INFLATION-INDUCED DISTORTIONS IN GOVERNMENT AND PRIVATE SAVING STATISTICS

by

Jeremy J. Siegel*

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RODNEY L. WHITE CENTER
FOR FINANCIAL RESEARCH

University of Pennsylvania

The Wharton School

Philadelphia, Pa. 19104

*Associate Professor of Finance, The Wharton School, The University of Pennsylvania.

ABSTRACT

This study reformulates the National Income Accounts definitions of the government deficit and surplus and gross private saving. These new definitions are based on employing the change in the real value of government debt, due to price and interest rate changes, as a measure of the real deficit rather than the real value of the nominal debt change, as is now calculated by the Department of Commerce. The two definitions are identical if government debt were fully indexed. The major empirical differences in the revised statistics are a larger deficit during the Depression years and a much smaller deficit during inflationary periods, particularly during World War II and recent years. During the last decade the government has actually run substantial surpluses in real terms despite the cash deficits reported by the Department of Commerce. The redefined gross private saving ratio is reduced in periods of inflation and displays the same variability as the national savings rate instead of the significantly lower variability reported by the traditional statistics. In the post-War data, there is a significant negative correlation between the national saving rate and the reformulated gross private savings ratio.

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I. Introduction

Probably the single most important statistic measuring the impact of government fiscal policy on the economy is the magnitude of the government surplus or deficit. Justifiably or not, this single figure has taken on such importance that the Congressional Budget and Impoundment Control Act of 1974 established a process whereby the Congress is forced to consider overall receipts and outlays and commit itself under a binding resolution to these totals.

Because of the importance of the budget figure, economists have continually sought to modify the raw data to better assess the impact of the government on aggregate demand. A major breakthrough was the concept of the "Full-Employment Surplus," which was popularized by the Council of Economic Advisors in their 1962 report, although its roots go back to World War II.[1] This concept recognized that due to the endogeneity of expenditures and particularly tax receipts, the actual budget deficit or surplus, uncorrected for the level of output, gives a biased indication of the stance of fiscal policy.

Although the concept of the full employment surplus was an improvement, dissatisfaction with the single summary statistic remained. Several economists have experimented with different weights on the components of taxes and spending, recognizing the differential spending propensities out of the different sources of income.[2] This approach has not been successful due to the

difficulty of reaching a consensus on a weighting scheme.

Another problem with the full employment surplus was the failure to adjust for changing price levels or rates of inflation. Fixed nominal income tax brackets, specific taxes, and taxes on nominal interest and capital gains all suggest that the impact of the budget should allow for the behavior of price level variables.[3] Although standardization to an exogenous level of potential output seems plausible (given normal "growth" or "frictional" unemployment), there is no "normal" price level associated with any given level of output. Furthermore, with the breakdown of the Phillip's Curve relationship in recent years, there appears to be no normal rate of inflation associated with a full employment level of output.

This paper attempts to demonstrate that price level changes are important for measuring fiscal impact apart from any attempt to determine what price level behavior would exist at full employment. Since the deficit is equivalent to the amount of government bonds sold to the public,[4] analysis of the impact of the supply of bonds is incomplete without allowing for changes in the real value of the debt caused by inflation or deflation. Real value, accrual accounting, which is making considerable headway in private sector accounts, can also be employed in the public sector. A redefinition of the deficit along these lines can be easily integrated with the full employment surplus or any variant definition to yield a better measureof fiscal impact. Section II of this paper presents a brief theoretical discussion of real value accrual accounting. Section III presents a rigorous analysis of real value accrual accounting in the presence of government

debt, studying the cases of short and long-term bonds, indexed bonds, and the correction to the private saving rate. Section IV presents the empirical calculations of the redefined deficit and saving rate and compares these to the standard NIA measures. The empirical evidence demonstrates that the proposed definitions result in substantial changes in both the government deficit and private saving rate series.

II. Theoretical Basis of Real Value Accounting

There are three principal and interrelated reasons for engaging in real value accounting in private and government accounts. The first involves the proper construction of a personal income series which is most appropriate for determining the consumption and saving behavior of economic units. The second concerns the most appropriate definition of the government deficit or surplus for measuring the impact of the budget on financial markets and the economy. The third is the construction of economics series where the real value of the stock variables are the accumulation of past real flow values and is discussed in Section III A below.

Two definitions of personal income are relevant in the analysis of real value accounting. The first, pioneered by Robert Haig (1921) and Henry Simons (1938), defines real income as consumption plus the change in the real value of an economic unit's assets, resulting from either relative or absolute price level changes. Such total accrual accounting would be justified in a world of universally competitive markets and negligible transactions costs, where all changes in the value of assets are treated equivalently as changes in income. A more restrictive concept,which I term purchasing power or real accrual accounting, assumes that only changes in the real value of assets caused by changes in the general price level are

deficit may become economically important in the case of a liquidity crisis, when economic agents are not acting in perfect markets and new bonds cannot be floated at the prevailing rate of interest.

As described above, real value accrual accounting may not be the appropriate concept in every economic situation. However, the widespread evidence that economic agents act on the basis of real variables suggests that utility of such a concept, particularly in inflationary periods.

A. Definitions of Stock-flow Consistency.

Assume the government has a certain quantity B of nominally denominated bonds outstanding. Assume that all discrepancies between taxes and receipts are financed by floating bonds. Thus $\dot{B}$ is a measure of the nominal deficit (surplus if negative) of the government sector. The Department of Commerce in the National Income Accounts then calculates $\dot{B}/p$, where p is the price level, as the real value of the government deficit. However, it can be easily shown that the accumulation of these real deficits or surpluses does not equal the real value of the government debt. I shall define a pair of variables $x(t)$, $y(t)$ to be "stock-flow consistent" if

$$y(t) = \dot{x}(t),$$

or y is the flow counterpart of the stock variable x. The capital stock and net investment are two such variables, as well as net worth and profit. However, $\dot{B}/p$, the NIA definition of the real government deficit, and B/p, the real value of government debt, are not stock-flow consistent. This is immediate since

$$d(B/p)/dt = \dot{B}/p - (\dot{p}/p)(B/p), \tag{2}$$

or the change in the real value of debt outstanding is equal to the NIA measure of the deficit minus the rate of inflation times the real value of debt outstanding. I shall term the right-hand side of equation (2) the reformulated measure of the real deficit. The reformulated deficit and the real value of debt are, by definition, stock-flow consistent. It is clear that the reformulated and NIA measure differ whenever prices are not stationary. In fact, there could be a positive real NIA deficit, while, if inflation is sufficiently great, there would be a fall in the real value of government debt outstanding.

II. B. Case of demand debt

It is important to note that according to purchasing power accrual accounting the difference between the NIA and reformulated definition does not depend on whether the change in the price level was anticipated or not. Let us examine the cases of foreseen and unforeseen inflation. For example, assume the government has demand debt outstanding of zero maturity, yielding a constant real rate r_0. Assume the total budget is in balance and prices are stable, so that both the NIA and reformulated deficit are zero. Assume prices begin rising at time t_0 at a rate π, which is fully anticipated.

Interest payments on the debt will rise to $(r_0 + \pi)B$ and hence the budget experiences a NIA deficit of πB at t_0, and remains in deficit at level πB through time if all other real revenues and real taxes of the government are constant. Assuming all deficits are covered by only bond financing, this means the government will be forced to issue bonds at rate πB. However, from (2), the reformulated deficit is always zero. The government is simply adding bonds at the rate inflation is depreciating them, leaving no change in the real value of bonds held by the public. The government may be running an accounting deficit on a cash basis, but it is not running an economic or accrual deficit.

If the inflation is unforeseen, the interest rates will not rise, and there will be no NIA or cash deficit. However, the real value of the government's bonds will fall at rate πB, so in real terms the government is in surplus, as its real liabilities fall in value. One way of interpreting this result is imagining that inflation "taxes" the bondholders at rate π which is a non-cash tax imposed by the government. If the inflation is foreseen, the bondholder can demand higher "cash" interest payments (recorded as an NIA government expenditure) to offset the non-cash depreciation of the principal value of their bonds (not recorded as an NIA receipt). The reformulated deficit, resulting from adding both the implicit and explicit taxes, is zero since no change in the real liabilities of the government occurs.

II. C. The Case of Long-term bonds

The valuation of the budget deficit becomes slightly more complicated when the government debt is not in demand form. Assume the government has a certain amount of debt, B, outstanding in the form of consols yielding a nominal coupon r_0. The real value of the debt is $Br_0/(pr_c)$, where r_c is the current market consol rate of interest. If we assume that the real rate of interest is expected to be a constant r_0 for all future time, it can be shown that r_c is a positive (weighted) function of expected future rates of inflation. The change in the real value of this debt assuming new debt is floated at the market rate is

$$d(Br_o/(pr_c))/dt = \dot{B}/p - \frac{\dot{p}}{p}(Br_0/(pr_c)) - \frac{\dot{r}_c}{r_c}(Br_0/(pr_c)). \qquad (3)$$

Hence the change in the real value of the debt is equal to the NIA real cash deficit, $\dot{B}/p$ minus the rate of inflation times the real debt outstanding, minus the real value of changing market valuations of the debt due to changing market rates of interest. If the real rate is constant, changes in the consol rate are due solely to changes in the expected future path of the price level. Expectations of increased future inflation will cause the consol rate to rise. The consequent fall in the value of the consol exactly matches the fall in the real discounted value of future interest payments and so is a real capital gain to the government and a capital loss to the bondholders. The change in the value of these bonds caused by changing expectations of inflation does not change the cash payments of the government, but real values held by the public.

If the change in the rate of interest were due only to changes in the real rate, such accrual accounting may not be appropriate. This is so since

the asset side of the government's balance sheet, which contains real capital, should also be capitalized at the real rate. If real capital is matched by the value of bonds, then the net wealth position of the government remains unchanged as a result of changing real rates.

II. D. Indexation of Bonds

The issuance of indexed bonds by the government, with both the principal and all intermediate interest payments price-linked, results in an identical NIA and reformulated deficit. Since the real value of index bonds is independent of the price level, the change in the real value of indexed bonds outstanding would be indentical to their rate of issuance, independent of the behavior of the price level, so both measures would be "stock-flow" consistent as described above. In terms of our example with demand debt, foreseen inflation at rate π would not increase the real value of the interest payments to the public, since the interest rate on indexed bonds is the real rate which is constant. If other real taxes and receipts are constant, then the cash deficit is always zero.

The same invariance results if the government floats long-term debt, as consols, fully indexed to the price level. In this case, future expected rates of inflation will not (to a first order approximation) alter the real rate, and hence will not affect the real value of the bond. Real cash flows are unaffected by not only current but expected future changes in the price level and the real cash deficit is equivalent to the value of indexed bonds issued.

II. E. The Saving Rate Reformulation.

The changes in the accounting for the government sector must be accompanied by compensating changes in private sector accounts in order for the National Income Accounts to be consistent.[6] In the case of inflation, the reformulated measure of the government deficit records the accrued capital losses to the private sector and reduces private saving. However, the equivalent gains to the government sector would be recorded as increased government saving. The same shift occurs when nominal interest rates are rising. Deflation or falling interest rates result in decreased government saving and increased private saving. The combined saving of both the government and the private sector, referred to as national saving, is unaffected by a change in either prices or interest rates.

III. Empirical Evidence

A. The reformulated government deficit

As can be seen from equation (3), the reformulated deficit differs from the NIA deficit by the price and interest rate induced change in the real value of the government debt outstanding. Charts 1 and 2 decompose the changes in the real value of the government debt into those that are induced by inflation and those induced by changes in the market rates of interest. (See Data Appendix for definitions and methods). These statistics are measured in 1958 dollars and a positive value indicates that the reformulated surplus should be higher than the NIA surplus by the amount indicated. Interest rate induced changes in the real value of government debt are in general of smaller magnitude but of greater variability than the price-induced changes. This greater variability is particularly true in the quarterly data, as shown in Chart 2. Chart 1 plots annual data from

1929 through 1975 while Chart 2 graphs quarterly data from 1947-1 through 1975-3. As mentioned in Section II. C., accrual accounting of interest-rate induced changes the market value of government debt is only strictly applicable if these changes are due solely to fluctuations in inflationary expectations. Since it is likely that much of the short-term fluctuations are due to real factors, the interest-rate induced changes, especially for the short-term, are apt to be overstated. For this reason Charts 3 and 4 were constructed which depict the NIA real government surplus and deficit as defined by the change in the real value of debt exclusive of interest rate induced changes.

The following are some of the major conclusions resulting from analysis of the NIA and reformulated government surplus.

(1) The mean real NIA government deficit for the entire 47 years from 1929 through 1975 was 8.04 billion 1958 dollars, the reformulated budget was in surplus $2.55 billion, and the inflation plus interest rate corrected budget was in surplus 3.58 billion. From 1947 through the third quarter of 1975, the values, respectively, are $1.38 billion deficit, $11.24 billion surplus, and $13.71 billion surplus.[7] Hence, inflation on the whole has turned the average budget of the government from deficit to surplus, through the persistent lowering of the real amount of debt outstanding.

(2) The reformulation of the deficit during the Great Depression shows that, on average, the deficit was greater than reported by the NIA statistics due to falling prices and interest rates. In the four years 1929 through 1932 the real NIA deficit averaged $2.38 billion 1958 dollars.

However, the fall in prices added an average $3.52 billion to the deficit and the fall in interest rates another $.38 billion, so the real deficit averaged $6.28 billion, a 164% increase over the reported NIA deficit. As a percentage of GNP, this would be equivalent to almost a $60 billion reformulated deficit today (1976 prices), or about a $100 billion deficit measured on an NIA basis with a 6% rate of inflation. During the ten years from 1929 through 1938, the real NIA deficit averaged $3.40 billion. The inflation correction raised the deficit to $4.13 billion, and changes in interest rate raised the deficit further to $5.16 billion, a 52% increase over the NIA figures.

These data may be interpreted in several ways. Since during the Depression the reformulated deficit was higher than the NIA deficit, fiscal policy was more stimulatory, in either on active or passive sense, than would be apparent from government statistics. These data also indicate, however, that the "automatic stabilizers" of lower prices and interest rates in increasing the public's real wealth (often referred to as the "Pigou Effect") was insufficient to prevent the severe business collapse that occurred.

(3) From 1941 through 1948, the average NIA deficit was $32.73 billion 1958 dollars. Interest rate changes during the war were small. However inflation wiped out an average of $18.19 billion per year, or 5/9 of the deficit was a result of nominal cash and not real accural accounting. Hence, due to the inflation, the public had to increase the nominal value of their government securities just to maintain a constant portfolio

fraction of debt to other assets so that the rapid absorption of government debt by the public occurred primarily in nominal, and not real terms.

(4) Recently inflation and interest-rate induced changes have again become important. In the nine years since 1967, the first year of a string of major NIA deficits, the real value of the NIA deficit has averaged 6.94 billion 1958 dollars. Inflation has wiped out, on average, $22.85 billion per year and rising interest rates another $3.56 billion. In fact, in 1974, the NIA deficit was $2.12 billion but inflation wiped out $48.12 billion of debt, placing the budget, in real terms, substantially in surplus. During this period there is much reason to believe that the rising interest rates were due to inflationary expectations and hence should be included in our calculations. Hence the real change in the value of the debt indicates an average surplus of $19.47 billion 1958 dollars over the period. To the extent that the government debt influences the bond market, the effects of inflation has been to release funds, in real terms, for use in the private sector, possibly helping to explain the low real rates of interest experienced over the last several years.

III. B. The Saving Rate

As mentioned in Section II.E., NIA private saving is influenced in the opposite direction of government saving when employing real accural accounting. Charts 5 and 6 depict the gross private saving rate as reported by NIA accounts, the reformulated ratio which takes into account real debt changes induced by inflation, and the national saving ratio. The major empirical results are listed below.

(1) The mean gross private saving rate over the entire 47 years is lowered from .151 to .128. In the post World War II period, 1947 to the present, the ratio is reduced from .156 to .133. The national saving rate over the entire 47 year period is .128, identical to the gross private saving rate. Hence in real terms the government budget, as noted earlier, has been nearly balanced over the entire period. In the Post-War period, the national saving rate is .155, a value above the corrected gross private saving rate due to the average surplus in government accounts.

(2) Analagous to the war years discussed above, the average inflation-corrected private saving rate from 1941 through 1948 was .1418. Although this rate is above the 47-year average for the period, it has been exceeded in nearly half the post war years. The private saving rate reported by NIA accounts averages .1996 during the period. This again indicates that the private sector was not on the whole engaging in as much real saving as the raw NIA data would indicate.

(3) In the post-War period, the variability of the gross private saving rate is greatly increased under the inflation corrected definition. This is important since Paul David and John Scadding (1974) had noted as paradoxical the apparently greater stability of the private saving rate compared to the national saving rate. This is certainly true under the traditional NIA accounting. From 1948 to 1971, the period their study covers, the standard deviation of the NIA private saving rate is only .0061 while that of the national saving rate is .0152. Scadding and David give an elaborate explanation to account for this phenomenon, which involves the differential inferences by the public concerning real government investment. However,

the inflation corrected private saving rate has a standard deviation of .0158, virtually identical to the national rate. This differential variability does not exist prior to World War II for either the NIA or inflation-corrected saving rate. Since government debt was small prior to the war this is not surprising. The reformulated private saving rate in contrast to standard NIA accounting techniques, indicates that no structural change in the variability of the private saving rate relative to the national saving rate has occurred over the period.

(4) There exists a significant negative correlation (-.344) between the corrected private saving rate and the national saving rate during the Post-War period but virtually no correlation exists between the NIA private saving rate and the national saving rate during the same period. If the size of the government deficit has absolutely no effect on private saving, then the correlation would be positive since government saving is a component of national saving. If private saving responded to exactly offset government saving, then the correlation would be zero. A negative correlation indicates that increases in government saving are associated with an even greater decline in private saving. This could be true in a simple Keynesian model. An increase in the budget deficit would lead to a multiplier effect on income and private saving. However, other explanations may be consistent. A slack economy, due to a rise in desired saving, could induce a passive government deficit and yield the negative correlation.

IV. Summary

The reformulated deficit and private saving ratio presented in this paper are based on an accrual instead of a cash basis of accounting, the

latter tabulated by the Department of Commerce in the National Income Accounts. Price level and interest rate changes can lead to substantial differences between the two concepts. However, only the reformulated deficit has the property that the accumulation of past real deficits equals the current real value of the debt. Economists concentrating on real wealth and real stock-flow effects of government policy may choose to concentrate on the reformulated data presented in this paper, while those interested in the purely cash-flow aspects of deficit might choose the current, government compiled data. Indexing government debt would bring the cash concept in line with the reformulated accrual concept. The reformulated deficit is greater than the NIA deficit during the Depression and smaller during periods of rapid inflation, such as World War II and the last decade. The reformulated saving rate displays no pre-to post-World War II change in its variability and is negatively correlated to the national saving rate. Both these results are in contrast to the behavior of the saving rate calculated by the Department of Commerce. The reformulated data may be useful in discrimininating between various macroeconomic models in which the government budget plays an important role.

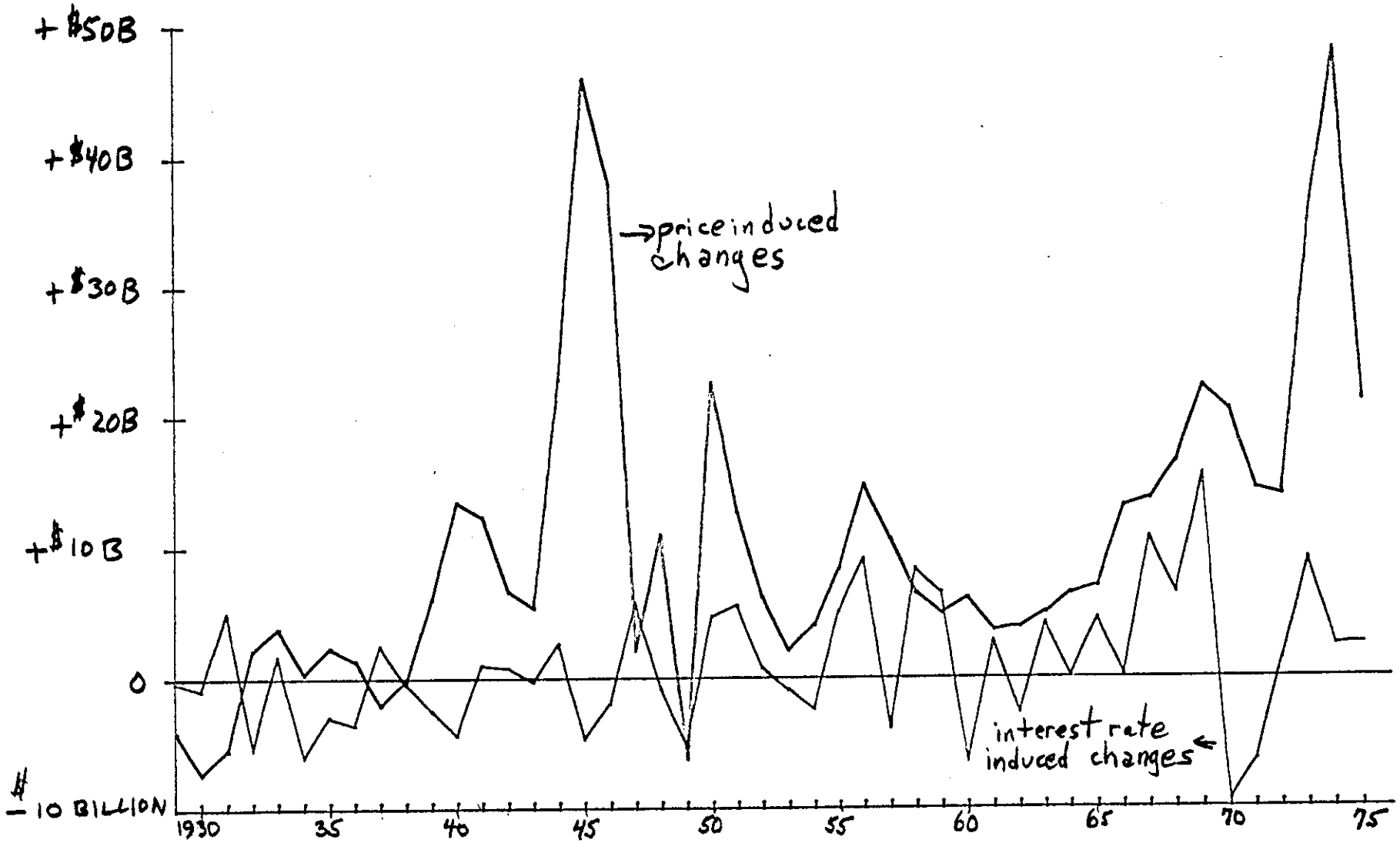

Chart 1. Inflation-induced and interest rate-induced changes in government budget (Annual). 1929-1975.

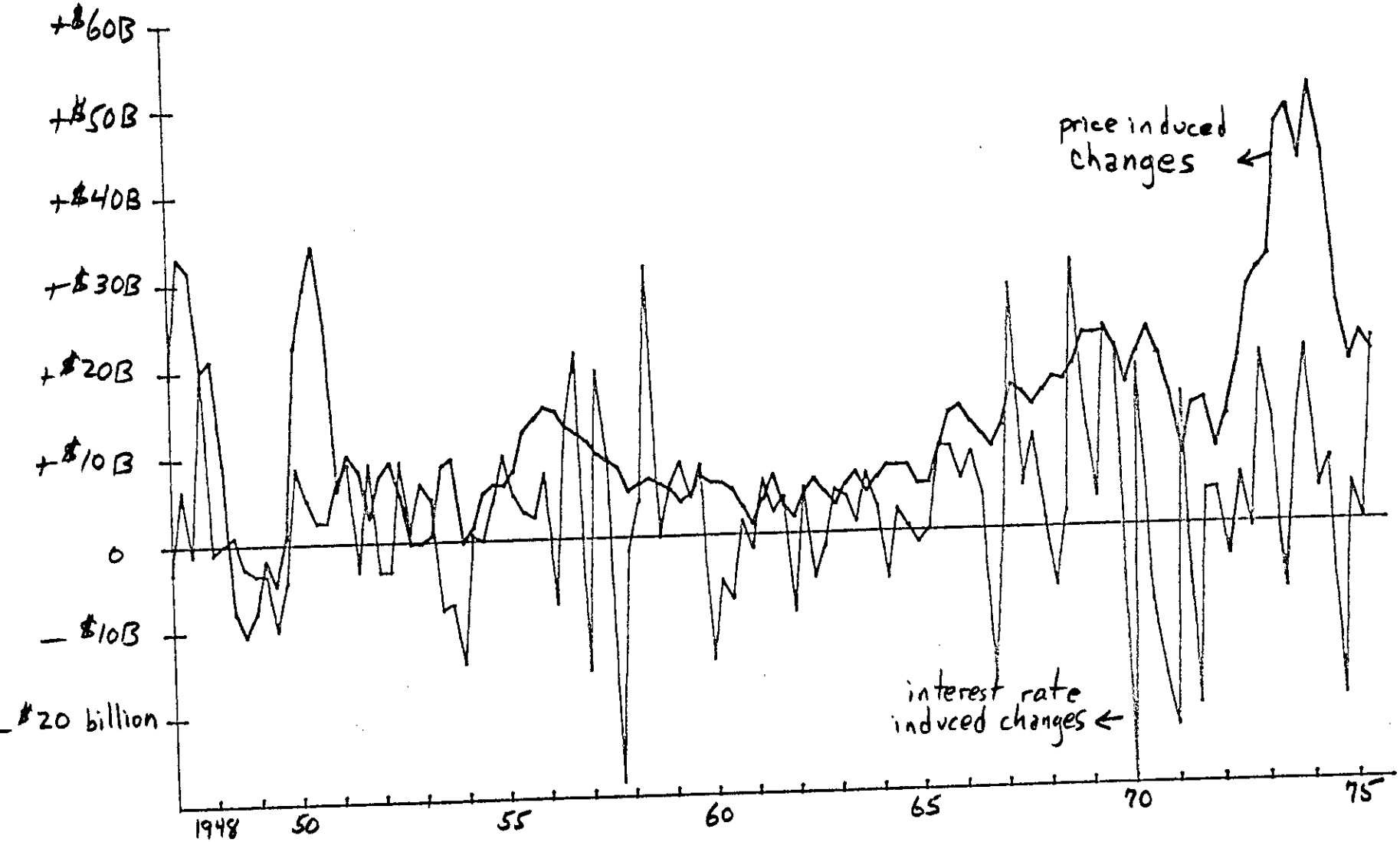

Chart 2. Inflation-induced and interest rate-induced changes in government budget (Quarterly). 1947-1 to 1975-3.

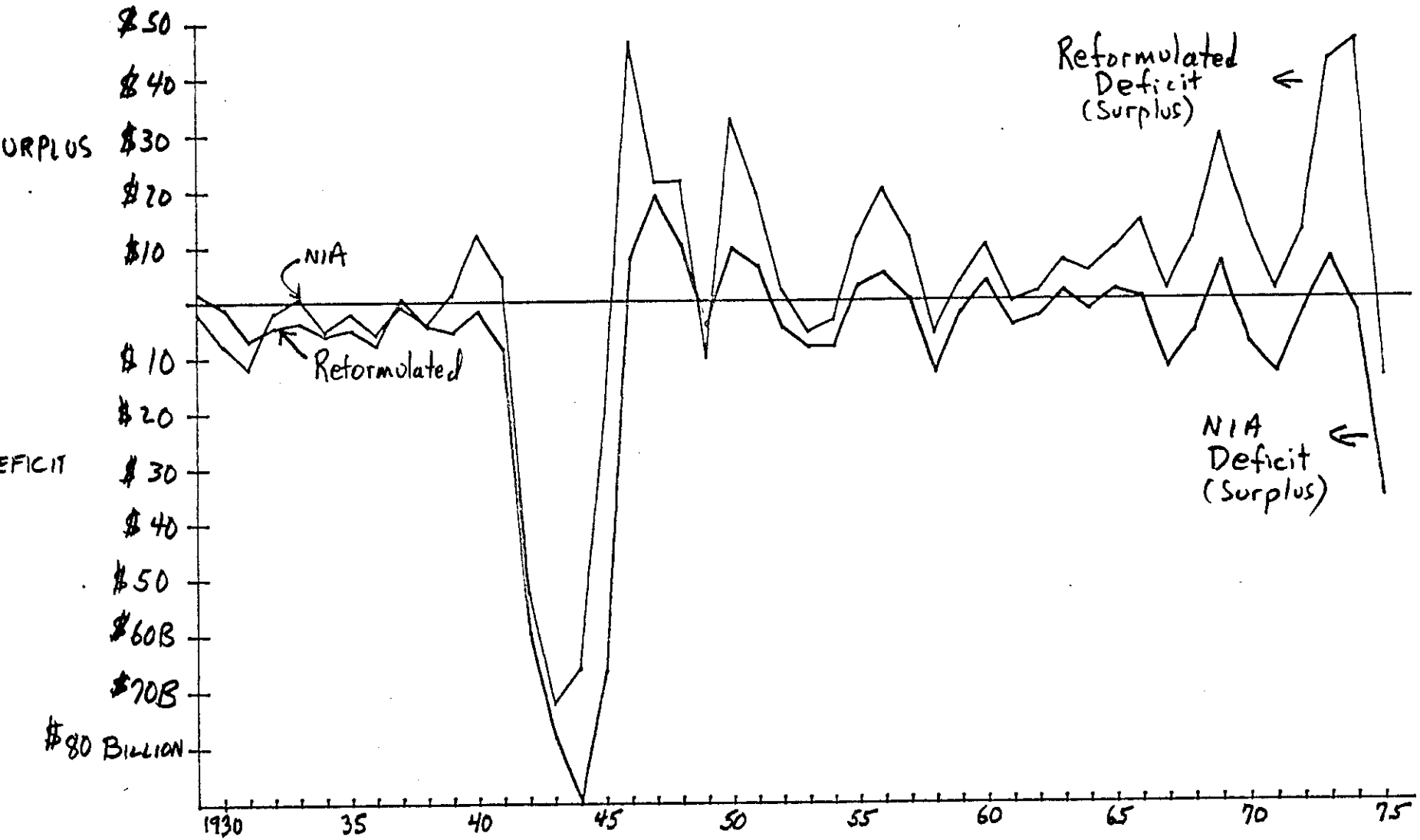

Chart 3. NIA real surplus (deficit) in 1958 dollars. Reformulated surplus (deficit) equal to NIA real surplus plus inflation induced changes in 1958 dollars. Annual 1929 to 1975.

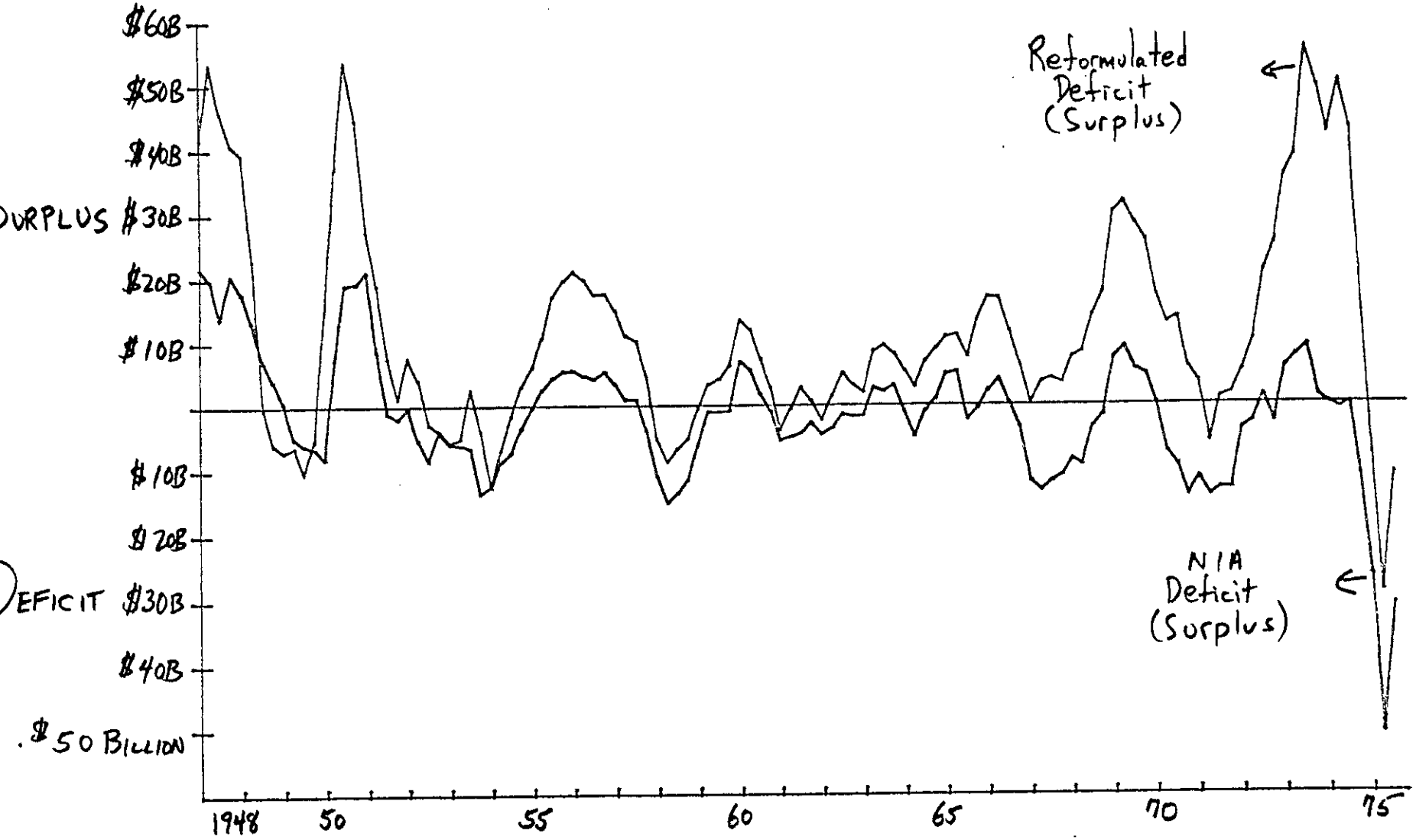

Chart 4. NIA real surplus (deficit) in 1958 dollars. Reformulated surplus (deficit) equal to NIA real surplus plus inflation induced changes, in 1958 dollars. Quarterly 1947:1 to 1975:3.

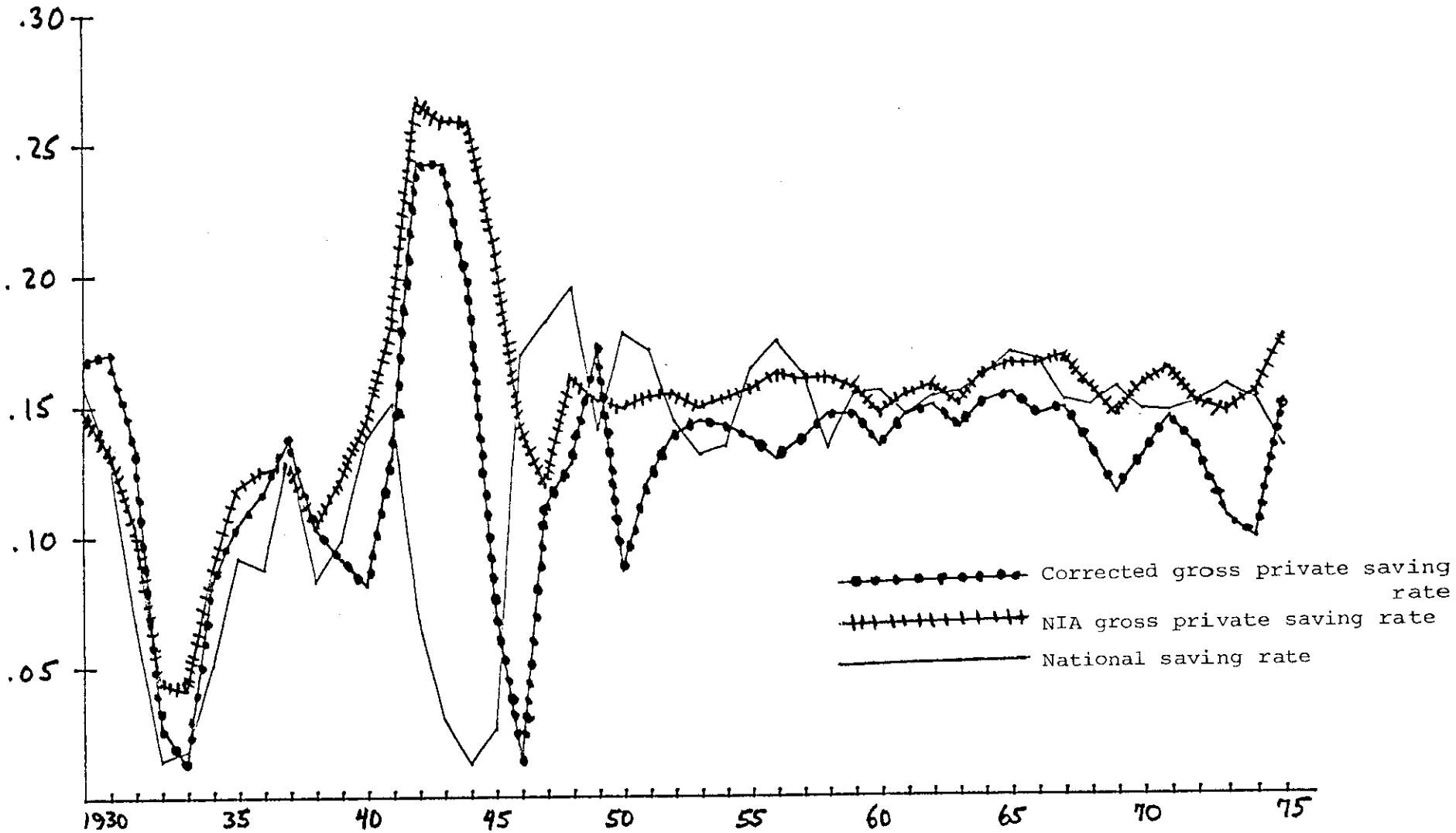

Chart 5. Corrected gross private saving rate, NIA gross private saving rate, and National saving rate. Annual 1929 to 1975.

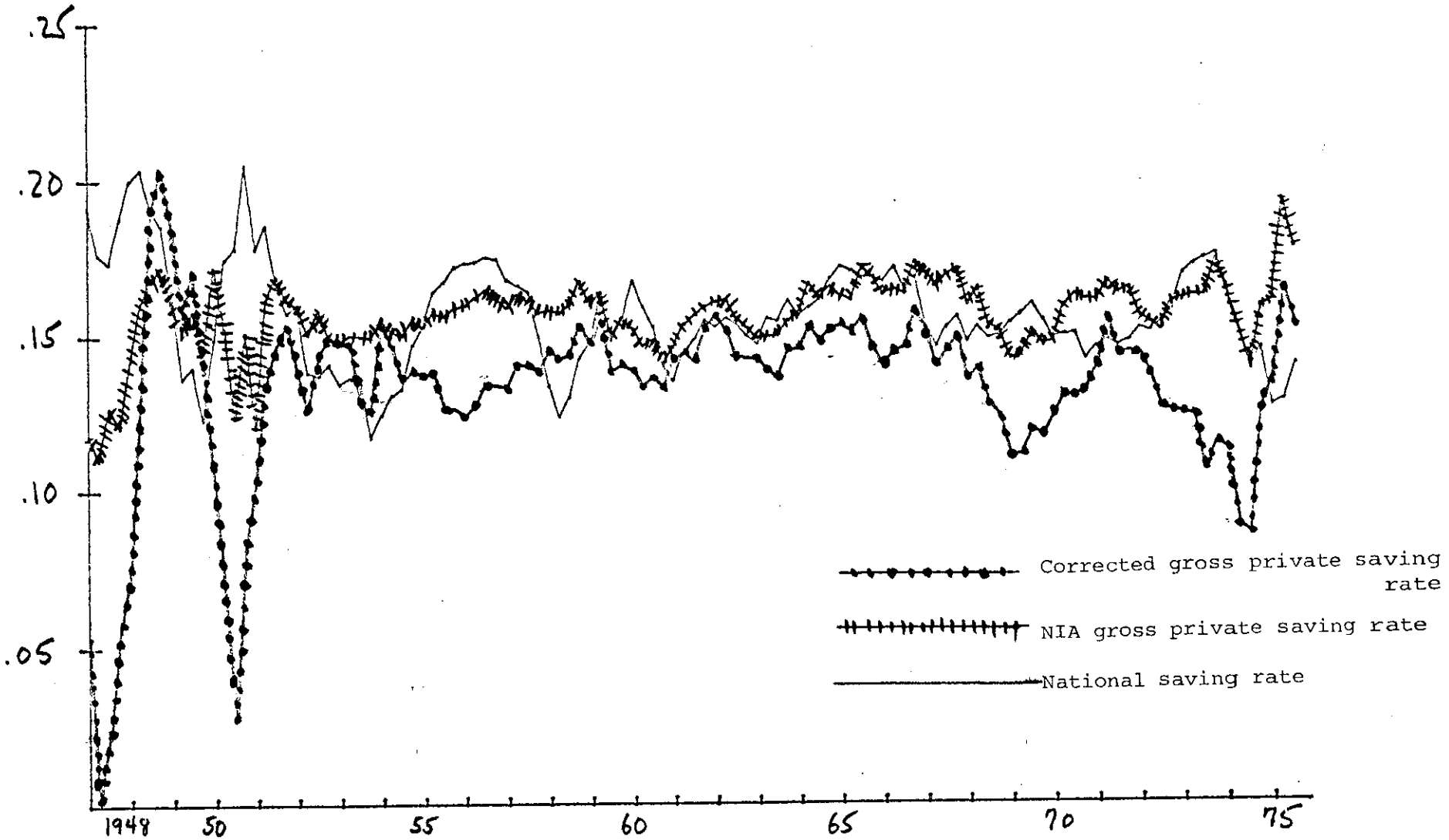

Chart 6. Corrected gross private saving rate, NIA gorss private saving rate, and National Saving rate. Quarterly 1947:1 to 1975:3.

DATA APPENDIX

Definitions and Sources:

1. Government debt = combined federal and state and local nominal debt.

   U.S. Dept. of the Treasury, Annual Report of the Secretary of the Treasury on the State of the Finances, 1946.

   U.S. Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, 1975.

   U.S. Dept. of Commerce, Survey of Current Business, (SCB), var ed.,

   U.S. Bureau of the Census, Statistical Abstract of the United States: 1968.

   U.S. Bureau of the Census, Government Finances: 1951.

2. Deficit (NIA accounts) = Total federal and state and local.

   Data Resources Inc. (DRI), Computer Data Base. (1975)

   Survey of Current Business, var. ed.

3. Prices: GNP deflator

   DRI Computer Data Base.

   Survey of Current Business, var. ed.

4. Interest Rates: See calculations below.

   U.S. Bureau of the Census, Historical Statistics, op. cit., 1975.

   DRI Computer Data Base.

   U.S. Board of Governors, Federal Reserve Bulletin, var. ed.,

5. Gross Private Saving

   DRI Computer Data Base

   Survey of Current Business, var. ed.,

Data Calculations; To calculate price-induced changes, Z_t, in real value of government debt between t and t+1, where t = Jan. 1, and t+1 = Jan. 1, next year for annual data, Apr. 1 for quarterly data,

$$Z_t = \frac{P_{t+1} - P_t}{\bar{P}_t} (\bar{D}_t),$$

where $\bar{P}_t$ and $\bar{D}_t$ indicate arithmetic average level of prices and debt between t and t+1. Z_t is then normalized to 1958 dollars. Figures are annualized if quarterly data is used. P_t is computed by averaging price level of adjacent years or (when available) adjacent quarters.

To calculate interest rate induced changes in debt value, average maturity of marketable debt and interest rate series of matching maturities were obtained. From 1929-1945, maturity was taken to be 10 years and from 1974 to 1976 maturity was taken at 3 years. For other years interest rate series matched maturities. Bond formulae were then used to calculate changes in market value of debt induced by changes in market rates of interest rates. The volume of saving bonds were excluded from interest rate calculations since they are fixed in nominal terms.

FOOTNOTES

I would like to thank Milton Friedman, Ben McCallum, and the members of the University of Chicago's and University of Virginia's Money and Banking Workshops for their helpful comments on earlier versions of this work. Steve Thompson provided valuable research assistance and computer programming.

[1]Initial references to the concept were Ruml and Sonne (1944), Committee for Economic Development (1947), and Friedman (1948). For an excellent discussion of the concept see Okun and Teeters (1970).

[2]In particular see Gramlich (1966), Musgrave (1964), Okun and Teeters (1970), and Hymans and Wernette (1970). Warren Smith in Okun and Teeters (1970) gives yet another impact statistic.

[3]See Committee for Economic Development (1947), Gramlich (1967) and Okun and Teeters (1970) for attempts at price level standardization.

[4]For simplicity it is assumed throughout this paper that the money supply is held constant. One can alternatively regard the profits (seigniorage) from steady-state monetary expansion as tax revenue, so that monetary financing is considered only as an inflationary tax on real cash balances.

[5]For an excellent summary of purchasing-power accrual accounting as applied to the corporate sector, see Shoven and Bulow (1975, 1976).

[6]Bisignano (1975) has noted some of these changes.

[7]The fact that real debt increased from 1929 to 1975 is due to the fact that much state and local debt is floated to finance capital projects which is not treated as a budget deficit. During most of the post-War period, state and local governments have been in surplus although the value of their nominal debt has been rising. The real value of federal debt has fallen since World War II.

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