses. (Since royalties and bonuses have a minor impact on short-term extrapolations in comparison to the impact of price changes, simple assumptions should be sufficient. The assumption of zero royalties and bonuses for 1946-53 implies that the values are lower bound estimates.)

Cash, Other Monetary Assets, Taxes, Trade Credit, Loans and Mortgages at par, Miscellaneous Assets (Lines 10, 11, 13, 14, 16, 21): The series were taken at face value from the Federal Reserve, *Flow of Funds Accounts* (Release Z.1; FOF for short), using the WEFA database. Cash includes the FOF entries "checkable deposits and currency" and "time deposits." Other monetary assets represents the FOF entries "gold, SDRs and official foreign exchange." Taxes represent the FOF entry "taxes receivable." Loans and mortgages includes all components of the FOF entry "credit market instruments" held by the U.S. government.

Mortgages: Market-Par Adjustment (Line 17): I use Eisner's (1986, p.211-212) approach, but I apply it to government-held mortgages rather than government plus agency mortgages and I make several modifications. First, Eisner's prepayment assumptions (12 years) are inconsistent with his perpetual inventory accounting for the maturity structure of the government's mortgage portfolio. Second, Eisner apparently misunderstood the traditional "rule of thumb" saying that mortgage are well approximated by assuming prepayment after 12 years: The assumption is usually interpreted as saying that there are no prepayments until year 12, when the entire mortgage balance is prepaid, rather than (as Eisner assumes) that a mortgage would yield a constant cash flow over 12 years. Third, the traditional 12 year-prepayment assumption is too high for the 1980s, where prepayment rates increased due to increased mobility and legislative changes.

For 1947-77, I use Eisner's data in spite of these reservations, mainly because of data limitations and because possible adjustments would be fairly small (well under $0.5 billion). Thus, I took the ratio of Eisner's (1986, Table B12) market value series for U.S. government plus agency held mortgages divided by the corresponding FOF par values as a market-par index for government mortgages, and applied it to the par value of U.S. government-held mortgages.

For 1978-89, I constructed a market-par index for U.S. government mortgages as follows. For perpetual inventory accounting, I use the stock of mortgages outstanding in 1946 as starting point. For 1946-1977, I adopt Eisner's version of the 12-year prepayment assumption, which is that 1/5 of all mortgages are prepaid after years 10-14, respectively. For 1978-89, where the 12-year assumption would be excessive, I assume 8 years to prepayment, which means that 1/5 of all mortgages are prepaid after years 6-10. (This assumption also captures the high rate of refinancing at lower interest rates, especially in 1986.) Mortgage portfolios are then constructed by assuming that government gross investment in new mortgages is the sum of net investment (change in stocks) plus repayments, where I take into account regular payments as well as prepayment at the assumed rates. All mortgages are assumed to have the average FHLBB yield on new mortgages of the year when they were originated. The resulting predicted cash flows are discounted at the FHLBB yield on new mortgages at the end of the current year. Note again that these values were used for 1978-89 only, since the perpetual inventory method needs a start-up period. For many years before 1978, the values were similar to Eisner's, however. (I should acknowledge that there are more sophisticated mortgages prepayment models, which might yield somewhat more precise values; but this is left for future research.)

Note that these adjustments reflect interest rate risk, but not credit risk. To the extent that there were unbooked loan losses, the face value of government loans in Line 16 may overstate the market value of government-held loans (see the *Budget of the United States, Fiscal Year 1992*, Part 2, Section VIII.A). This issue should be examined more closely in future research.

Federal Reserve Gold: Market-Par Adjustment (Line 19): For 1947-84, the market-par adjustment is the difference between Eisner's (1986, Table B12) market value series for gold minus the FOF par value. For 1985-89, year-end market prices (December averages) were taken from the *Survey of Current Business* and divided by the official price. The resulting market-par ratio was applied to the FOF data.

Federal Reserve Securities: Market-Par Adjustment (Line 20): The market-par index for government debt described below (see Line 27) was applied to Federal Reserve holdings of government securities obtained from the FOF.

Treasury Currency&SDR cert., Accounts Payable, Federal Debt at par, Life Insurance Reserves, Miscellaneous Liabilities (Lines 23, 24, 26, 32, 36): The entries were taken at face value from the FOF. Accounts receivable stands for the FOF entry "trade debt." Federal Debt at par refers to the

FOF liability entry "credit market instruments," which is the same as publicly-held federal debt (see the *Treasury Bulletin*).

Federal Debt: Market-Par Adjustment (Line 27): As noted in the text, a market-par index was applied to publicly held federal debt excluding savings bonds. For 1985-89, a market-par index including accrued interest was taken directly from the 1990 CRSP bond files. I found that the CRSP files have fairly complete price quotes for the 1980s—which means that the CRSP-based index can be interpreted as an exact measure of the market-par ratio on marketable debt—but that many price quotes are missing for some earlier years. Therefore, I used Cox's (1985) index on marketable Treasury debt plus an estimate for accrued interest to obtain a market-par index for 1947-84. Accrued interest is estimated as 1/4 of the average coupon rate on marketable treasury debt times the outstanding amount of Treasury bonds and notes (which assumes that the semi-annual coupon dates are uniformly distributed over the year). For 1965-89, the coupon rate was taken from the WEFA database (Source: Treasury Department, *Statement of the Public debt*); for 1947-64, I proxied the coupon rate by the ratio of net interest payments divided to initial publicly-held federal debt. Note that the resulting index closely matches the CRSP-based index for years with relatively complete CRSP price quotes.

Accrued Pension Liabilities: Civil Service (Line 29): Raw data on accrued actuarial liabilities and funding levels were collected from the 1990 *Report of the Civil Service Retirement and Disability Fund*, various earlier Reports, and from the *Annual Report of the Board of Actuaries of the Civil Service Retirement System*, various issues. Until 1972, CSRS actuarial valuations used static estimates—not taking into account inflation and salary growth—with nominal interest rates of 3% until 1962, 3.5% from 1963-69, and 5% for 1970-71. Because of the high discount rates (which are effectively real rates, because inflation is ignored), the official estimates for 1963-71 are far too low. In 1970, the actuarial report acknowledged the undervaluation and indicated how the value would have changed with inflation. Since 1972, actuarial valuations have included dynamic estimates, unfortunately with changing assumptions about the real discount rate. Independently, Leonard (1985) has estimated actuarial values for 1980, based on simulation methods and for alternative real interest rates.

I have used the ratios of Leonard's estimates for different interest rates as correction factors to convert the various official CSRS estimates to a common real rate of 3%. The relatively high real rate of 3% was used because of the arguments made in Section IV: Retirement claims are largely wage-indexed claims that should be discounted at a higher rate than the safe interest rate. (Also, I do not want to overstate the relevance of employee pensions.) Until 1963, the raw data were used. From 1963-69, the estimates were increased to correct for the excessively high nominal rate of 3.5%. For 1970 and 1972, the official dynamic estimates using a 3% real rate were used directly. For 1977-89, the official estimates were converted to a 3% basis using Leonard's sensitivity estimates. For 1971, 1973-76, the official estimates were merely extrapolations of the 1970 and 1972 actuarial valuations. If these data were used, the series would have jumps at the time of new actuarial valuations. Moreover, dynamic estimates were not available for every year. Therefore, data between the major revaluations were interpolated (in real terms, assuming geometric growth) from the 1970, 1972, and 1977 data. Since the official estimates are on a fiscal year basis, the estimates were finally converted to calendar year basis by interpolating the fiscal year values.

In defense of these interpolations and adjustments, note that throughout the sample, the official data are based on periodic actuarial valuations and extrapolations for the years in between. If the true underlying actuarial values change continuously, interpolation may provide better ex post information about the in-between years than the official data that only use information from the earlier valuations. Finally, note that my values for 1963-69 may be somewhat low, because no (or no additional) adjustment was made to reflect the introduction of a COLA clause in 1962. No adjustment was made, because there was also a (costly) change in COLA provisions in 1969, so that it would have been incorrect to interpolate-away the 1969-70 increase in valuations.

Accrued Pension Liabilities: Military (Line 30): The raw data for 1979-89 are from the Treasury's *Statement of Liabilities* and the *Consolidated Financial Statements*, which provide dynamic valuations and various discount rates. (Earlier official data used static valuations and seemed far to low in comparison to other estimates.) In addition, McGill (1979) provides static values for 1970 and 1976, and Munnell and Conolly (1976) estimate a value for 1975, using dynamic methods and a 3%

real rate. Using interest rate sensitivity estimates in Munnell and Conolly (1976), I have converted all raw data to a common 3% real rate and then interpolated the values (in real term, geometrically) for the missing years. (The interest rate conversion factors were very similar to those based on Leonard (1985), which were used for CSRS.) Prior to 1970, extrapolation estimates were produced by assuming a fixed proportion of military to CSRS liabilities, using the ratio of 1970. Since the official estimates are on a fiscal year basis, the estimates were finally converted to calendar year basis by interpolating the fiscal year values.

As this description suggests, the data for the military retirement system are presumably of much lower quality than the CSRS data. For 1979-89, the data are at least based on official estimates, though not well documented ones. For 1970-78, the data are interpolations based on benchmark estimates for 1970, 1975, and 1979. For 1947-69, they are mere extrapolations. Since a static (i.e., relatively low) value was used for the 1970 benchmark estimate and since the ratio of military employment to civilian employment was much higher around World War II and the Korean war period than later, I suspect that the military retirement estimates seriously underestimate the government's true actuarial liabilities for the early years. However, I do not want to make an upward adjustment without good justification, because I do not want to overstate the relevance of employee pensions.

Accrued Pension Liabilities: Other Pension Plans (Line 31): The 1988-89 values were taken at face value from the 1989 *Consolidated Financial Statements* (CFS). The 1982-85 values were taken from various earlier CFS editions. The 1986-87 CFS values were not used, because they apparently included obligations to the Railroad Retirement System. Instead, the 1986-87 values were linearly interpolated from the 1985 and 1988 CFS values in terms of GNP-shares.

Deposit Insurance Guarantees (Line 34): The values for 1985-89 are Kane's (1991) estimates of the aggregate market-value insolvency including disposition cost, interpolated to calendar years. In contrast to Kane, I am excluding the expected future losses of currently solvent S&Ls from the balance sheet estimates. The expected losses for the year ahead are instead treated as part of the primary deficit of that year (see the comments on Table 3 below). For 1989, Kane's August-September data were taken as proxy for the year-end values, assuming that the slight decline in mortgages rates from September to December, which would increase the market value of S&L assets, was roughly offset by a continuing deterioration in asset quality. (A more exact estimation for December 1989 is left for future research, because it would require separate analyses for all the FSLIC successors.)

For earlier years, estimates have been produced by Kane (1985, 1989) and Brumbaugh (1988), but they are not directly comparable to Kane's (1991) most recent estimates. Therefore, I re-estimated the government's net exposure to FSLIC problems for 1965-84 based on data about FSLIC reserves, estimated unbooked aggregate market-value insolvencies of insured institutions, and disposition cost. For the period before 1965 (assuming the FSLIC problems started after that date) and for later years in which FSLIC reserves exceeded the unbooked losses, the government liability was set to zero.

Book values of FSLIC reserves were taken from Kane (1989). Aggregate market value insolvencies for 1965-84 were computed using the method suggested by Brumbaugh (1988, Table 2.7): Total S&L assets were multiplied by a percentage factor that reflects a market-par adjustment on S&L-owned mortgages. For 1980-84, Brumbaugh's percentage factors were used directly. For 1965-79, I used data on mortgage holdings from Kane (1985) and on FHLBB mortgage interest rates to compute market-value estimates in a similar way. (I also assume 12 years to prepayment but take into account that the aggregate S&L mortgage portfolio includes some older mortgages with fewer years to maturity.)

Concerning disposition cost, it seems reasonable to abstract from such additional cost until 1980, assuming S&L assets could be liquidated at market value. After 1980 (and especially 1982), a growing number of S&L institutions were allowed to operate without sufficient capital and they were allowed to hold assets that could not easily be liquidated. Although no detailed estimates are available prior to Kane's 1985 value, disposition cost have to be recognized as part of the government liability for earlier years. For 1980-84, I have therefore used the stock of assets in GAAP insolvent S&L institutions that were allowed to remain open as an indicator of how the problem of disposition costs was growing over time. Thus, disposition cost are assumed to be proportional to the assets of GAAP insolvent S&Ls, where the proportionality factor was determined from Kane's 1985 value.

Guarantees for Other Agencies (Line 35): This line reflects two items. First, the data for 1988-89 reflect the debt of the Farm Credit System Financial Assistance Corporation (FAC) that was created in the context of the 1987 farm credit system bailout. This debt is supposed to be paid off by the industry in the future, but at this point, it is a government liability. (I should acknowledge that I did not examine the 1987 farm credit bailout in detail, which means that I may have missed an additional unbooked government liability during the mid-1980s. CBO (1991a) reports a $4.6 billion cumulative farm credit loss for 1985-87, which may be viewed as an upper bound.)

Second, the series includes the negative net worth of the FOF sector "federally sponsored credit agencies," which is obtained by comparing the private equity in federally sponsored credit agencies (from the FOF) to the market-par adjustment on agency-held mortgages. The market-par adjustment uses Eisner's market-par index for government mortgages explained above (see Line 17). For 1981, where the negative market-par adjustment exceeded the book value of private equity, the resulting negative net worth was entered on the balance sheet as government liability. For all other years, equity at book value (from the FOF) plus market-par adjustment remained positive and no adjustment on the government balance sheet was made. I should acknowledge that an agency-by-agency comparison of equity versus market-par adjustments would probably be more appropriate than the aggregate comparison and that such comparisons might indicate a somewhat larger government exposure. But since the values are rather small, a more detailed analysis is left for future research.

A4. Description of the Income Statements - Tables 3 and 4

Starting from the NIPA budget deficit excluding net interest payments, three adjustments are made, which are shown in Table 3:

Adjustment for tangible assets (Column 3): The decision not to impute a non-zero return on government capital is best explained in a setting where government assets produces public goods or services that are non-marketable and that enter individual utility separably from private consumption. A government decision to purchase or sell such assets has a impact on government finance which is measured by the market price on government assets. This explains why such assets have to be listed on the balance sheet. But the "social" rate of return on such assets may be very different from the rate of return on private assets (or on the government asset if it were in private use), which suggests that any imputed return would be questionable.

To be specific, let $U = u_1(C) + u_2(S)$ be the preferences over private consumption C and government services S, where $S = R^G \cdot K^G$ is the service flow from the stock of government capital. If R is the return on private capital K, and if Y is non-capital income, the national budget constraint will be

$$C + \Delta K + \Delta K^G = Y + R \cdot K. \tag{A15}$$

As this equation shows, the net investment in government capital, ΔK^G, has an opportunity cost in terms of private consumption. Hence, one has to account for government capital on the balance sheet. But the return on government capital R^G is irrelevant for private consumption. Moreover, it may be unnecessary to define R^G, since one can write preferences $u_2(S) = u_2(R^G \cdot K^G) \equiv v(K^G)$ directly in terms of the stock of government capital.

I have defined R^G only to illustrate that it does not have to be related to the private return R in any way: To the extent that government capital yields service flows in terms of non-marketable public goods, the returns on government capital are not comparable to the returns on private capital. It is ultimately an empirical question whether or not government capital yields significant returns in terms of marketable goods which may have to be added on the right hand side of (A15). (An answer is clearly beyond the scope of this paper.) The point here is that any simple imputation of a non-zero rate of return would be questionable.

Given the assumption of a zero real market return on government capital, the NIPA primary balance must be adjusted by adding real net investment at current prices. (One has to add gross capital expenditures, which are included in NIPA outlays, and to subtract the user cost of capital, which is the appropriate measure of current outlays. With a zero real return, the user cost is measured by the depreciation.) For fixed capital investment, real net investment at current prices was computed as the change in real capital stocks (at 1982 prices) multiplied by the price index for capital goods. For inventories, real net investment at current prices was computed as the change in real inventories at constant 1982 cost, multiplied by the price index for inventories. For land and mineral rights, most asset sales and purchases are already excluded from NIPA, except for royalty payments. The NIPA surplus were therefore reduced by the amount of royalty revenues shown in the FOF tables.

Note that readers who wish to impute a non-zero return on government capital may take these calculations as starting point for further adjustments. A primary balance with imputations can be computed by simply subtracting the amount of any imputed real return from the values in Table 3.

Adjustment for employee pension funds (Column 4): To account for federal employee pension funds on an accrual basis, one has to use a charge for accruing pension benefits—the entry-age normal cost—as measure of current outlays instead of the actual pension fund contributions.

For the civilian funds CSRS and FERS, fund contributions were taken from the 1990 *Report of the Civil Service Retirement and Disability Fund* and from earlier *Annual Reports of the Board of Actuaries of the CSRS*. Normal cost charges were obtained by multiplying federal civil service payrolls (from the *Social Security Bulletin, Annual Statistical Supplement 1990*) with the normal cost rate. Raw data for normal cost rates were obtained from the same sources as the raw data for actuarial values (see above) and they are subject to similar data limitations.

For 1954 to the start of indexation in 1962, the official static cost rates were used. For 1970 and 1972, official actuarial estimates for the normal cost rates at a 3% real discount rate were published. Normal cost rates for other years obtained in several steps to assure that the results are consistent with the valuation series using a 3% real discount rate. First, the official 1978 normal cost rate, which is base on a 2% real discount rate, was applied to 1978-82, and the 1987 CSRS cost rate, which also used a 2% real discount rate, was applied for 1983-87 to obtain a consistent series of normal cost rates for 1972-1989 based on 2% real discount rate. Second, using the fact that the 1972 valuation provided normal cost rates at 2% and 3% real interest rates, the series based on a 2% real discount rate was converted to a series consistent with a 3% real discount rate by multiplying with the ratio of the two 1972 cost rates, which is 0.75. The official 1963-1968 cost rates based on static estimates based on a 3.5% discount rate were converted to a 3% discount rate (i.e. down 0.5%) by adding 1/2 of the adjustment between the 2% and 3% rates, i.e. by multiplying the raw cost rate series by by 1.125. The 1969 value was obtained by interpolating the 1968 and 1970 values with 3:1 weights, because a more generous inflation-indexing formula applied for the final quarter of 1969. Finally, for 1946-53, the 1954 cost rate was used, because the pre-1954 rates were based on a discount rate above 3%.

For the military retirement system, fund contributions were taken from the 1992 *Budget of the United States* and interpolated to obtain calendar year values. Total military payrolls were obtained from the *Social Security Bulletin, Annual Statistical Supplement 1990*. Normal cost on basic military pay were taken from Munnell and Conolly (1976) and converted to a change on total military payrolls by multiplying by the 1976 ratio of basic pay to the total military payroll. Since Leonard (1987) estimates similar values, the resulting 26% normal cost charge was applied throughout the 1970-89 period. For 1946-69, normal cost rates for the military were obtained by multiplying the CSRS cost rates by the 1970-ratio of military to CSRS normal cost rates, i.e., by using the same extrapolation as for the values. No adjustment was made for the small "other funds" balance sheet entry.

<u>Adjustment for Credit&Other</u> (Column 5): The adjustment consists of three parts. First, transfers of Federal Reserve earnings to the Treasury are excluded from primary receipts, because they are not an operating item (and perhaps best interpreted as return of interest on Treasury securities).

The second adjustment involves deposit insurance. For accrual accounting, the cost of running an insurance business should be measured by the expected insurance claims over the accounting period rather than the actual outlays. Given that actual deposit insurance losses are already excluded from the NIPA deficit, the main issue is how to estimate the expected losses. Since deposit insurance operated for many year with an insurance premium of 1/12 of 1%, the steady state expected cost for a relatively "well run" insurance system might be very small. Hence, I have not made an adjustment for the period before 1980. Since 1980, expected losses are presumably much larger, because a significant number of S&Ls were allowed to operate with negligible or even negative equity positions. For 1985-89, Kane's (1991) estimates for the expected one-year-ahead FSLIC losses are available and were used. For 1980-84, I use the level of assets in S&Ls with negative GAAP equity as proxy for the insurance fund's expose to undercapitalized S&Ls and I assume that expected losses are proportional this variable in a way that the 1985 value matches Kane's 1985 value: That is, expected cost were estimated as 4.66% of assets in S&Ls with negative GAAP equity, which matches Kane's value of an expected $6 billion loss for 1985.

Third, one has to take issue with the NIPA geographical adjustment to the budget data, which essentially involves Puerto Rico. For the purpose of constructing a complete U.S. government income statement, any such exclusion of receipts and outlays is inappropriate. Since the adjustment amounted to about 0.4% of non-interest outlays in recent years, I have adjusted the primary balance downwards by this fraction to "undo" the NIPA adjustment.

Adjusted Primary balance - all (Column 6): sum of columns 3-6.

Adjusted Primary balance - non-military (Column 7): as column 6, but using only non-military assets in the adjustment for tangible assets.

In Table 4, column 1 shows the change in net worth minus the adjusted primary deficit (from Table 3, line 6 minus line 1). Column 2 shows the change in the value of tangible assets (from Table A1) minus net investment in tangible assets, where net investment is the sum of the NIPA adjustment in Table 3 and the bonus payments on mineral rights (from Boskin et al, 1989, and updated). Column 3 has the sum of all other changes in net worth minus all other components of the primary deficit. Columns 4 and 5 are the ratios of columns 2 and 3 divided by initial tangible assets and by initial net debt, respectively. Columns 6 and 7 deduct the growth in the GNP-deflator from columns 4 and 5, respectively.

Table 1: Variables in the Three-Period Model

Panel A: Flow Variables

Period	Generations:			Government*
	i=0	i=1	i=2	
t=1	(Y_1^0, T_1^0, C_1^0)	(Y_1^1, T_1^1, C_1^1)		G_1
t=2		(Y_2^1, T_2^1, C_2^1)	(Y_2^2, T_2^2, C_2^2)	G_2
t=3			(Y_3^2, T_3^2, C_3^2)	G_3

Panel B: Assets at the start of a period (by holder)

Period	Generations:			Government
	i=0	i=1	i=2	
t=1	(K_0, D_0)	$\overset{x}{\downarrow}$		$-D_0$
t=2		(K_1, D_1)	$\overset{x}{\downarrow}$	$-D_1$
t=3			(K_2, D_2)	$-D_2$

Legend:

The flow variables are: (Y_t^i, T_t^i, C_t^i) = (income, taxes, consumption), and G_t = government spending.

The stock variables are: D_t = government debt, K_t = inventory of goods.

Generation i is born in period t=i. Generations i=1 and i=2 carry assets from period t=i to period t=i+1. Generation i=0 starts out with initial holdings of capital and government debt.

* Tax revenues are omitted in this column since there is not separate symbol.

Table 2: U.S. Government Balance Sheets

Line	Balance Sheet Items	Bohn Dec. 1989	Comparison for 1984: Bohn Dec. 1984	Eisner Dec. 1984	CFS Sept. 1984*
1	Tangible Assets	1699.5	1578.6	1118.0	463.5
2	Financial Assets	454.5	401.1	887.4	473.8
	Liabilities:				
3	Federal Debt at par	**2269.4**	**1376.8**	1376.8	1312.6
4	Funded Gov. Employee Pensions	228.9	130.0	130.0	126.9
5	*Unfunded Gov. Employee Pensions*	983.5	*890.2*	*0.0*	*910.1*
6	*Social Security*	**	**	*0.0*	*1911.8*
7	All Other Liabilities	353.8	151.6	556.5	475.2
8	Net Debt (ND)	**3381.1**	**2147.4**	1175.9	4262.8
9	*Excl. Soc. Sec.&Unfunded Pensions*	2397.6	*1257.2*	*1175.9*	*1440.9*
10	Net Worth (NW)	**-1681.6**	**-568.8**	-57.9	-3799.3

Legend: The table shows my most recent balance sheet estimates and a comparison between my estimates, Eisner's data, and the CFS balance sheets for 1984. Line 8 is the sum of lines 3-7 minus line 2. Line 9 equals line 8 minus lines 5-6. Line 10 equals line 8 minus line 1.

* = The CFS use fiscal years, all other estimates are constructed on a calendar year basis.

** = Estimates will be derived in Section IV, but they are not directly comparable.

Sources: Eisner (1986); Arthur Anderson&Co. (1986); Department of the Treasury, *Consolidated Financial Statements* (CFS); Federal Reserve, *Flow of Funds Statistics*; and own calculations.

Table 3: Primary Balances

Year	Change in Net Worth	Primary Bal. NIPA	Adjustments due to: Tangibles	Pensions	Other	Primary Bal. - adjusted All	Non-mil.
	1	2	3	4	5	6	7
1948	-1.4	12.5	-25.9	-0.5	-0.3	-14.2	10.7
1949	-21.9	1.7	-14.5	-0.6	-0.4	-13.7	2.4
1950	7.7	13.6	-9.7	-0.7	-0.3	2.9	12.5
1951	17.9	11.0	2.0	-1.2	-0.5	11.3	10.2
1952	5.4	0.7	14.0	-1.5	-0.6	12.6	2.8
1953	12.8	-2.6	15.9	-1.6	-0.6	11.1	1.8
1954	11.7	-1.4	11.7	-1.7	-0.6	8.0	1.7
1955	12.5	9.0	8.8	-1.5	-0.6	15.7	10.3
1956	13.2	11.1	3.2	-1.9	-0.7	11.8	9.0
1957	-6.1	7.8	-0.6	-1.7	-0.8	4.7	5.3
1958	-17.5	-5.1	1.2	-1.7	-0.8	-6.5	-4.8
1959	-3.9	5.1	-0.3	-1.9	-1.2	1.6	3.7
1960	-8.5	9.8	0.4	-1.5	-1.2	7.5	8.9
1961	-1.0	2.3	-0.5	-1.4	-1.1	-0.7	0.0
1962	-9.9	2.5	3.2	-1.4	-1.2	3.0	1.4
1963	-3.7	7.6	4.2	-1.8	-1.3	8.7	6.4
1964	-5.9	4.7	0.6	-1.9	-2.0	1.4	1.9
1965	-0.8	9.0	-0.5	-1.8	-1.8	4.9	6.8
1966	-3.0	7.4	0.7	-2.4	-2.1	3.5	2.3
1967	-9.2	-3.3	2.3	-2.5	-2.5	-6.0	-8.2
1968	-6.5	5.2	5.3	-2.9	-3.2	4.5	1.6
1969	1.5	21.1	1.1	-2.5	-3.7	15.9	15.7
1970	-48.1	1.7	-3.5	-2.6	-4.3	-8.7	-6.9
1971	-33.4	-8.2	-2.0	-2.2	-4.2	-16.6	-14.0
1972	-34.0	-2.4	-2.6	-2.3	-4.1	-11.4	-10.2
1973	2.8	12.4	-2.7	-1.3	-5.3	3.2	4.3
1974	56.4	9.1	1.7	0.5	-6.7	4.7	2.5
1975	-88.1	-46.4	6.4	3.3	-6.8	-43.4	-48.4
1976	-59.8	-26.7	4.4	4.3	-7.4	-25.4	-28.3
1977	-9.8	-16.9	7.4	5.6	-7.5	-11.4	-11.9
1978	18.1	5.8	14.4	7.3	-8.7	18.8	10.4
1979	106.5	26.4	15.3	10.0	-11.2	40.5	28.1
1980	92.1	-8.0	19.0	13.9	-14.0	11.0	-2.3

Table 3 (cont.): Primary Balances

Year	Change in Net Worth	Primary Bal. NIPA	Adjustments due to: Tangibles	Pensions	Other	Primary Bal. - adjusted All	Non-mil.
	1	2	3	4	5	6	7
1981	32.1	8.6	26.7	16.3	-17.3	34.2	19.7
1982	-172.7	-61.4	46.6	17.0	-20.3	-18.0	-49.0
1983	-177.7	-81.8	29.5	18.0	-20.8	-55.2	-79.0
1984	-208.8	-53.9	26.2	20.6	-24.2	-31.3	-59.9
1985	-250.3	-66.7	57.6	28.0	-27.3	-8.5	-46.9
1986	-391.4	-71.3	36.2	28.8	-27.2	-33.5	-61.1
1987	-18.9	-15.9	37.7	30.3	-28.6	23.5	-12.9
1988	-245.5	9.6	20.6	30.5	-29.8	30.9	-1.8
1989	-206.7	37.8	43.5	30.9	-32.6	79.6	37.3

Legend: All data are billions of US-dollars. Column 1 is the change in net worth (see Table A1). Column 2-7 are described in the appendix. (Column 6 is the sum of columns 2-5.)

Sources: *National Income and Product Accounts* and own calculations.

Table 4: Returns on Assets and Net Debt

	Return Components:			Rates of Return:			
Year	Total	Tangibles	Net Debt	Nom. Tang.	Nom. ND	Real Tang.	Real ND
	1	2	3	4	5	6	7
1948	12.8	17.4	-4.6	9.1%	2.1%	2.0%	-4.9%
1949	-8.2	-0.6	-7.6	-0.3%	3.6%	0.2%	4.0%
1950	4.8	8.6	-3.8	5.1%	1.7%	3.1%	-0.3%
1951	6.7	8.6	-1.9	5.1%	0.9%	0.3%	-3.9%
1952	-7.2	-0.7	-6.5	-0.4%	3.2%	-1.9%	1.7%
1953	1.7	9.1	-7.4	4.7%	3.5%	3.1%	1.9%
1954	3.7	9.3	-5.6	4.3%	2.5%	2.7%	0.9%
1955	-3.1	3.3	-6.5	1.4%	2.8%	-1.8%	-0.5%
1956	1.4	7.6	-6.2	3.1%	2.7%	-0.3%	-0.7%
1957	-10.8	7.2	-18.0	2.8%	7.8%	-0.8%	4.2%
1958	-11.1	-0.5	-10.5	-0.2%	4.3%	-2.3%	2.3%
1959	-5.4	0.5	-6.0	0.2%	2.3%	-2.3%	-0.3%
1960	-16.1	1.8	-17.9	0.7%	6.8%	-1.0%	5.1%
1961	-0.3	7.1	-7.4	2.6%	2.7%	1.7%	1.7%
1962	-12.9	3.2	-16.1	1.2%	5.7%	-1.1%	3.5%
1963	-12.3	3.5	-15.9	1.2%	5.3%	-0.2%	3.8%
1964	-7.4	4.7	-12.0	1.6%	3.9%	0.0%	2.2%
1965	-5.6	5.3	-10.9	1.8%	3.4%	-0.8%	0.8%
1966	-6.5	7.7	-14.2	2.5%	4.3%	-1.0%	0.8%
1967	-3.2	8.8	-12.0	2.9%	3.5%	0.0%	0.7%
1968	-11.0	6.2	-17.2	1.9%	4.8%	-3.1%	-0.2%
1969	-14.5	22.9	-37.4	6.9%	9.9%	1.5%	4.5%
1970	-39.4	16.1	-55.5	4.5%	13.9%	-1.1%	8.2%
1971	-16.8	25.7	-42.5	7.0%	9.2%	1.4%	3.6%
1972	-22.7	17.9	-40.6	4.6%	7.8%	-0.2%	3.1%
1973	-0.4	44.0	-44.4	10.8%	7.8%	4.3%	1.3%
1974	51.7	99.9	-48.2	22.3%	7.9%	13.3%	-1.0%
1975	-44.6	41.7	-86.3	7.6%	13.3%	-2.3%	3.3%
1976	-34.4	48.1	-82.5	8.0%	10.5%	1.7%	4.1%
1977	1.7	61.9	-60.2	9.5%	6.7%	2.8%	0.0%
1978	-0.7	71.6	-72.3	9.9%	7.4%	2.6%	0.1%
1979	66.0	128.2	-62.2	15.9%	5.9%	7.1%	-2.9%
1980	81.1	207.9	-126.8	21.9%	11.7%	12.8%	2.6%

Table 4 (cont.): Returns on Assets and Net Debt

	Return Components:			Rates of Return:			
Year	Total	Tangibles	Net Debt	Nom. Tang.	Nom. ND	Real Tang.	Real ND
	1	2	3	4	5	6	7
1981	-2.1	216.7	-218.9	18.4%	18.0%	8.8%	8.3%
1982	-154.6	39.4	-194.0	2.8%	13.6%	-3.7%	7.1%
1983	-122.5	6.2	-128.6	0.4%	7.6%	-3.5%	3.8%
1984	-177.5	10.7	-188.1	0.7%	9.9%	-3.0%	6.2%
1985	-241.8	-22.2	-219.6	-1.4%	10.2%	-4.4%	7.2%
1986	-357.9	-139.2	-218.8	-8.6%	9.0%	-11.2%	6.4%
1987	-42.4	26.1	-68.6	1.7%	2.5%	-1.4%	-0.7%
1988	-276.4	-3.5	-272.9	-0.2%	9.7%	-3.5%	6.4%
1989	-286.3	64.1	-350.4	4.0%	11.4%	-0.1%	7.3%

Legend: Returns in columns 1-3 are computed by taking change in net worth, tangible assets, and net debt, respectively, and deducting the corresponding primary component. Columns 1-3 are in billions of US-dollars. The percentage nominal returns in columns 4 and 5 are computed by dividing absolute returns by the corresponding initial stocks; real returns deduct inflation measured by the change in the GNP-deflator.

Sources: Own computations.

Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
1	**Assets**	**221.9**	**217.2**	**202.0**	**208.6**	**226.2**	**240.8**	**266.8**	**284.5**	**299.1**	**309.1**	**316.1**
2	**Tangible Assets**	**192.1**	**183.6**	**168.5**	**167.4**	**178.0**	**191.3**	**216.3**	**237.2**	**249.3**	**260.1**	**266.7**
3	Fixed Capital	101.7	90.6	81.3	80.8	86.8	97.3	106.5	111.9	119.3	128.1	129.9
4	*Equipment*	*56.9*	*44.5*	*36.9*	*34.4*	*35.7*	*43.0*	*50.9*	*55.7*	*60.0*	*64.6*	*64.9*
5	*Structures*	*44.8*	*46.1*	*44.4*	*46.4*	*51.1*	*54.3*	*55.6*	*56.2*	*59.3*	*63.5*	*65.0*
6	Inventories	42.5	32.6	28.0	25.2	26.6	31.5	43.1	55.2	59.3	59.3	57.6
7	Land	8.3	9.0	9.2	11.6	13.5	10.9	10.8	11.6	12.3	13.5	14.5
8	Mineral Rights	39.5	51.3	50.1	49.8	51.1	51.7	55.9	58.6	58.5	59.2	64.8
9	**Financial Assets**	**29.9**	**33.6**	**33.5**	**41.2**	**48.3**	**49.5**	**50.5**	**47.2**	**49.8**	**49.0**	**49.3**
10	Cash	3.8	5.0	5.4	5.1	5.3	7.8	6.2	5.9	5.7	5.3	5.4
11	Other Monetary Assets	1.3	1.7	1.9	1.6	1.6	1.6	1.5	1.3	1.2	1.8	2.1
12	Accounts Receivable	10.6	11.4	9.1	16.9	22.9	20.2	20.8	18.0	20.5	18.7	16.7
13	*Taxes*	*10.6*	*11.4*	*9.1*	*16.5*	*21.6*	*18.0*	*18.5*	*15.5*	*18.2*	*16.4*	*14.4*
14	*Trade Credit*				*0.4*	*1.3*	*2.3*	*2.2*	*2.4*	*2.3*	*2.3*	*2.3*
15	Loans and Mortgages	12.6	13.9	15.3	16.0	17.3	18.8	20.8	20.5	21.1	21.8	22.4
16	*Par Values*	*12.6*	*13.9*	*15.3*	*16.0*	*17.3*	*18.8*	*20.8*	*20.5*	*21.1*	*21.8*	*22.4*
17	*Mortgages: Market-par Adj.*											
18	Federal Reserve-Net Value	0.3	0.4	0.6	0.3	-0.1	-0.1	0.1	0.2	-0.3	-0.9	-0.2
19	*Gold: Market-par Adj.*											
20	*Securities: Market-par Adj.*	*0.3*	*0.4*	*0.6*	*0.3*	*-0.1*	*-0.1*	*0.1*	*0.2*	*-0.3*	*-0.9*	*-0.2*
21	Miscellaneous	1.3	1.2	1.3	1.3	1.2	1.2	1.2	1.3	1.7	2.2	2.9

Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
22	**Liabilities**	**249.8**	**246.5**	**253.1**	**252.0**	**251.8**	**261.0**	**274.1**	**280.2**	**282.3**	**279.1**	**292.1**
23	Treasury Currency&SDR Cert.	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.6
24	Accounts Payable				1.1	2.7	2.8	2.6	2.4	2.3	2.6	2.8
25	**Federal Debt**	223.3	217.9	222.9	218.8	215.5	220.7	229.0	232.1	227.8	218.1	220.7
26	***Par Value***	***220.8***	***215.1***	***217.7***	***216.5***	***216.1***	***221.4***	***228.4***	***230.8***	***230.0***	***224.2***	***222.0***
27	*Market-Par Adjustment*	*2.5*	*2.8*	*5.2*	*2.3*	*-0.5*	*-0.7*	*0.6*	*1.2*	*-2.3*	*-6.1*	*-1.3*
28	Accrued Pension Liabilities	14.4	16.5	18.6	20.5	21.7	26.0	31.1	34.8	41.7	47.7	58.2
29	*Civil Service*	*7.4*	*8.6*	*9.6*	*10.6*	*11.3*	*13.4*	*16.1*	*18.0*	*21.6*	*24.7*	*30.2*
30	*Military*	*6.9*	*8.0*	*9.0*	*9.9*	*10.5*	*12.5*	*15.0*	*16.8*	*20.1*	*23.0*	*28.0*
31	*Other Pension Plans*											
32	Life Insurance Reserves	5.4	5.6	5.7	6.0	6.1	6.2	6.3	6.0	5.8	6.1	6.2
33	Current Value of Guarantees											
34	*Deposit Insurance*											
35	*Other Agencies*											
36	Miscellaneous	4.3	4.0	3.6	3.3	3.3	2.9	2.7	2.5	2.2	2.0	1.7
37	**Net Debt**	**219.9**	**212.8**	**219.7**	**210.9**	**203.5**	**211.4**	**223.6**	**232.9**	**232.5**	**230.1**	**242.8**
38	**Net Worth**	**-27.8**	**-29.3**	**-51.2**	**-43.5**	**-25.5**	**-20.1**	**-7.3**	**4.3**	**16.9**	**30.0**	**23.9**
MEMO: Military assets included above:												
39	Tangible Military Assets	111.0	89.1	73.4	67.8	71.5	82.4	97.6	109.2	116.0	122.0	122.1
40	Fixed Capital	70.6	59.5	50.9	49.0	52.2	59.3	66.0	69.9	74.5	80.2	81.1
41	*Equipment*	*50.7*	*38.8*	*31.5*	*28.9*	*29.9*	*36.1*	*42.9*	*46.9*	*49.9*	*53.5*	*53.4*
42	*Structures*	*19.9*	*20.7*	*19.4*	*20.1*	*22.3*	*23.2*	*23.1*	*23.0*	*24.6*	*26.7*	*27.7*
43	Inventories	40.4	29.6	22.5	18.8	19.3	23.1	31.6	39.3	41.5	41.8	41.0
44	Tangible assets excl. military	81.0	94.5	95.1	99.6	106.5	108.9	118.6	128.1	133.3	138.2	144.7
45	Net worth excl. military	-138.9	-118.3	-124.6	-111.2	-97.0	-102.5	-105.0	-104.9	-99.2	-91.9	-98.1

Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1	**Assets**	**315.0**	**319.6**	**324.0**	**333.0**	**343.2**	**354.4**	**363.3**	**370.7**	**384.1**	**396.5**	**415.9**
2	**Tangible Assets**	**267.4**	**267.6**	**269.9**	**276.4**	**282.8**	**290.6**	**295.9**	**300.7**	**309.1**	**320.3**	**331.8**
3	Fixed Capital	130.1	130.9	132.8	137.8	142.9	148.0	152.7	158.2	166.1	172.2	180.5
4	*Equipment*	*64.5*	*64.6*	*65.6*	*68.3*	*71.0*	*73.7*	*76.0*	*78.1*	*81.9*	*84.9*	*87.8*
5	*Structures*	*65.6*	*66.3*	*67.2*	*69.5*	*71.9*	*74.3*	*76.7*	*80.1*	*84.2*	*87.3*	*92.7*
6	Inventories	57.8	56.7	54.5	52.6	52.4	53.4	53.1	51.2	49.5	51.8	54.0
7	Land	15.3	16.7	18.5	20.7	22.3	24.0	25.7	27.4	29.7	31.8	33.8
8	Mineral Rights	64.2	63.3	64.0	65.3	65.3	65.2	64.4	63.9	63.9	64.4	63.5
9	**Financial Assets**	**47.6**	**52.0**	**54.2**	**56.6**	**60.3**	**63.8**	**67.5**	**70.0**	**74.9**	**76.3**	**84.2**
10	Cash	5.8	6.4	7.4	7.3	8.4	7.9	8.4	7.0	6.6	7.8	5.5
11	Other Monetary Assets	2.0	2.1	1.7	1.9	1.2	1.2	1.0	1.4	0.9	1.3	3.3
12	Accounts Receivable	13.7	15.8	14.5	14.9	15.7	18.0	18.5	20.1	20.0	16.4	18.0
13	*Taxes*	*12.0*	*14.1*	*12.7*	*13.2*	*13.7*	*15.5*	*15.7*	*17.0*	*15.7*	*10.5*	*11.6*
14	*Trade Credit*	*1.7*	*1.7*	*1.8*	*1.8*	*2.0*	*2.5*	*2.7*	*3.1*	*4.4*	*5.8*	*6.4*
15	Loans and Mortgages	23.9	25.7	26.7	28.4	30.4	31.9	34.7	37.2	42.6	47.2	52.0
16	*Par Values*	*23.9*	*25.7*	*26.7*	*28.4*	*30.4*	*31.9*	*34.7*	*37.6*	*42.7*	*47.3*	*52.3*
17	*Mortgages: Market-par Adj.*								*-0.4*		*-0.1*	*-0.3*
18	Federal Reserve-Net Value	-0.9	-1.4	-0.2	-0.5	-0.2	-0.6	-0.6	-1.2	-1.0	-2.0	
19	*Gold: Market-par Adj.*											2.3
20	*Securities: Market-par Adj.*	*-0.9*	*-1.4*	*-0.2*	*-0.5*	*-0.2*	*-0.6*	*-0.6*	*-1.2*	*-1.0*	*-2.0*	*-2.3*
21	Miscellaneous	3.2	3.4	4.1	4.5	4.9	5.3	5.3	5.4	5.8	5.6	5.4

Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
22	**Liabilities**	**308.6**	**317.1**	**330.1**	**340.0**	**360.1**	**375.0**	**389.8**	**397.9**	**414.4**	**436.1**	**461.9**
23	Treasury Currency&SDR Cert.	2.6	2.6	2.7	2.7	2.8	2.8	2.8	3.1	4.0	4.6	5.1
24	Accounts Payable	2.8	2.9	3.4	3.6	4.1	4.4	4.5	5.0	5.8	6.5	6.5
25	**Federal Debt**	224.7	227.9	234.5	239.8	249.2	250.9	257.4	256.2	261.2	269.7	282.0
26	***Par Value***	***231.3***	***238.3***	***236.3***	***243.5***	***250.5***	***254.4***	***260.7***	***262.4***	***266.1***	***279.1***	***292.6***
27	*Market-Par Adjustment*	*-6.5*	*-10.4*	*-1.7*	*-3.7*	*-1.3*	*-3.5*	*-3.3*	*-6.2*	*-4.9*	*-9.4*	*-10.6*
28	Accrued Pension Liabilities	70.7	75.9	81.9	86.3	96.6	109.4	117.7	126.0	135.4	147.0	160.0
29	*Civil Service*	*36.6*	*39.4*	*42.4*	*44.7*	*50.1*	*56.7*	*61.0*	*65.3*	*70.2*	*76.2*	*82.9*
30	*Military*	*34.1*	*36.6*	*39.5*	*41.6*	*46.5*	*52.7*	*56.7*	*60.7*	*65.2*	*70.8*	*77.1*
31	*Other Pension Plans*											
32	Life Insurance Reserves	6.2	6.3	6.4	6.5	6.6	6.8	6.9	7.0	7.1	7.2	7.2
33	Current Value of Guarantees											
34	*Deposit Insurance*											
35	*Other Agencies*											
36	Miscellaneous	1.5	1.3	1.2	1.0	0.8	0.7	0.6	0.6	0.8	1.0	1.2
37	**Net Debt**	**261.0**	**265.1**	**275.9**	**283.5**	**299.7**	**311.2**	**322.4**	**328.0**	**339.4**	**359.8**	**377.8**
38	**Net Worth**	**6.4**	**2.5**	**-6.0**	**-7.0**	**-16.9**	**-20.6**	**-26.5**	**-27.3**	**-30.3**	**-39.5**	**-46.0**
MEMO: Military assets included above:												
39	Tangible Military Assets	120.8	119.2	117.8	118.3	121.3	125.4	127.2	127.6	131.5	137.2	141.1
40	Fixed Capital	81.2	81.5	82.3	85.4	89.0	92.2	94.1	96.0	99.1	101.9	105.5
41	*Equipment*	*53.1*	*53.0*	*53.6*	*56.1*	*58.9*	*61.5*	*63.1*	*64.1*	*66.4*	*68.3*	*70.3*
42	*Structures*	*28.1*	*28.5*	*28.7*	*29.3*	*30.1*	*30.7*	*31.0*	*31.9*	*32.7*	*33.6*	*35.2*
43	Inventories	39.6	37.7	35.5	32.9	32.3	33.2	33.1	31.6	32.4	35.3	35.6
44	Tangible assets excl. military	146.6	148.4	152.0	158.2	161.6	165.2	168.7	173.1	177.6	183.1	190.7
45	Net worth excl. military	-114.4	-116.7	-123.9	-125.3	-138.2	-146.0	-153.7	-154.8	-161.8	-176.7	-187.1

Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	**Assets**	**440.0**	**457.8**	**488.6**	**509.2**	**566.2**	**695.8**	**745.4**	**818.1**	**901.6**	**1022.8**	**1257.4**
2	**Tangible Assets**	**355.8**	**368.4**	**392.1**	**407.5**	**448.8**	**550.5**	**598.6**	**651.1**	**720.3**	**806.4**	**949.8**
3	Fixed Capital	189.8	201.0	210.8	223.2	241.9	277.1	292.3	313.1	335.2	377.8	428.7
4	*Equipment*	*90.3*	*95.0*	*97.1*	*100.2*	*104.6*	*113.8*	*123.2*	*132.7*	*142.7*	*160.8*	*184.6*
5	*Structures*	*99.5*	*106.0*	*113.7*	*123.0*	*137.3*	*163.3*	*169.1*	*180.4*	*192.5*	*217.0*	*244.1*
6	Inventories	60.2	58.8	58.2	56.2	57.7	68.8	72.9	78.5	88.1	99.8	118.7
7	Land	40.2	42.4	53.0	60.3	74.8	86.4	93.9	103.9	121.6	141.3	154.1
8	Mineral Rights	65.6	66.2	70.0	67.7	74.4	118.2	139.5	155.6	175.4	187.4	248.3
9	**Financial Assets**	**84.3**	**89.4**	**96.5**	**101.7**	**117.4**	**145.3**	**146.8**	**167.1**	**181.2**	**216.4**	**307.6**
10	Cash	7.1	10.3	13.7	13.9	13.1	8.7	11.7	15.7	15.5	19.6	20.2
11	Other Monetary Assets	4.7	3.6	2.2	2.6	2.9	4.3	4.6	7.0	7.6	5.4	5.3
12	Accounts Receivable	15.8	12.2	12.0	10.5	12.3	13.1	12.3	16.2	13.4	16.9	16.7
13	*Taxes*	*8.4*	*5.7*	*7.1*	*6.4*	*8.0*	*7.8*	*5.8*	*9.2*	*7.2*	*7.9*	*5.4*
14	*Trade Credit*	*7.3*	*6.6*	*4.9*	*4.0*	*4.3*	*5.3*	*6.5*	*6.9*	*6.2*	*8.9*	*11.3*
15	Loans and Mortgages	55.0	57.9	60.3	62.2	64.6	71.7	85.6	93.5	103.4	119.2	136.6
16	*Par Values*	*55.4*	*58.2*	*60.3*	*62.2*	*64.9*	*72.2*	*85.8*	*93.7*	*103.6*	*120.6*	*140.0*
17	*Mortgages: Market-par Adj.*	*-0.4*	*-0.3*	*-0.1*		*-0.2*	*-0.4*	*-0.2*	*-0.2*	*-0.1*	*-1.4*	*-3.4*
18	Federal Reserve-Net Value	-3.8	-0.3	2.5	6.6	17.6	40.5	26.5	27.6	33.5	46.9	119.3
19	*Gold: Market-par Adj.*	*0.2*	*0.9*	*2.6*	*7.5*	*19.4*	*42.0*	*27.1*	*25.6*	*34.2*	*50.9*	*124.4*
20	*Securities: Market-par Adj.*	*-4.0*	*-1.2*	*-0.1*	*-0.9*	*-1.9*	*-1.6*	*-0.6*	*2.0*	*-0.7*	*-4.0*	*-5.1*
21	Miscellaneous	5.5	5.7	5.8	5.9	6.9	7.0	6.1	7.1	7.8	8.5	9.5

Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
22	**Liabilities**	**484.6**	**550.5**	**614.6**	**669.2**	**723.5**	**796.7**	**934.3**	**1066.9**	**1160.1**	**1263.2**	**1391.3**
23	Treasury Currency&SDR Cert.	5.3	6.0	6.4	7.0	7.4	7.7	8.7	9.9	10.2	10.7	12.3
24	Accounts Payable	6.4	5.4	4.4	4.6	5.7	6.7	9.0	13.7	15.5	19.0	20.0
25	**Federal Debt**	272.2	296.0	325.2	337.3	342.4	355.3	444.0	524.5	569.5	607.4	639.6
26	***Par Value***	***289.0***	***300.8***	***325.7***	***340.8***	***349.1***	***360.8***	***446.3***	***515.8***	***572.5***	***626.2***	***663.6***
27	*Market-Par Adjustment*	*-16.8*	*-4.8*	*-0.5*	*-3.5*	*-6.7*	*-5.5*	*-2.3*	*8.8*	*-3.1*	*-18.8*	*-24.0*
28	Accrued Pension Liabilities	189.3	231.5	270.4	312.5	357.4	409.0	457.9	502.0	549.9	600.0	669.3
29	*Civil Service*	*98.1*	*122.3*	*147.3*	*170.9*	*194.1*	*223.8*	*255.0*	*282.9*	*309.0*	*333.1*	*368.6*
30	*Military*	*91.2*	*109.2*	*123.2*	*141.6*	*163.4*	*185.2*	*202.9*	*219.2*	*240.9*	*266.9*	*300.7*
31	*Other Pension Plans*											
32	Life Insurance Reserves	7.3	7.4	7.4	7.6	7.8	7.9	8.0	8.2	8.4	8.7	9.0
33	Current Value of Guarantees	3.2	3.9	0.4		2.5	8.3	5.7	7.8	6.6	17.4	41.1
34	*Deposit Insurance*	*3.2*	*3.9*	*0.4*		*2.5*	*8.3*	*5.7*	*7.8*	*6.6*	*17.4*	*41.1*
35	*Other Agencies*											
36	Miscellaneous	0.9	0.3	0.3	0.3	0.3	1.7	1.2	0.7	0.0	0.0	0.0
37	**Net Debt**	**400.3**	**461.0**	**518.1**	**567.5**	**606.1**	**651.4**	**787.5**	**899.8**	**978.8**	**1046.7**	**1083.7**
38	**Net Worth**	**-44.5**	**-92.6**	**-126.0**	**-160.0**	**-157.3**	**-100.9**	**-188.9**	**-248.7**	**-258.5**	**-240.4**	**-133.9**
MEMO: Military assets included above:												
39	Tangible Military Assets	151.5	157.4	160.2	165.9	177.6	202.7	208.9	221.5	233.0	259.3	302.3
40	Fixed Capital	110.2	116.6	119.9	126.8	137.5	153.3	159.2	172.7	182.1	202.7	234.4
41	*Equipment*	*72.4*	*76.6*	*78.6*	*81.8*	*86.0*	*93.2*	*101.4*	*110.4*	*118.4*	*133.5*	*154.9*
42	*Structures*	*37.8*	*40.0*	*41.3*	*45.0*	*51.5*	*60.1*	*57.8*	*62.3*	*63.7*	*69.2*	*79.5*
43	Inventories	41.3	40.8	40.3	39.1	40.1	49.4	49.7	48.8	50.9	56.6	67.9
44	Tangible assets excl. military	204.3	211.0	231.9	241.6	271.2	347.7	389.6	429.5	487.4	547.1	647.6
45	Net worth excl. military	-196.0	-250.1	-286.2	-325.9	-334.9	-303.6	-397.9	-470.3	-491.5	-499.7	-436.1

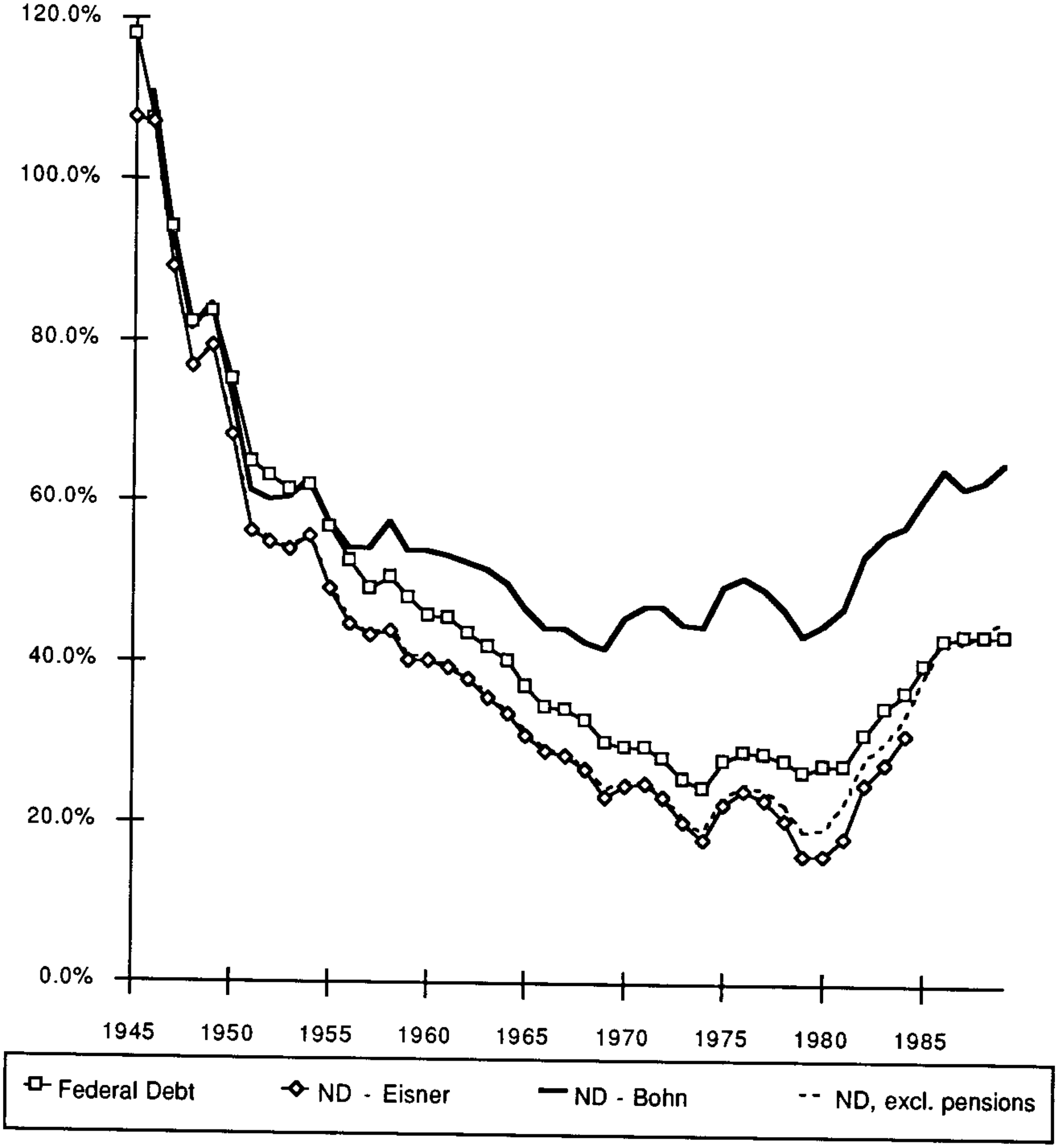
Table A1: Balance Sheets of the U.S. Government: 1947-89

Line	Entry Year:	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	**Assets**	**1538.6**	**1764.3**	**1879.2**	**1923.4**	**1979.7**	**2067.6**	**2000.2**	**2071.0**	**2052.9**	**2153.9**
2	**Tangible Assets**	**1176.7**	**1420.1**	**1506.1**	**1541.7**	**1578.6**	**1614.0**	**1511.0**	**1574.8**	**1591.9**	**1699.5**
3	Fixed Capital	485.5	533.4	572.1	609.0	633.4	688.7	720.6	749.5	793.0	834.6
4	*Equipment*	*213.7*	*246.8*	*282.8*	*310.2*	*331.2*	*362.2*	*384.8*	*404.2*	*430.3*	*456.3*
5	*Structures*	*271.8*	*286.6*	*289.3*	*298.8*	*302.2*	*326.5*	*335.8*	*345.3*	*362.7*	*378.3*
6	Inventories	135.6	149.1	171.9	174.0	185.7	202.5	199.1	205.6	207.6	216.0
7	Land	175.0	214.0	210.3	223.6	237.4	231.3	247.8	265.5	279.4	295.8
8	Mineral Rights	380.7	523.5	551.8	535.1	522.1	491.5	343.5	354.2	311.9	353.1
9	**Financial Assets**	**361.9**	**344.1**	**373.1**	**381.7**	**401.1**	**453.7**	**489.2**	**496.2**	**461.0**	**454.5**
10	Cash	17.0	18.0	25.6	17.1	23.0	35.2	34.3	23.1	33.5	27.4
11	Other Monetary Assets	10.6	13.8	17.1	19.0	20.3	25.1	28.0	29.1	28.0	31.7
12	Accounts Receivable	28.2	20.9	19.9	30.9	41.1	40.7	41.2	56.3	55.6	57.5
13	*Taxes*	*13.1*	*3.2*	*-2.5*	*4.7*	*9.8*	*5.7*	*8.6*	*15.3*	*14.5*	*13.4*
14	*Trade Credit*	*15.1*	*17.6*	*22.4*	*26.2*	*31.3*	*35.0*	*32.6*	*41.0*	*41.1*	*44.1*
15	Loans and Mortgages	158.5	179.4	199.6	211.9	229.0	250.2	258.5	243.3	219.6	207.6
16	*Par Values*	*163.8*	*187.8*	*203.6*	*213.2*	*230.1*	*248.6*	*255.3*	*240.0*	*217.6*	*207.1*
17	*Mortgages: Market-par Adj.*	*-5.3*	*-8.3*	*-4.0*	*-1.3*	*-1.1*	*1.5*	*3.2*	*3.3*	*2.0*	*0.5*
18	Federal Reserve-Net Value	137.7	101.2	98.6	89.9	72.8	86.2	110.4	126.3	104.0	109.0
19	*Gold: Market-par Adj.*	*144.7*	*107.7*	*94.3*	*89.9*	*69.9*	*73.6*	*91.5*	*116.5*	*98.6*	*96.1*
20	*Securities: Market-par Adj.*	*-7.1*	*-6.5*	*4.3*		*2.9*	*12.6*	*19.0*	*9.8*	*5.4*	*12.8*
21	Miscellaneous	10.0	10.8	12.3	12.9	14.9	16.3	16.8	18.1	20.2	21.3

Table A1: Balance Sheets of the U.S. Government: 1947-89

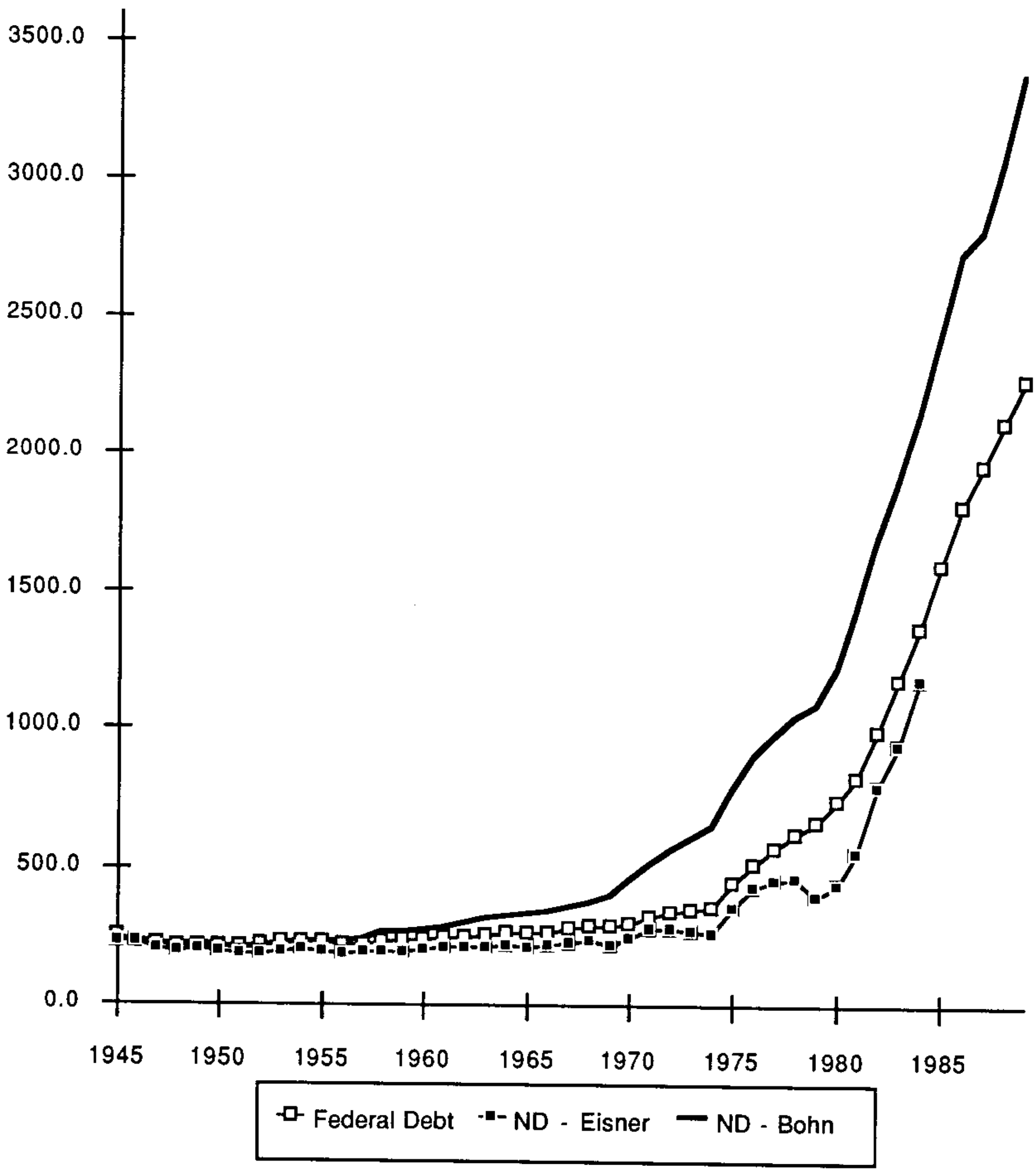
Line	Entry Year:	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
22	**Liabilities**	**1580.4**	**1774.0**	**2061.5**	**2283.4**	**2548.6**	**2886.7**	**3210.6**	**3300.3**	**3527.8**	**3835.5**
23	Treasury Currency&SDR Cert.	13.6	14.8	16.5	16.9	17.5	18.0	18.8	19.2	19.8	23.8
24	Accounts Payable	21.3	21.8	23.7	26.7	29.9	34.6	44.4	46.6	48.7	52.6
25	**Federal Debt**	705.7	793.8	1019.1	1177.9	1399.4	1703.1	1974.4	2039.6	2163.1	2387.9
26	***Par Value***	***742.8***	***830.1***	***991.4***	***1177.9***	***1376.8***	***1600.4***	***1815.4***	***1960.3***	***2117.8***	***2269.4***
27	*Market-Par Adjustment*	*-37.0*	*-36.3*	*27.7*	*-0.1*	*22.7*	*102.7*	*159.0*	*79.3*	*45.3*	*118.5*
28	Accrued Pension Liabilities	760.0	818.5	892.8	975.4	1020.2	1031.6	1050.2	1069.7	1124.9	1212.4
29	*Civil Service*	*419.8*	*448.0*	*478.0*	*526.9*	*549.0*	*564.8*	*577.3*	*590.9*	*630.5*	*679.0*
30	*Military*	*340.2*	*370.5*	*406.1*	*432.1*	*453.0*	*448.1*	*453.7*	*459.0*	*473.6*	*512.4*
31	*Other Pension Plans*			*8.8*	*16.4*	*18.2*	*18.7*	*19.3*	*19.8*	*20.8*	*21.0*
32	Life Insurance Reserves	9.1	9.3	9.5	9.7	9.9	10.2	10.5	10.8	11.1	11.5
33	Current Value of Guarantees	70.7	115.7	99.9	76.8	71.6	89.2	112.4	113.1	154.4	154.0
34	*Deposit Insurance*	*70.7*	*114.7*	*99.9*	*76.8*	*71.6*	*89.2*	*112.4*	*113.1*	*153.7*	*153.1*
35	*Other Agencies*		*0.9*							*0.7*	*0.8*
36	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	5.8	-6.5
37	**Net Debt**	**1218.5**	**1429.8**	**1688.4**	**1901.7**	**2147.4**	**2433.1**	**2721.5**	**2804.2**	**3066.7**	**3381.1**
38	**Net Worth**	**-41.8**	**-9.7**	**-182.4**	**-360.0**	**-568.8**	**-819.1**	**-1210.5**	**-1229.4**	**-1474.9**	**-1681.6**
MEMO: Military assets included above:											
39	Tangible Military Assets	341.9	373.4	417.4	449.8	486.3	540.2	567.3	593.8	638.7	676.9
40	Fixed Capital	268.6	297.8	330.6	358.6	375.6	416.7	441.4	457.6	488.6	509.9
41	*Equipment*	*180.0*	*209.8*	*243.7*	*269.9*	*289.8*	*318.4*	*339.6*	*356.3*	*378.8*	*397.7*
42	*Structures*	*88.6*	*88.0*	*86.9*	*88.7*	*85.8*	*98.3*	*101.8*	*101.3*	*109.8*	*112.2*
43	Inventories	73.3	75.6	86.8	91.2	110.7	123.5	125.9	136.2	150.1	167.0
44	Tangible assets excl. military	834.8	1046.7	1088.7	1091.9	1092.4	1073.8	943.7	981.0	953.2	1022.5
45	Net worth excl. military	-383.7	-383.1	-599.7	-809.9	-1055.1	-1359.3	-1777.8	-1823.2	-2113.6	-2358.5

Figure 1: Net Government Debt and Federal Debt - GNP-shares



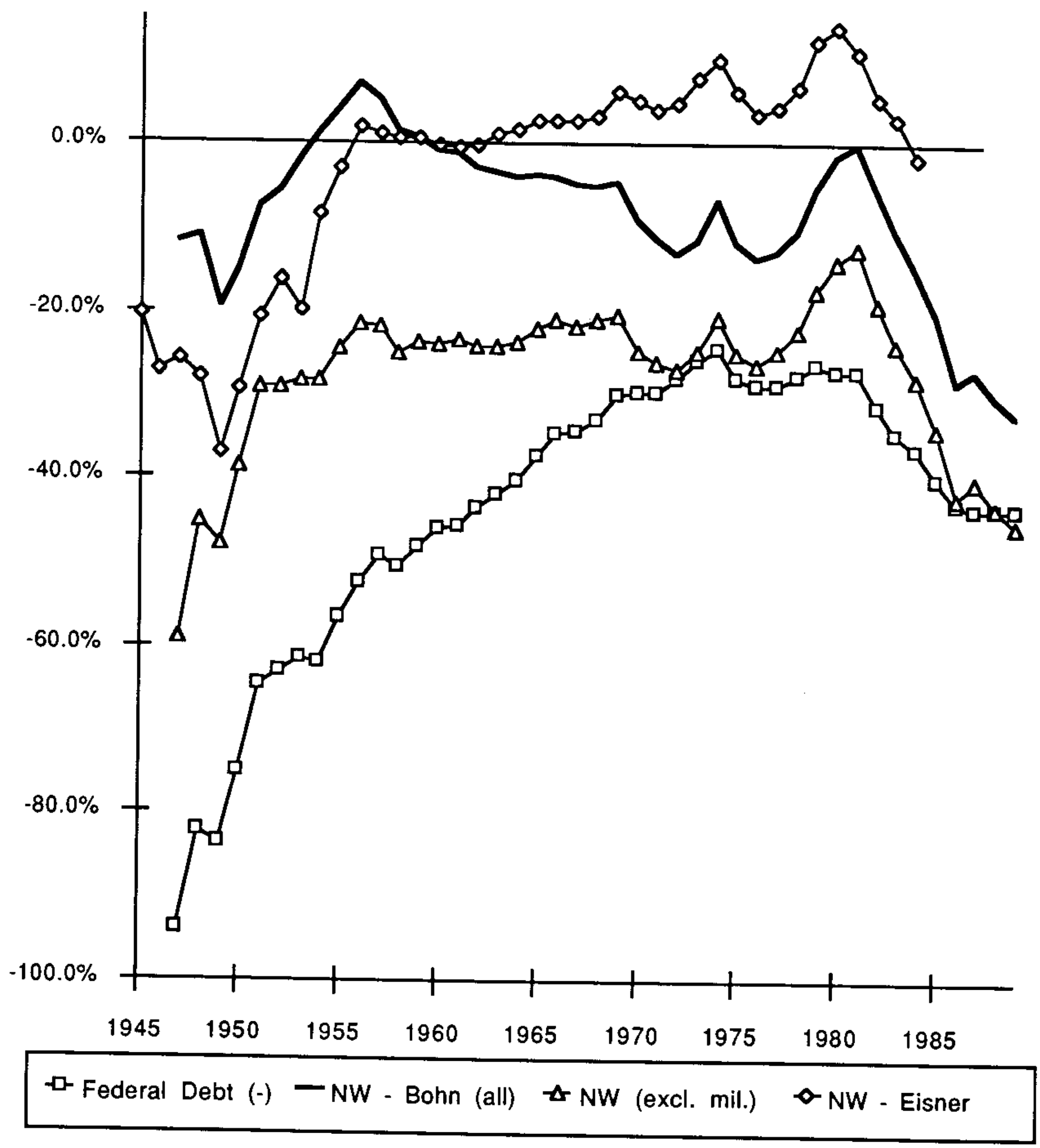
Note: The series "ND-Bohn" is the complete series for government net debt; "excl. pensions" refers to the net worth series excluding unfunded government employee pensions.
Sources: Federal Reserve Flow of Funds Statistics, Eisner (1986), and own calculations (see the appendix and Table A1).

Figure 2: Net Government Debt and Federal Debt - Nominal $bill.



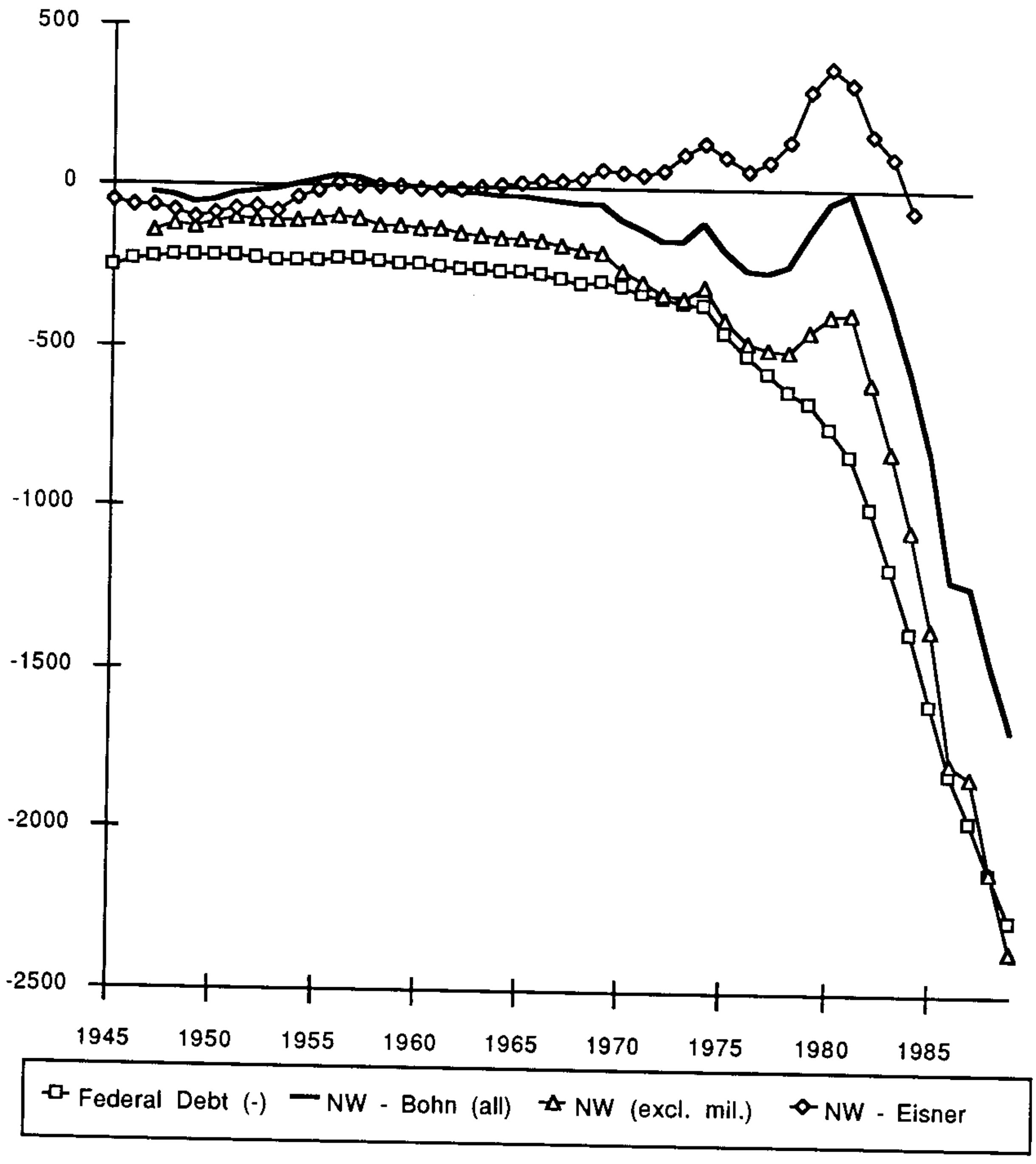
Notes and Sources: See Figure 1.

Figure 3: Government Net Worth - GNP-shares



Note: The series "NW-Bohn (all)" is the complete series for government net debt; "excl. mil." refers to the net worth series excluding fixed military capital and military inventories.
Sources: Federal Reserve Flow of Funds Statistics, Eisner (1986), and own calculations (see the appendix and Table A1).

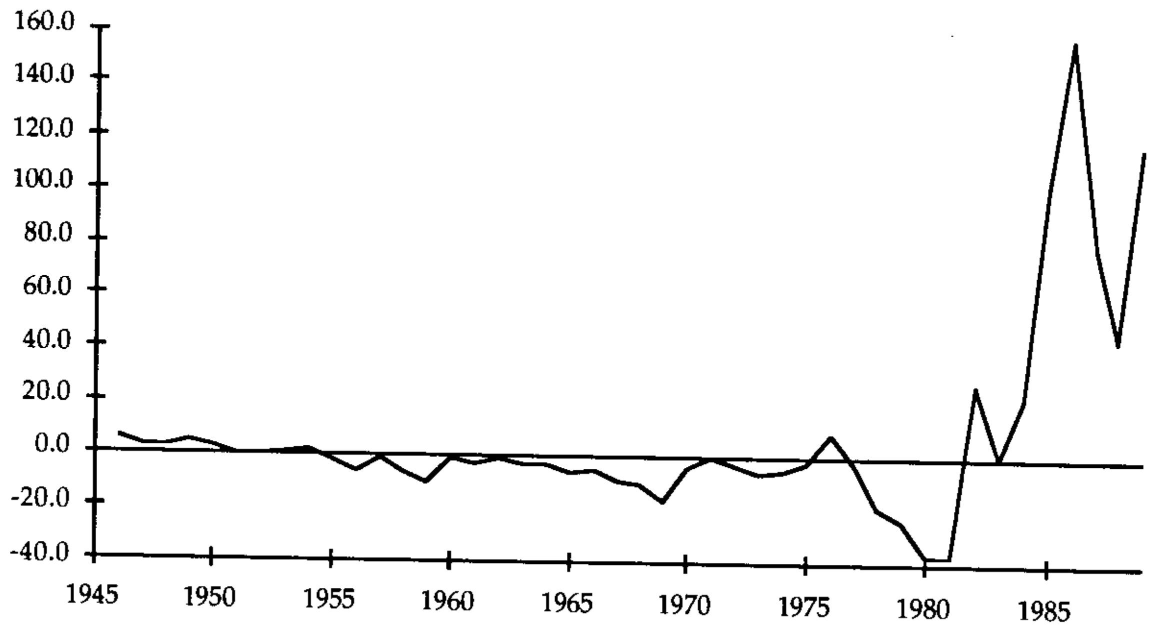
Figure 4: Government Net Worth - Nominal $bill.



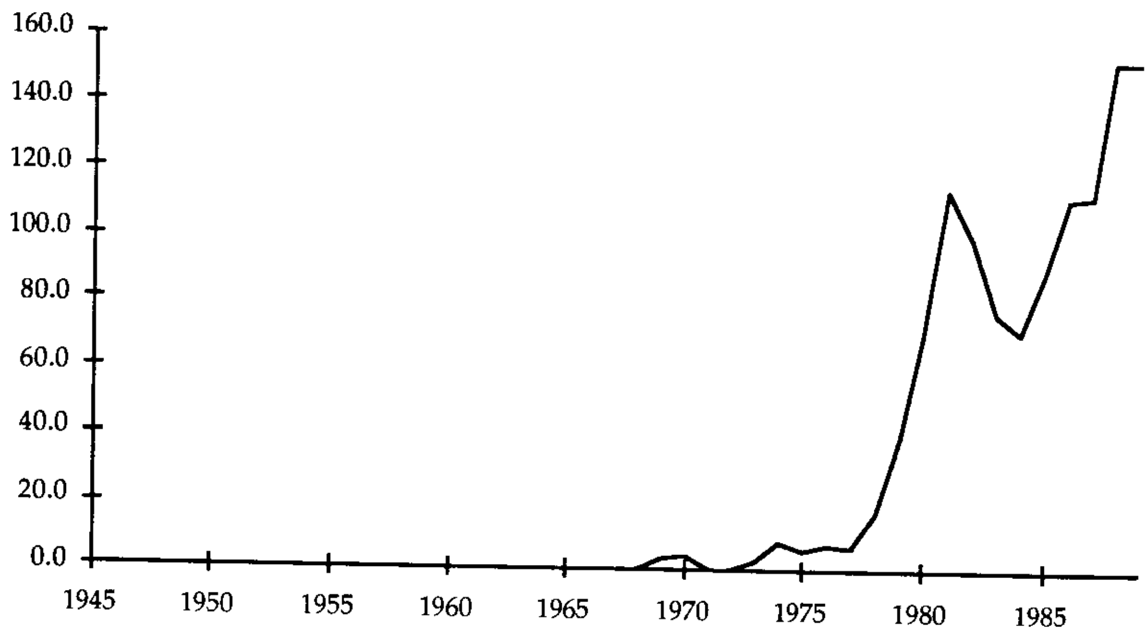
Notes and Sources: See Figure 3.

Figure 5: Market-Par Adjustments

(a) Market-par Adjustment on Publicly-held Federal Debt

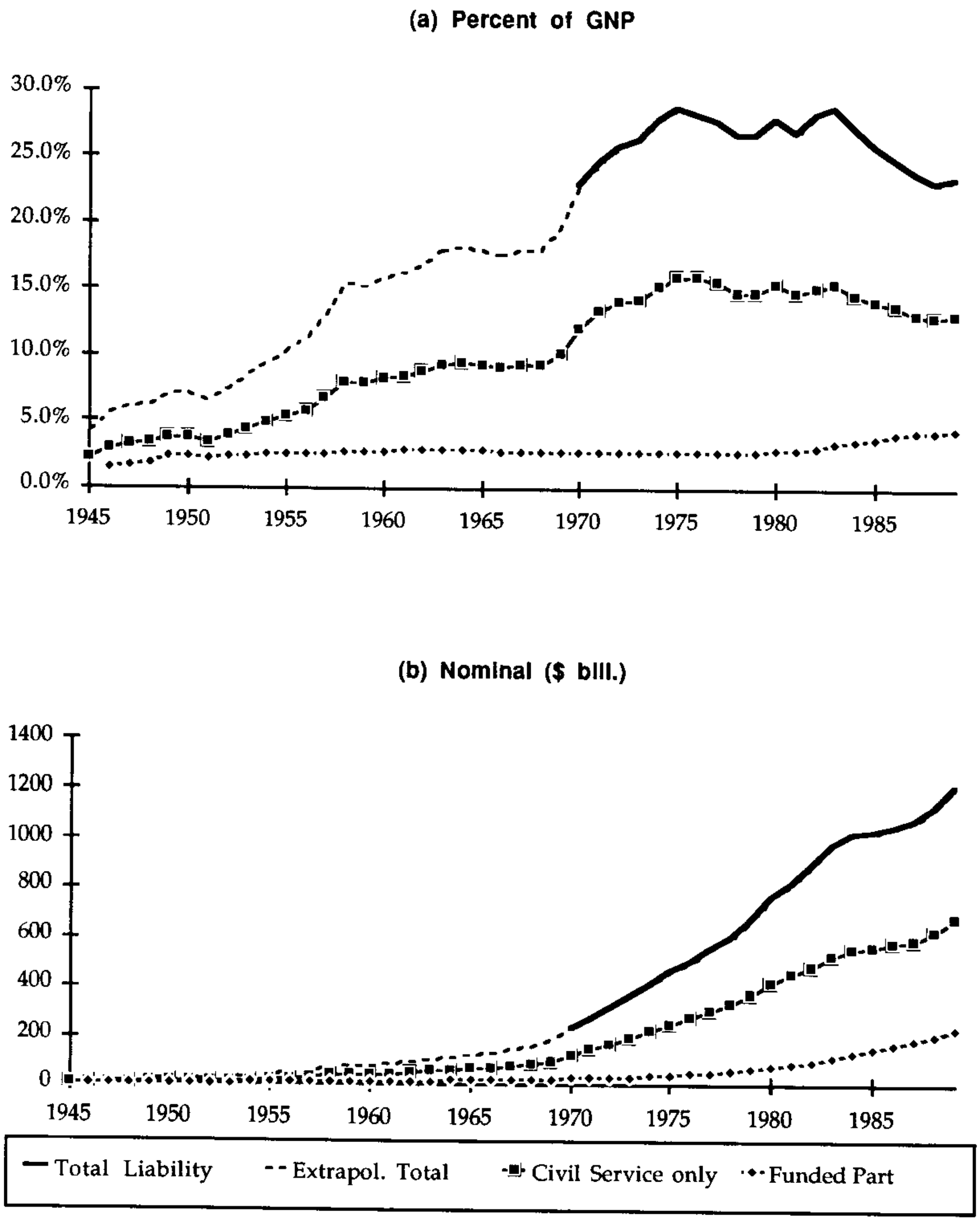


(b) Deposit Insurance Liabilities



Source: Own computations, see the appendix.

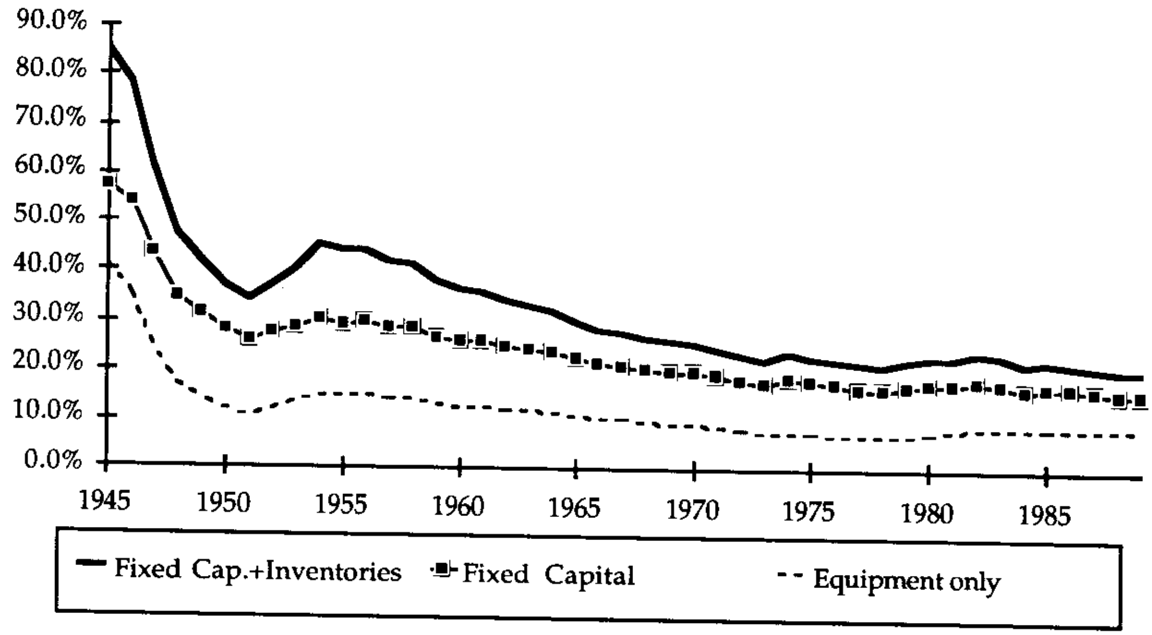
Figure 6: Government Employee Pension Funds



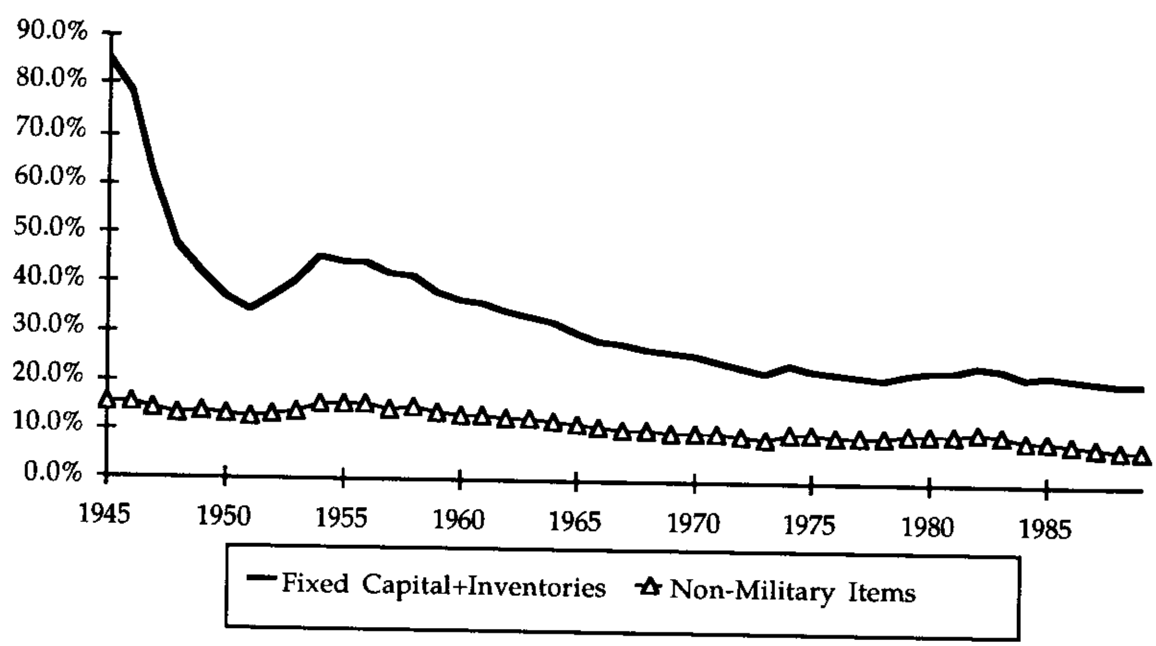
Source: Own computations, see the appendix.

Figure 7: Fixed Capital and Inventories

(a) Equipment, Structures, and Inventories

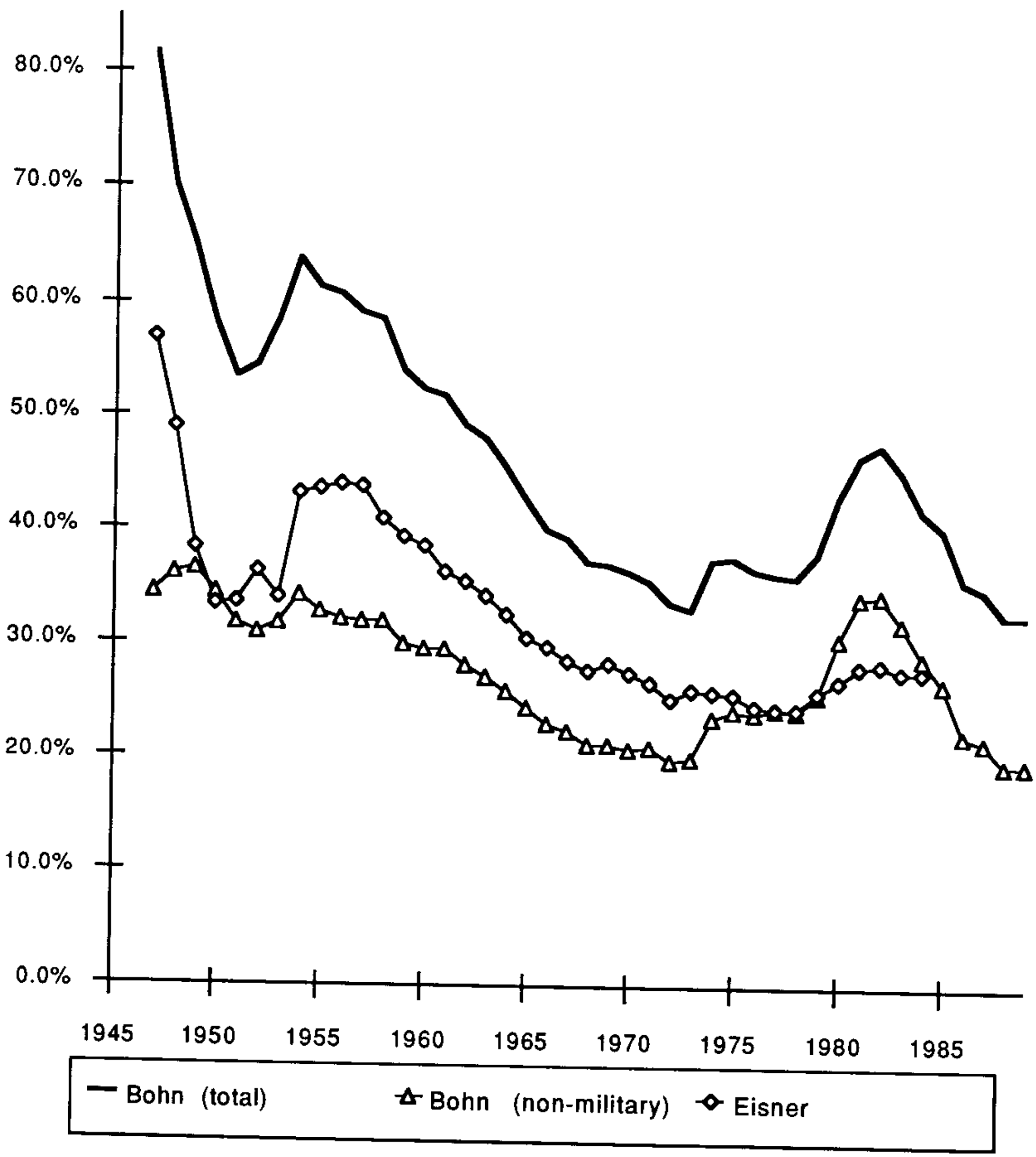


(b) Total and Non-military



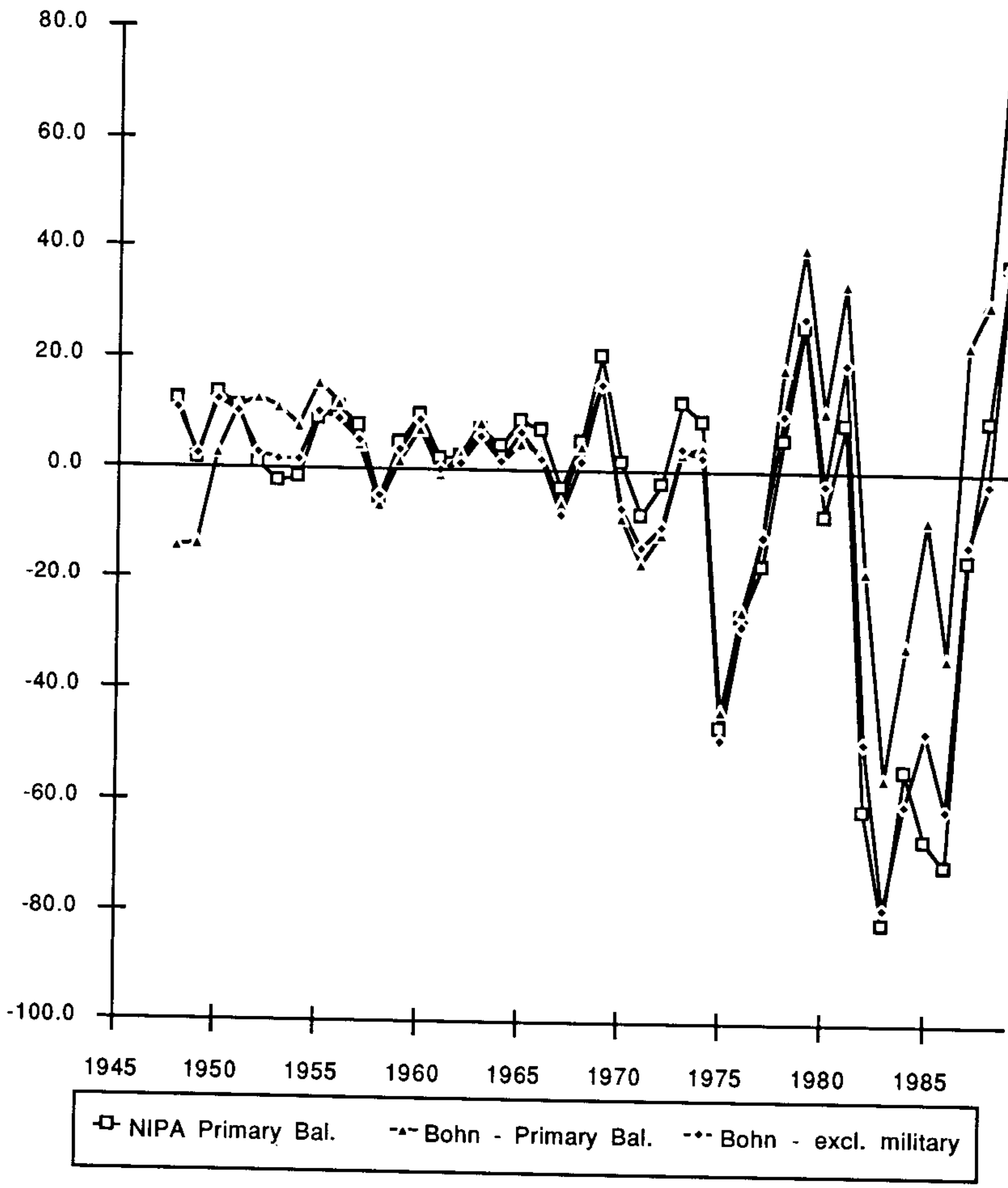
Sources: *Survey of Current Business*, various issues, and unpublished BEA data.

Figure 8: Tangible Government Assets



Sources: Eisner (1986), Boskin et al. (1989), and own computations (see the appendix).

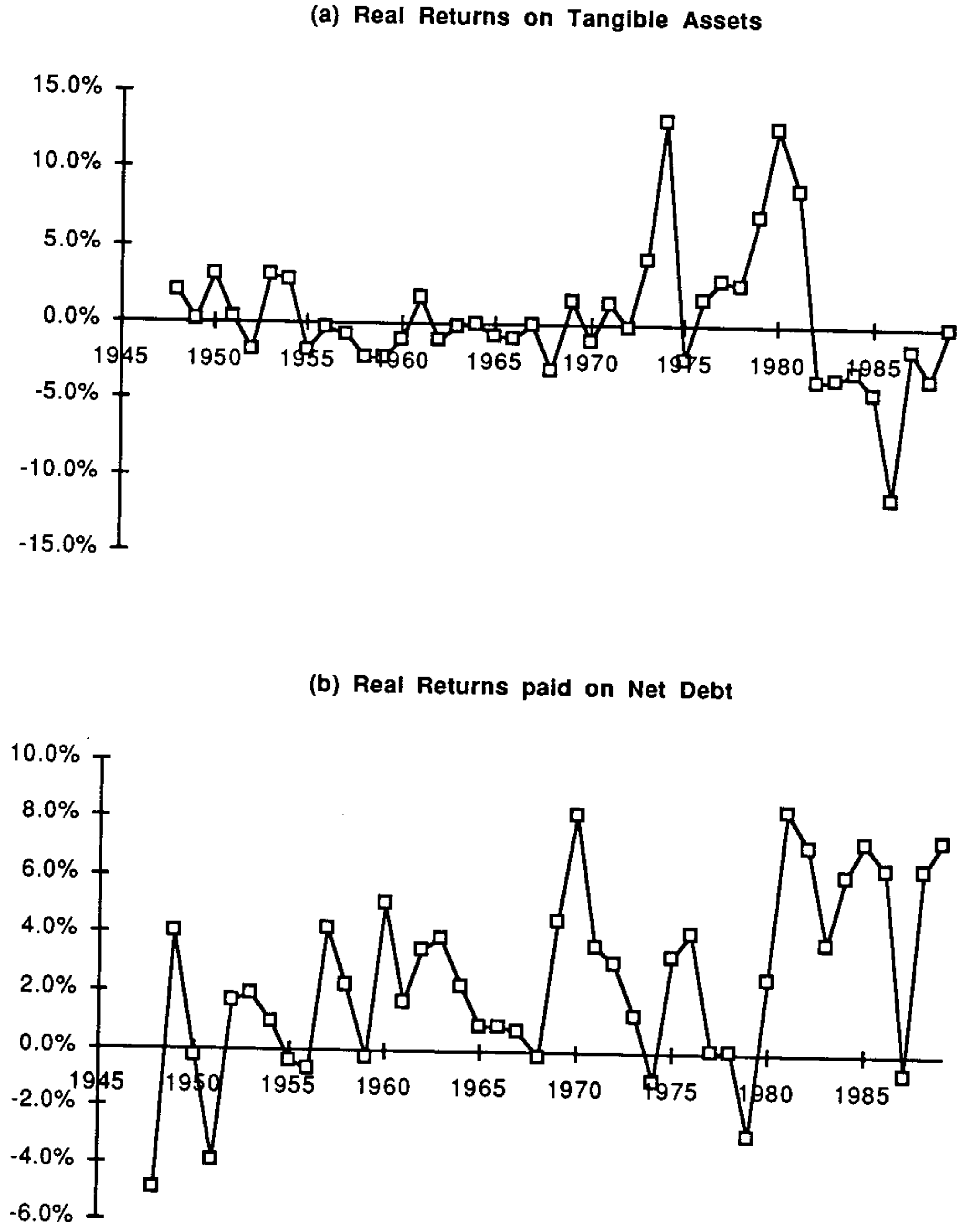
Figure 9: The Primary Balance



Note: The graph shows selected series from Table 3 in comparison to the official NIPA series.

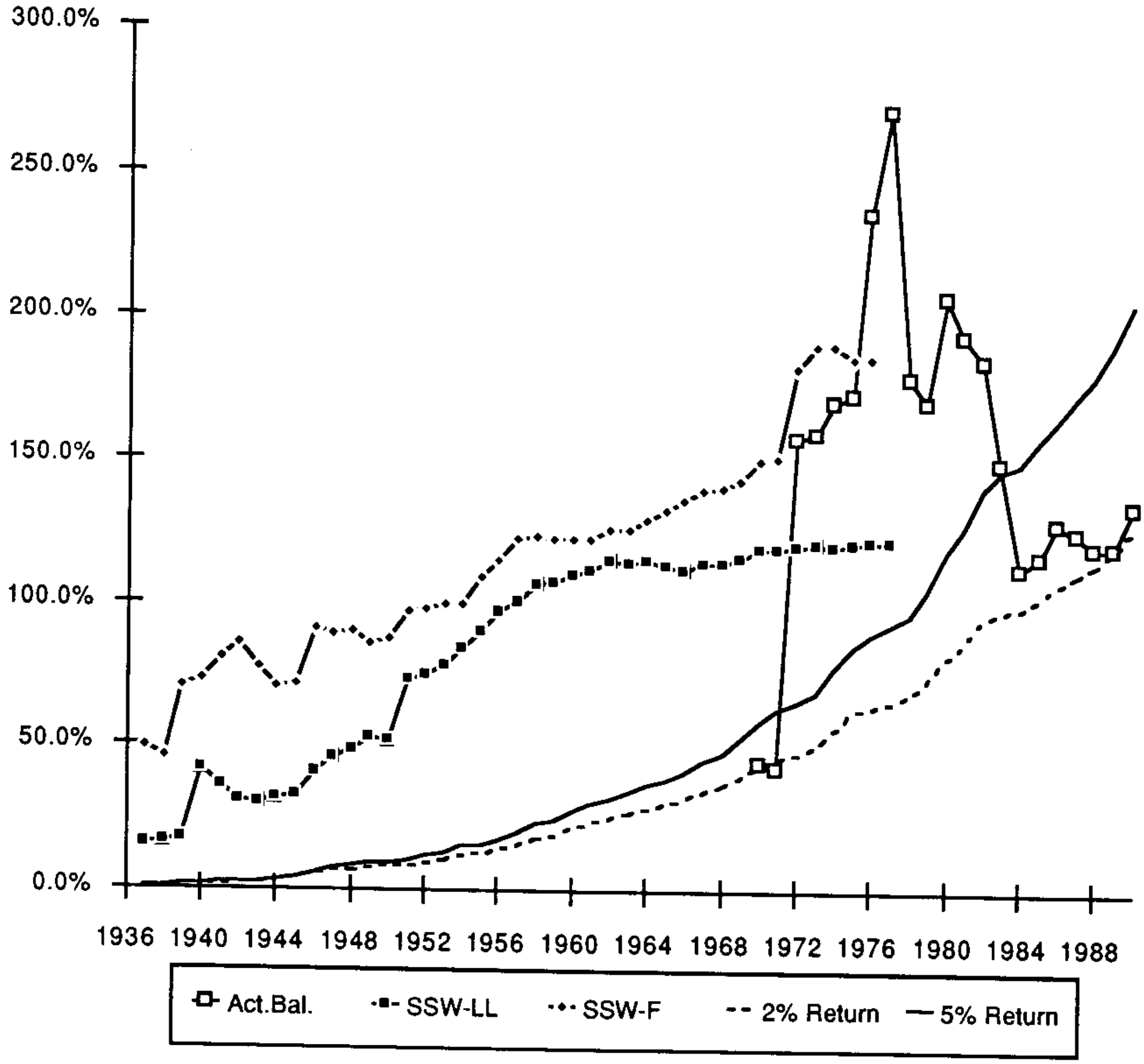
Sources: *National Income and Product Accounts* and own computations.

Figure 10: Returns on Government Assets and Net Debt



Note: The graphs show selected series from Table 4; see the appendix for sources.

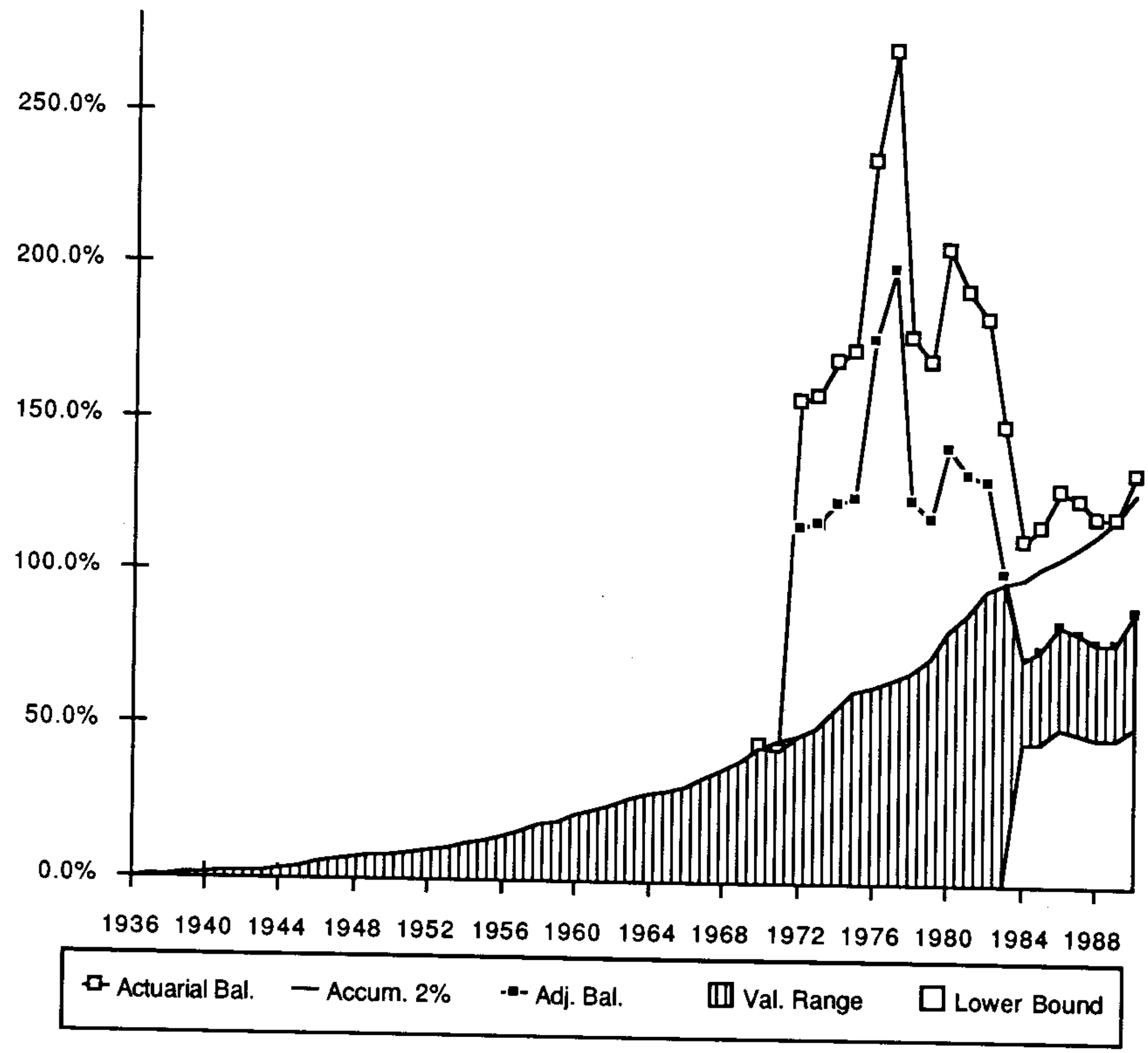
Figure 11: Social Security - Basic Estimates



Note: The graph shows the Social security Administration estimates of unfunded actuarial liabilities (Act. Bal.), the net social security wealth estimates due to Feldstein (SSW-F) and Lesnoy-Leimer (SSW-LL), and the accumulated social security contributions using 2% and 5% real rates of return, all in percent of GNP.

Sources: Social security Administration (unpublished estimates), Feldstein (1974, 1982), Lesnoy and Leimer (1982), and own computations.

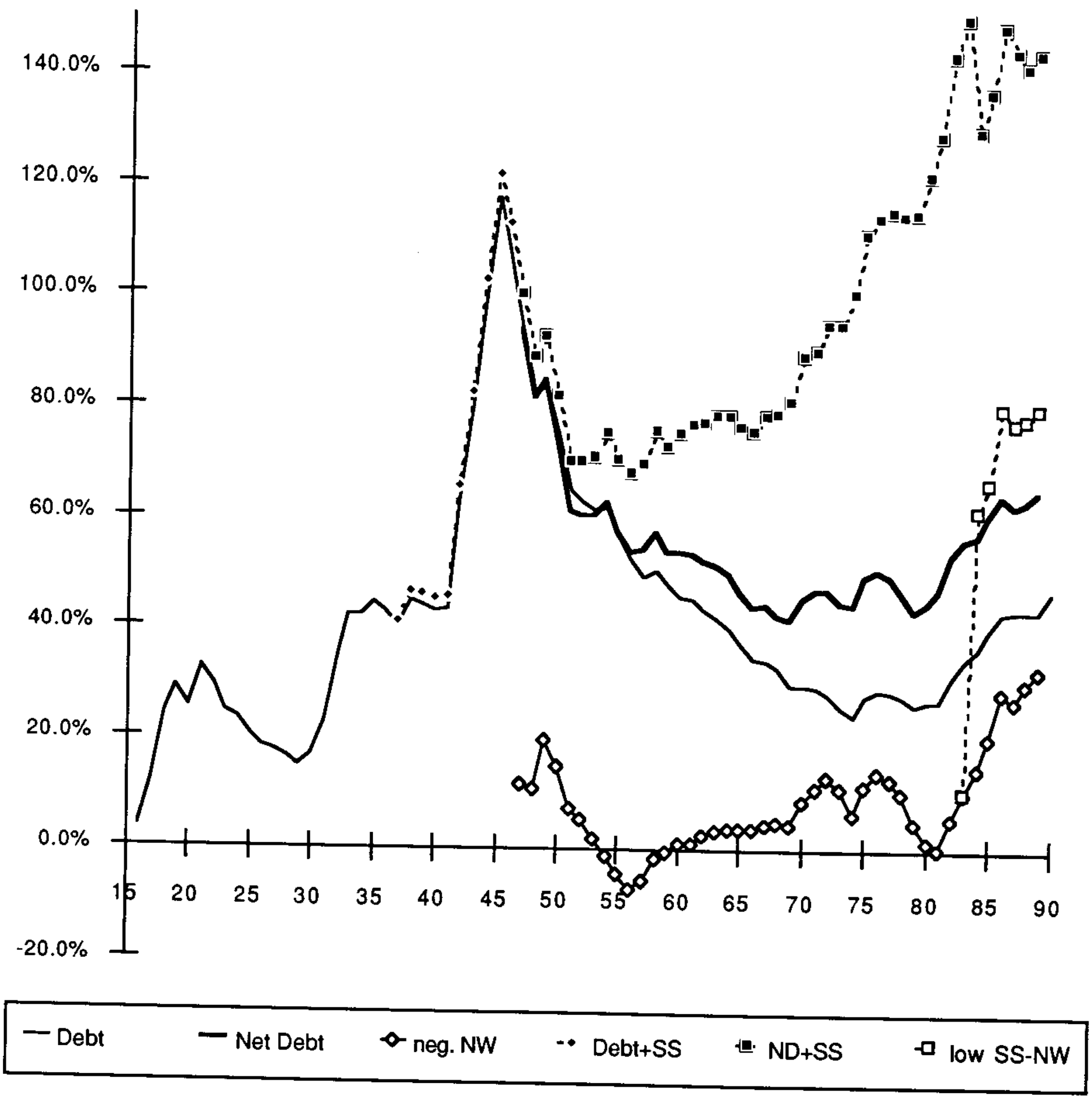
Figure 12: Social Security - A Range of Values



Note: The graph shows the Social Security Administration estimates of unfunded actuarial liabilities, accumulated contributions at a 2% real interest rate, the adjusted unfunded actuarial liabilities, and the upper and lower bound estimates for social security liabilities. The upper bound is the minimum of accumulated contributions and adjusted actuarial liabilities. The lower bound is zero until 1983 and it equals the present value of benefits to current beneficiaries for 1984-90.

Sources: Social security administration and own computations.

Figure 13: Government Net Debt and Social Security



Note: The graph shows federal debt, net debt, and negative net worth and their sums with the upper or lower bound estimates of the social security liabilities (see Figure 12), where "SS" indicates the upper bound estimate and "low SS" the lower bound estimate.

Sources: Own computations.