
The Evaluation of the Fiscal Management and the Tax Policy in the 90's

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Introduction

The early 1990s was the period when the primary balance of the central government showed signs of improvement thanks to a strong increase in tax revenues behind the asset-inflated bubble economy. However, the collapse of the bubble economy and the following prolonged economic stagnation again worsened the expanded budget deficit. Undoubtedly, frequent mobilizing of finances and the policy of substantial tax reduction required as countercyclical measures were among factors behind the worsening of the fiscal balance. It is the policy target of the government to move the primary balance into the black in FY2011, but in order to achieve this target, it seems necessary to have not only a high economic growth rate and extensive spending cuts but also taxation reforms, bringing an increase in taxes.

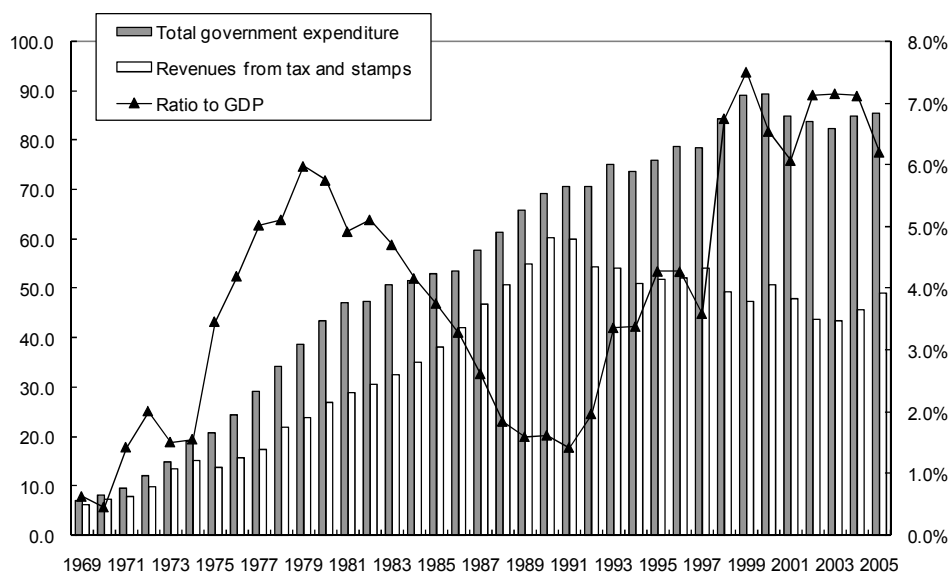
There is a need to examine whether the expansion of public debt accompanied by budget deficits accumulated since the 1990s deviated from a sustainable range of fiscal management or if it was within the range where the possibility of repayment of its debt in the future was not undermined. In dynamically inefficient circumstances (where long-term interest rates are below the nominal growth rate), if improvement in the primary balance is promoted and the balance continues to be in the black due to subsequent efficient fiscal management, the expanded public debt is insignificant (called the Domar condition). However, in a dynamically efficient economy, there is a possibility of fiscal bankruptcy unless the present debt is paid by financial surplus in the future. There is a wealth of theoretical and empirical research from the past concerning the sustainability of fiscal management.

As a new attempt at the evaluation of fiscal management, verification of the effect of tax reduction policies on sustainability, which has not been necessarily discussed explicitly in existing studies, will be made in this paper. For this purpose, the fiscal management in our country is evaluated by introducing the sustainability index, which was proposed by Polito and Wickens (2007). The structure of this paper is as follows: First, the trends of the fiscal balance

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in recent years are clarified, and the transition of the primary balance—as well as the structural fiscal balance that is calculated by several different methods—is explained. In addition, the effect of tax reduction policies in the 1990s on the fiscal balance is estimated. After theoretical backgrounds relating to the sustainability of fiscal management are explained, the sustainability index is introduced, and fiscal management is evaluated based on this index.

Figure 1: Fiscal balance of general accounts (unit: trillion yen, %)



Sources: "Financial Statistics" from Ministry of Finance, and "Annual Report on National Accounts" from the Cabinet Office, Government of Japan

1. Trends of the Fiscal balance and the Structural Fiscal Balance

1.1 Trends of the Fiscal balance and the Debts of the Central Government

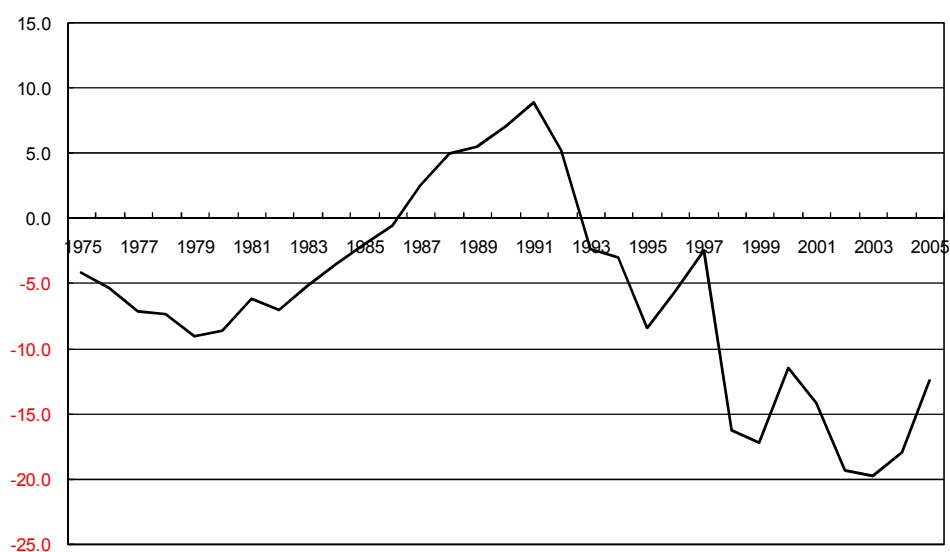
1.1.1 Balance of General Accounts and Budget Deficit

First, the transition of the balance of general accounts and budget deficit should be clarified. Figure 1 shows the transition of the amount of annual expenditures and the amount of revenues from tax and stamps in the bar graph, and the ratio of revenues from public bonds to GDP in the sequential line graph (all on a closing account basis) since FY1969. The amount of nominal annual government expenditures increased by approximately double from 43.4 trillion yen in FY1980 to 85.5 trillion yen in FY2005. This shows that the calculated mean annual rate of increase for the 25 years between FY1980 and FY2005 is 2.8 percent. After dividing this period of 25 years into two periods, 1980-1992 and 1992-2005, the mean annual rate of increase of the annual government expenditures for each period is 4.1% for the former period and 1.5% for the latter. Revenues from tax and others also increased from 26.9 trillion yen in FY1980 to 49.1 trillion yen in FY2005, and the mean annual rate of increase calculated in the same manner during this period is 2.4 percent. However, the rate of increase of revenues in the former period (6.1%) surpasses the rate of

increase of government expenditures, while that in the latter period (- 0.8%) actually decreases. In the background of the decrease in revenues were influences from shrinking tax revenues accompanied by economic stagnation and tax reduction policies, which were implemented in the 1990s; this will be explained afterwards.

Since there was no growth in tax revenues in the 1990s in contrast to an increase in the amount of government expenditures, revenues from public bonds were increased in order to make up the difference. According to Figure 1, the ratio of revenues from public bonds to GDP expanded to 6.0 percent in FY1979, but dropped to 1.4 percent in FY1991. This reflected the restraint of government expenditures accompanied by fiscal reconstruction and an increase in tax revenues due to the asset-inflated bubble economy in the 1980s. However, the ratio rose rapidly afterwards, reaching 7.5 percent in FY1999, and the 7.2 percent level in FY2003. Though the issuance of government bonds was limited by the Koizumi administration, the ratio has been recorded at approximately the 7 percent level since the 2000s. Incidentally, in FY2005 (on a closing account basis), the amount of government expenditures, revenues from tax and others, and revenues from public bonds were 85.5 trillion yen, 49.1 trillion yen, and 31.3 trillion yen respectively, while the ratio of revenues from public bonds to GDP dropped slightly to 6.2 percent.

Figure 2: Transition of primary balance (unit: trillion yen)



Data: "Financial Statistics" from Ministry of Finance, Government of Japan

1.1.2 Transition of the Primary Balance

Primary balance trends are important when scrutinizing fiscal balances. This is because the sustainability of fiscal management is kept by maintaining a high economic growth rate if the primary balance remains in surplus in an environment where the Domar condition is applicable.

The primary balance is defined as the amount of money remaining after deducting government bond costs from public bond revenue. When annual expenditure is assumed to consist of general expenditures and government bond costs, while the annual revenue consists of tax revenues and public bond revenues, the difference between general

expenditures and tax revenues corresponds to the primary balance. This value is equal to the difference between public bond revenue and government bond costs.

The transition of the primary balance since FY1975 shows there was a primary balance deficit until FY1986, with a peak of 7.9 trillion yen recorded in FY1979. Following this, the primary balance went into surplus from FY1987 until FY1992, reaching 8.8 trillion yen in FY1991. However, the primary balance ran into deficit again from FY1993, which grew to 17.2 trillion yen in FY1999 and 19.8 trillion yen in FY2003. The ratio of the primary balance deficit to GDP was 3.5 percent in FY1999 and 4.0 percent in FY2003.

1.1.3 Transition of Government Debts

The long-term debt of the central government at the end of FY2006 (total debt other than government bonds and short-term securities) reached 733.4 trillion yen, while the outstanding balance of government bonds was 674.1 trillion yen (including the outstanding amount of ordinary government bonds of 531.7 trillion yen). Among the debts of the central government, the outstanding amount of long-term debts borne by the general accounts was 531.5 trillion yen, of which the outstanding amount of government bonds was 529.2 trillion yen. The outstanding balance of long-term debts to be borne by the general accounts was 190.9 trillion yen, which was only 39.5 percent of nominal GDP at the end of FY1992. Based on deterioration of the primary balance, however, both the government debts together with the ratio of those debts to GDP have increased rapidly since then, reaching 349.5 trillion yen (70.0 percent) at the end of FY1999. This trend continued into the 2000s; the outstanding balance of long-term debts became 531.5 trillion yen (105.6 percent of GDP), exceeding the level of nominal GDP at the end of FY2006.

The amount of interest payments borne by the general accounts as government bond costs was curtailed due to low long-term interest rates, despite an increase in government debts. The amount of interest payments in FY1992 was 10.6 trillion yen; nearly the same level of 10.5 trillion yen was recorded in FY1999. Following this, the amount of interest payments decreased further and remained at 7.0 trillion yen in FY2005.

1.2 Structural Fiscal Balance

1.2.1 Estimated Structural Fiscal Balance

In order to estimate the structural fiscal balance, general expenditures and tax revenues are divided into long-term components and components affected by short-term cyclical fluctuations; the structural fiscal balance is calculated provisionally based on the long-term components. As for the estimate of these long-term components, three methods (the Hodrick-Prescott filter, the Kalman filter, and the Beveridge-Nelson decomposition) are used¹⁾. The amount of revenue and expenditure estimated by the above-mentioned methods is divided into the amount of cyclical revenue and expenditure fluctuating on a short-term basis according to cyclical fluctuations, and the amount of long-term components. The outline of the three methods is as follows²⁾:

¹⁾ There is another method for calculation of the structural fiscal balance, which was proposed by Giomo et al. (1995), the Economic Planning Agency (1998), and others; this method has also been used in the recent Annual Report on the Japanese Economy and Public Finance (the Cabinet Office), and others. In this method, the GDP elasticity of tax revenue, which is found by dividing revenue into income tax, corporation tax, indirect tax, social-security burden, etc., is multiplied by potential GDP to obtain the amount of structural revenue. However, there are some weak points in income tax and so on, including a strong assumption on income distribution. Recently, Kitaura and Nagashima (2006) have made detailed analysis on this method.

²⁾ Refer to Higo and Nakata (1998) and the papers of other researchers for techniques to break down time series variables into long-term components and short-term variable components.

a) Hodrick-Prescott Filter (the HP filter, Hodrick and Prescott (1997))

The HP filter is a method of extracting long-term components with a certain degree of smoothness from time series data. If the long-term components are g_t and the short-term fluctuating components are c_t , g_t is calculated using the formula (1) so as to minimize the sum of the squares of short-term fluctuating components and the sum of the squares of the second differences of long-term components,

$$\text{Min} \left[\sum_{t=1}^T c_t^2 + \lambda \sum_{t=1}^T \{ (g_t - g_{t-1}) - (g_{t-1} - g_{t-2}) \}^2 \right] \quad (1)$$

where, T denotes an observed value, and λ is an adjustment parameter, while $\lambda=100$ is recommended in the case of annual data.

b) Kalman Filter

The Kalman filter is a method that is used to estimate a state space model. The state space model can be shown by the equations (2-1) and (2-2), where the value of observation at a point in time t is x_t , long-term components are $\bar{x}_t$, and short-term fluctuating components are u_t . The structural fiscal balance was calculated by using this state space model.

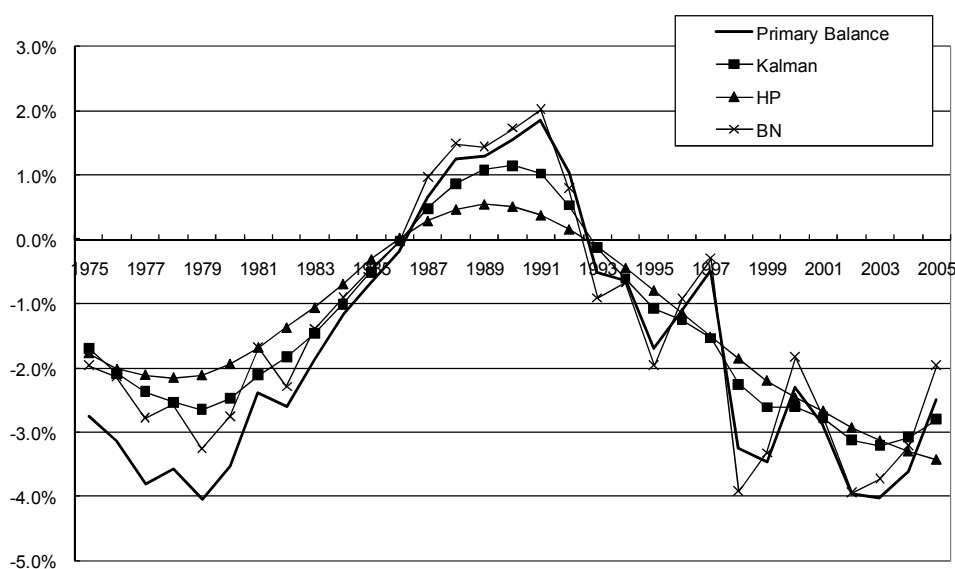
$$\text{Observation equation} \quad x_t = \bar{x}_t + u_t \quad (2-1)$$

$$\text{Transition equation} \quad \bar{x}_t = c_1 \bar{x}_{t-1} + c_2 \bar{x}_{t-2} + \varepsilon_t \quad (2-2)$$

c) Beveridge-Nelson Decomposition (the BN decomposition, Beveridge and Nelson (1981))

The Beveridge-Nelson decomposition used here is the efficiently modified method of Beveridge and Nelson (1981) by Newbold (1990). The BN decomposition is a method by which variables are broken down into stochastic trend components and other temporary short-term fluctuating components.

Figure 3: Structural Fiscal Balance (ratio to GDP, %)



Data: "Financial Statistics" from the Ministry of Finance, Government of Japan; the structural fiscal balance in Table 3 is calculated by the author.

Suppose ΔB_t is expressed by $MA(\infty)$ according to the stationary process, where the long-term components of ΔB_t are $\Delta \bar{B}_t$, the short-term fluctuating components are c_t , and the constant of $MA(\infty)$ is $\mu(c_t = \Delta \bar{B}_t - \Delta B_t)$; Newbold (1990) showed that c_t can be calculated using the equation (3)³⁾,

$$\begin{aligned} c_t &= (1 - \phi_1 - \dots - \phi_p)^{-1} \sum_{j=1}^p \sum_{i=j}^p \phi_i (\Delta B_{t-j+1} - \Delta B_{t-j} - \mu) \\ &= [\phi(1)]^{-1} \left[\phi(L) \Delta B_t - \sum_{j=1}^p j \phi_j \mu \right] \end{aligned} \quad (3)$$

where general expenditure, tax revenue and others were calculated on the assumption of $p=1$.

1.2.2 Trends of Structural Fiscal Balance

The structural primary balance can be calculated by finding the long-term components of general expenditures and tax revenue. This balance is determined by the way itself of implementing fiscal management independently from the business cycle. Moreover, in order to express the relative size of the structural primary balance, its ratio to potential GDP was calculated. Figure 3 shows the result (and the actual primary balance to which the short-term fluctuating components are added is shown in the ratio to nominal GDP)⁴⁾.

This result shows that the ratio of the primary balance to GDP in FY1990 was 1.6 percent, while the ratio of the structural primary balance to potential GDP was lower at 0.5 percent by the HP filter and 1.2 percent by the Kalman filter. However, its ratio by the BN decomposition was 1.7 percent, almost reaching the standard. In FY1999, the ratio of the primary balance to GDP lowered to -3.5 percent, while the ratio of the structural primary balance to potential GDP was -2.2 percent by the HP filter, -2.6 percent by the Kalman filter and -3.3 percent by the BN decomposition. Furthermore, in FY2003 when the deficit of the ratio of the primary balance to GDP peaked at -4.0 percent, the ratio of the structural primary balance to potential GDP calculated by each method was -3.1 percent, -3.2 percent and -3.7 percent, respectively. It is necessary to examine the potential primary balance to observe the trends of long-term fiscal management. Considering all these factors together, it seems that the actual primary balance in recent years was observed to be worse than the structural primary balance by about 0.5-1.0 percent points, due to the influence of the short-term business cycle.

2. Fiscal Management and Fiscal Balance in the 1990s

2.1 Outline of Tax Reduction Policy

The deficit trend of the fiscal balance of the central government (general accounts) has expanded throughout the 1990s compared with that in previous years, as seen in the preceding chapter. There has been an increase of government spending for public works and so on as a result of measures taken by the Government against long-standing economic stagnation, as well as a decrease in tax revenue resulting from a series of tax reduction policies. Though public works spending on a closing account basis went up from 9.7 trillion yen in FY1992 to 13 trillion yen in

³⁾ General expenditures, tax revenue, etc. were calculated on the assumption of $p=1$.

⁴⁾ Calculation of the potential GDP was made by the method of the Cabinet Office (2003).

FY1998, it decreased to 8.4 trillion yen in FY2005 due to the spending cuts implemented by the Koizumi administration. On the other hand, revenues from tax and so on tended to decrease roughly through the 1990s. A series of tax reduction policies in addition to a decrease in tax revenues due to little growth in the national income are the main factors of the above trends.

There were three big taxation reforms in addition to the annual review of the tax system back in the 1990s. The first policy was a special tax cut laid down in 1994, which aimed at reducing taxes on the scale of 5.5 trillion yen in the period from FY1994 to FY1996. Subsequently, a sweeping revision of the taxation system centering on permanent tax cuts of income tax and residential taxes (- 3.5 trillion yen), and also the consumption tax increase (+ 4.1 trillion yen) were approved in November, 1994. The precedent tax cuts had been implemented for individual income tax since FY1995, before the consumption tax rate was increased in 1997.

Taxation reform targeting corporate tax was carried out in 1998, and reduction of the corporate tax rate together with special tax cuts in income tax amounting to 4.0 trillion yen in total was executed. In addition, a permanent tax cut measure was introduced in FY1999 for both personal income tax and corporate tax. As for personal income tax, a tax cut on the scale of 4.1 trillion yen was carried out by reduction of the top rate of personal income tax as well as proportional tax reduction. Regarding corporate tax, a tax cut on the scale of 2.5 trillion yen was implemented by reduction of the basic rate of corporate tax. Among these, the proportional tax reduction of income tax was abolished in FY2007.

As regarding the reduction of income tax, there were 3.8 trillion yen of special tax cuts in 1994 and 2.0 trillion yen each of the special tax cuts in FY1995 and FY1996. Furthermore, there was a reduction of 2.4 trillion yen by the income taxation reform based on drastic changes of the tax system in 1994, 2.8 trillion yen by special tax cuts in FY1998, and 3.0 trillion yen each of proportional tax reduction every year after FY1999. These figures are based on the budget and supplementary budget; as such, it is difficult to estimate the detailed amount of tax revenue decreases on a closing account basis. However, some kinds of techniques are needed to examine the extent of the influence of taxation reforms exerted on the fiscal balance⁵⁾. The influence on tax revenues on a closing account basis was estimated using the following method, although it is a slightly simplified technique.

2.2 Method of Estimating Annual Revenue Decrease Resulting from Tax Reductions

The influence of the taxation reforms implemented in the 1990s was estimated by the following method.

- i) The amounts of tax increased and decreased resulting from revision of taxation system described in the budget (draft) and the supplementary budget (government budget draft) are found by types of tax.
- ii) The amounts of tax revenue by types of tax are found by adding the amount of tax increased and decreased obtained in i) to the expected tax revenue in the budget (supplementary budget) on assumption that there was no revision of the taxation system.
- iii) The amount of tax revenue in each fiscal year assuming that there was no revision of taxation system revision is estimated by multiplying each amount of tax revenue which was found by its type of tax on a closing basis by the ratio of (budget + amount of increase and decrease of tax) / the amount of the budget. The total is assumed to be the amount of tax revenue when there was no tax reduction.

⁵⁾ Also refer to Kitaura and Nagashima (2006), and others.

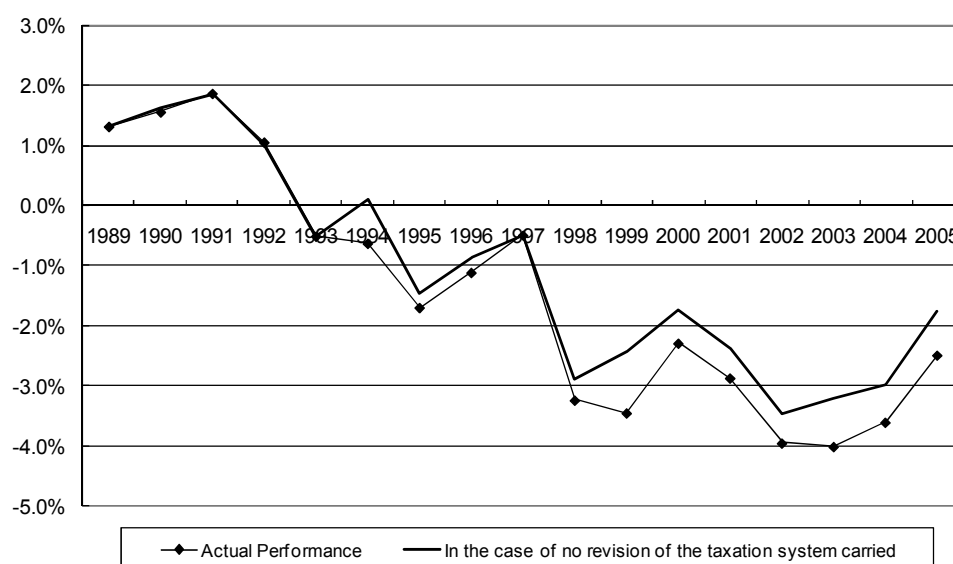
- iv) The estimated annual revenue decrease is assumed to be the difference between the amount of the closing account (actual performance) and the amount of the closing account on assuming that there was no tax reduction (estimated amount in iii)).

Furthermore, it is necessary to estimate the level of public bonds required when there is no tax reduction in order to find the fiscal balance. This is calculated as follows:

- v) The amount of public bonds necessary on assuming that there was no tax reduction is estimated by deducting the amount of tax reduction on a closing account basis, which is found in iv) from the amount of public bond receipts on a closing account basis.
- vi) The primary balance, on assuming that there was no tax reduction, is found by deducting the public bond receipt (estimated value in v)) from the amount of government bonds on assuming that there was no tax reduction.

When estimating the amount of tax revenues from FY1989 to FY2005 (including increases in tax), influences of not only the large-scale taxation reforms described in 2.1 but also the annual taxation reforms were taken into consideration. As a result, the total amount of tax revenues for the 17 years from FY1989 to FY2005 reached 869.5 trillion yen, while the accumulating total of tax revenues on assuming that there was no revision of the tax system was 943.3 trillion yen; this indicates that 73.8 trillion yen, or about 7.8 percent of tax revenues, was reduced during this period.

Figure 4: Tax Reduction Policy and the Primary Balance (ratio to GDP, %)



Data: "Financial Statistics" from Ministry of Finance, Government of Japan; data in the case of no revision of the taxation system carried was calculated by the author.

The result of estimating the value of the primary balance (ratio to nominal GDP), on assuming that there was no revision of the tax system, is shown in Figure 4. As previously described, the ratio of the primary balance to GDP in FY1990 was 1.6 percent, and it gradually fell into the red through the 1990s. The primary balance in FY1994 was -0.6 percent, although it would have produced a surplus of 0.1 percent if there had been no revision of the tax system. The primary balance deficit grew to -3.5 percent in FY1999; however, it is estimated to be -2.4 percent if there had been no revision of the tax system. The deficit ratio of the primary balance to GDP peaked at -4.0 percent in FY2003, but again it is estimated to be -3.2 percent if proportional tax reduction had not been implemented.

3. Sustainability of Fiscal Management

3.1 Sustainability of Fiscal Management

3.1.1 Theoretical Clarification

Can the government persistently increase the deficit? This is possible when the economy is in dynamically inefficient circumstances. It may be understood that the expression “in dynamically inefficient circumstances” refers to the situation where long-term interest rates are below the economic growth rate, and indicates an economic status where capital stock is excessively accumulated⁶⁾. If the level of long-term interest rates is equal to the yield of public bonds and is below the economic growth rate, it will be possible to lower the level of government debt in the ratio to GDP by maintaining a primary balance in the future, even if the present level of government debt is massive (called the Domar condition).

Can these dynamically inefficient circumstances really continue over a long period? Judging from the past yield of public bonds and the trends of real economic growth rates, it is difficult to say that the period where interest rates were below the economic growth rate has continued for a long time⁷⁾. If this is so, not only maintaining the primary balance but also introducing more positive fiscal management are required for a dynamically efficient economy. In such a case, the government should satisfy the inter-temporal budget constraint, even though it does not need to maintain a fiscal balance every year. That is, even if there is debt resulting from the budget deficit at present, it is necessary to produce a budget surplus in the future and set off the increased portion of the government debt. This will be shown below in detail.

Equation (4)⁸⁾ indicates the government budget constraint in the period of “ t ”, where G stands for the amount of government expenditure, T stands for the amount of tax revenues, B stands for the amount of government debt, ΔB stands for the increased portion of government debt (equivalent to the revenue from public bonds), and r stands for the interest rate (assuming that the interest rate “ r ” is constant).

$$G_t + rB_{t-1} = T_t + \Delta B_t \quad (4)$$

The following equations are obtained when the substitution calculation is repeated in equation (4) for the future:

⁶⁾ Refer to Abel etc. (1989) for details.

⁷⁾ Based on the author's calculation, interest rates have been above the economic growth rate in these years except the period of the asset-inflated bubble economy from 1988 to 1990.

⁸⁾ In addition, money creation executed by Seignorage is included in government revenues, but it is left out here. The interest rate is assumed to be constant here, but it is possible to relax the restriction in the assumption.

$$B_{t-1} = \sum_{j=0}^{\infty} (1+r)^{-(j+1)} [T_{t+j} - G_{t+j}] + \lim_{j \rightarrow \infty} (1+r)^{-(j+1)} B_{t+j} \quad (5)$$

The transversality conditions (No Ponzi conditions), where government debt is not in an expanding process, can be shown in equation (6).

$$\lim_{j \rightarrow \infty} (1+r)^{-(j+1)} B_{t+j} = 0 \quad (6)$$

More specifically, if the government introduces positive fiscal management so that the present government debt can be set off by a primary surplus in the future, the inter-temporal budget constraint will be satisfied.

3.1.2 Positive Analysis on the Sustainability of Fiscal Management

Positive analysis on whether the government satisfies the inter-temporal budget constraint has been made by various kinds of methods since the 1980s. As the details are described by Bohn (1995, 2005), as well as Polito and Wickens (2007), only the outline is introduced here. The first method, which is proposed by Hamilton and Flavin (1986), is to verify the issue of whether the bubble term, shown as the second term on the right-hand side in equation (5), is significantly zero. The second method is claimed by Trehan and Walsh (1988) et al., which states that if there is a cointegration relationship between government expenditures and tax revenues in the long term, the fiscal balance that is the difference between those two factors is constant, and consequently satisfies equation (5). The third method, which is proposed by Bohn (1995), is to examine fiscal management from the viewpoint of whether the government makes efforts in fiscal management to improve the primary balance when the budget deficit (primary deficit) has increased. Positive analyses that use the above-mentioned methods have been implemented in our country⁹⁾. There are cases made by Fukuda and Teruyama (1994) as well as Doi and Nakazato (1998) in which the sustainability of fiscal management was verified by proving the existence of the bubble term; the overall conclusion was that the finance of our country would be sustainable. On the contrary, Kato (1997), who used the cointegration analysis, concluded that sustainability was not acknowledged. Furthermore, Doi (2000, 2005), who used the method of Bohn (1995) that has become the predominant verification method, came to the conclusion that negated the sustainability.

3.2 Derivation of the Sustainability Index

What should be considered when verifying the sustainability of fiscal management carried out by the government is that inter-temporal budget constraint shown in equation (5) cannot be evaluated at the present moment; this is because the government can control the routes of future government expenditures and tax revenues. Therefore, there is a possibility that fiscal management is regarded as sustainable at the present moment if the government, which has fallen into massive debt, states its intention to return the fiscal balance to the black in the future, even if a surplus is not actually achieved. This means that equation (5) may not effectively work as a constraint for short-term fiscal management¹⁰⁾.

Polito and Wickens (2007) proposed an index of short-term fiscal management so as to deal with such a problem. Hereafter, the small letters denote variables in real term in the following expression, where government

⁹⁾ Refer to Doi (2004), and Ihori and Doi (2007) for related surveys.

¹⁰⁾ When the method of Bohn (1995, 2005) is used, it is possible to evaluate the efforts of short-term fiscal management.

expenditure is g_t , tax revenue is t_t , government debt is b_t , GDP is y_t , the nominal interest rate is R_t , the inflation rate is π_t , and economic growth is γ_t . Also,

$$1 + r_t = \frac{1 + R_t}{1 + \pi_t}, \quad 1 + \rho_t = \frac{1 + R_t}{(1 + \pi_t)(1 + \gamma_t)}$$

As the interest rate is variable judging from the equation (4), we obtain equation (7).

$$g_t + (1 + r_t)b_{t-1} = t_t + b_t \quad (7)$$

We then obtain the following equation by dividing equation (7) by y_t .

$$\frac{b_t}{y_t} = \frac{g_t}{y_t} - \frac{t_t}{y_t} + (1 + \rho_t) \frac{b_{t-1}}{y_{t-1}} \quad (8)$$

Here, we derive the following equation by deducting the subscript t from a steady-state variable, on the assumption that it is in a steady state.

$$\rho \frac{b}{y} = -\frac{g}{y} + \frac{t}{y} \quad (9)$$

The following equation is obtainable by employing a linear expression of the Taylor expansion for equation (8) using equation (9).

$$\ln \frac{b_t}{y_t} \cong c + \frac{g}{b} \ln \frac{g_t}{y_t} - \frac{t}{b} \ln \frac{t_t}{y_t} + (1 + \rho) \ln(1 + \rho_t) + (1 + \rho) \ln \frac{b_{t-1}}{y_{t-1}} \quad (10)$$

$$c = -\rho \ln \frac{b}{y} - \frac{g}{b} \ln \frac{g}{y} + \frac{t}{b} \ln \frac{t}{y} - (1 + \rho) \ln(1 + \rho) \quad (11)$$

Here, $\rho_t \cong R_t - \pi_t - \gamma_t$, and if the economy is dynamically efficient, $\rho_t > 0$; therefore, we obtain equation (12) by making forward calculations in equation (10). E_t indicates the expected value at the time point of t .

$$\ln \frac{b_t}{y_t} = (1 + \rho)^{-n} E_t \left(\ln \frac{b_{t+n}}{y_{t+n}} \right) - \sum_{s=1}^n (1 + \rho)^{-s} E_t (k_{t+s}) \quad (12)$$

$$k_t = c + \frac{g}{b} \ln \frac{g_t}{y_t} - \frac{t}{b} \ln \frac{t_t}{y_t} + (1 + \rho) \ln(1 + \rho_t) \quad (13)$$

If fiscal sustainability is maintained in the sense of equation (6), the first term on the right-hand side in equation (12) is construed as the transversality condition; subsequently, equation (14) is proved.

$$\ln \frac{b_t}{y_t} = -\sum_{s=1}^n (1 + \rho)^{-s} E_t (k_{t+s}) \quad (14)$$

Suppose a short-term target for the sustainability of fiscal management is not to deteriorate the ratio of the present government debt to GDP, at least for a certain period in the future. Under this condition, the sustainability index shown in equation (15) is obtained.

$$FSI(t, n) = \frac{K_{t,n}}{b_t / y_t} \quad (15)$$

However, $\ln K_{t,n} = (1 + \rho)^{-n} \ln \frac{b_t}{y_t} - \sum_{s=1}^n (1 + \rho)^{-s} E_t(k_{t+s})$

When the fiscal sustainability index, $FSN(t, n)$ equates to 1, this index shows that the ratio of government debt to GDP is maintained to be the same level as the present one for a certain period (n period) in the future. In the case that this index is smaller than 1, the ratio of government debt to GDP is estimated to be worse than the present one, while in the case the index exceeds 1, the ratio is expected to be better.

4. Evaluation of Fiscal Management in the 1990s

4.1 Verification of the Sustainability

4.1.1 Estimation Method for the Sustainability Index

Here I evaluated fiscal management in our country by using the fiscal sustainability index in equation (15) by Polito and Wickens (2007), as shown in the preceding chapter.

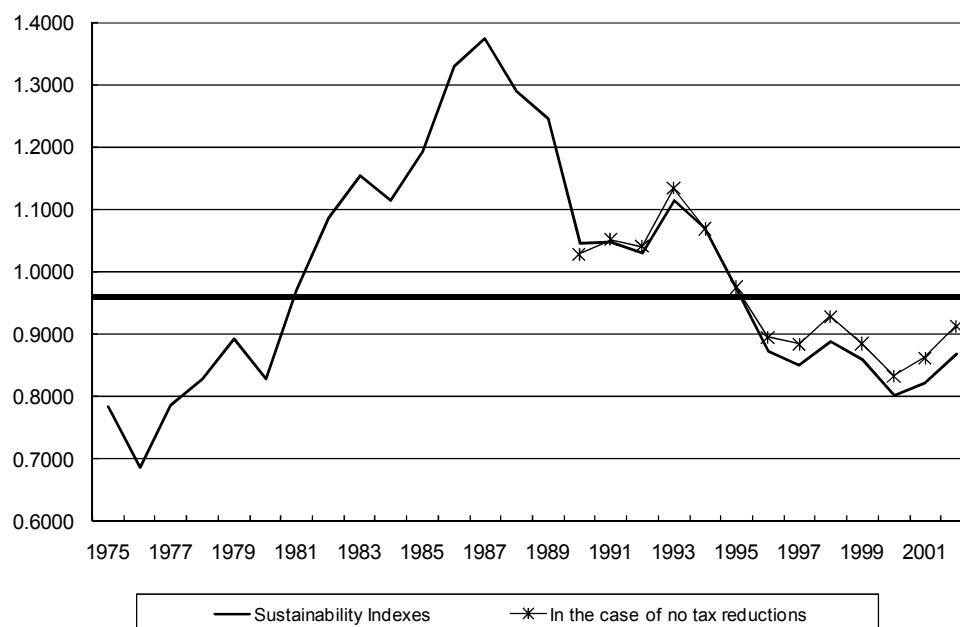
The following assumption was made for estimation of the sustainability index. As shown in equation (15), it is necessary to determine a certain period of time in the future, and to determine the expected values of government expenditure, tax revenue and others during that period. First, perfect foresight was hypothesized, and the past actual results of those for three years since the target year for evaluation were used. In other words, as for evaluation of fiscal management in FY1997, the actual results of government expenditure and tax revenue from FY1998 to FY2000 were used as expected values. Next, the mean value in the estimation period for 30 years from FY1975 to FY2005 (estimation of the index made for 27 years until FY2002) was used for the stationary-state value of each variable. The estimation period was set to be after 1975 in the light of the structural modification of the Japanese economy due to the First Oil Crisis as well as this time to be the period when the issuance of special deficit-financing bond was regularized.

The following procedures were used for obtaining necessary data and the processing method. The GDP deflator was used for preparing the real value of variables. As the system of national accounting changed from 68SNA to 93SNA, the GDP deflator was calculated after linking both methods to find the real gross domestic product series. The real amount of government expenditure, tax revenue and others were substantiated using this GDP deflator, and variables that were necessary for calculation of the fiscal sustainability index, $FSI(t, n)$, were obtained. The interest rate was obtained by making ex post facto calculations based on the amount of expenditures for the interest included in debt-servicing costs and the amount outstanding of national bonds, which was absorbed by the general accounting of the previous fiscal year. It is confirmed that the procedure of equation (12) was appropriate, as the result showed that the mean value of ρ was a positive value at 1.28 percent from FY1975 to FY2005.

Introduced below is the estimated result of the sustainability index under the hypothesis of perfect foresight, and the estimated result of sustainability calculated on the assumption that there was no taxation reform in the 1990s. If there were no taxation reductions, consequently there might have been no economic expansion, which might have had an effect on the real values of the macro variables including the Gross Domestic Product, interest rates, and so on.

However, such an effect was not included in the estimation.

Figure 5: Estimation of the Sustainability Indexes



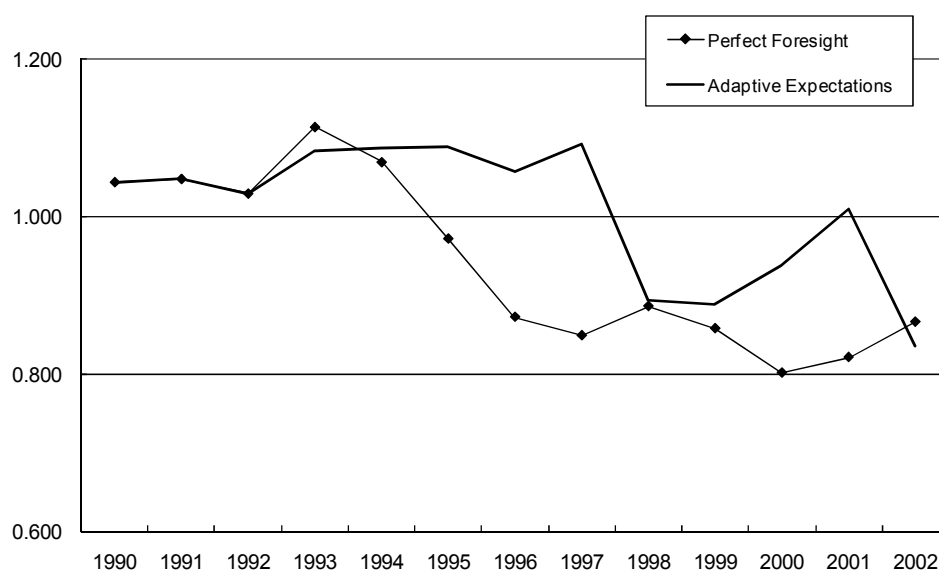
Data: "Financial Statistics" from the Ministry of Finance, and "Annual Report on National Accounts" and others from the Cabinet Office, Government of Japan

4.1.2 Estimated Result of the Sustainability Index

Figure 5 shows the estimated result of the sustainability index. The index exceeding 1 shows that the sustainability of fiscal management has improved, while the index falling below 1 shows it has deteriorated. In the past, the sustainability of fiscal management was most improved in FY1987 when the level of the index was 1.37. It generally exceeded 1.20 during the 1980s, when the sustainability of fiscal management increased. However, it decreased rapidly in the 1990s, and after reaching 1.07 in FY1994 it remained below 1, dropping to 0.85 in FY1997 and 0.80 in FY2000. The index then recovered to 0.87 in FY2002.

Looking at the sustainability index in the case where there was no taxation reform, in general it exceeds the above-mentioned estimated values. The level of the sustainability index was 0.88 in FY1997, 0.84 in FY2000, and 0.91 in FY2002, which is higher than the estimated value by 0.03 points, 0.03 points, and 0.04 points, respectively. Namely, the influence of the series of tax reduction policies based on taxation reform in the 1990s on the level of the sustainability index was thought to be approximately 0.03 points.

Figure 6: Comparisons between Perfect Foresight and Adaptive Expectations



Data: "Financial Statistics" from the Ministry of Finance, and "Annual Report on National Accounts" and so on from the Cabinet Office, Government of Japan

4.2 Estimation of the Sustainability Index Using VAR Model

Perfect foresight was assumed in the above. What kind of differences would there be if the government were to implement fiscal management based on adaptive expectations instead? The expected future value of variables based on adaptive expectations is prepared by using the VAR model; the sustainability index is then calculated using those expected values.

A method of forming future expected values using the VAR model is as follows. Variables necessary for performing calculations using the equation (14) are divided into the variable group A (variables for the interest rate, inflation rate, and growth rate) and the variable group B (b/y , g/y , t/y); the VAR model is then estimated for each variable group. The period targeted by estimation is the ten years from FY1993 to FY2002; estimation of the VAR model is made using data for the past 20 years from the target fiscal year. The lag order of two terms is used in the VAR model. Therefore, the VAR model for FY1993 is estimated using data from FY1973 to FY1993; predicted values of variables necessary from FY1994 to FY1996 are then calculated based on that result. Based on the predicted values obtained through the above process, calculations are made using equation (15) for the sustainability indexes of fiscal management.

Figure 6 indicates this estimate result. Many sustainability indexes based on adaptive expectations using the VAR model are larger than ones based on perfect foresight. As for values in FY1997, the sustainability index based on perfect foresight is 0.85, showing deterioration of the sustainability of fiscal management; however, the index based on adaptive expectations is 1.09, showing a tendency of improvement. Both indexes are at the same value of 0.89 in FY1998, but the index based on perfect foresight shows a tendency of deterioration while the one based on adaptive expectations indicates a tendency of improvement. The indexes in FY2000 are at 0.80 and 0.94 respectively, and in FY2001, 0.82 and 1.01 respectively; this shows the expansion of the difference between these two kinds of indexes.

How should this result be interpreted? If rational expectation cannot be established and the government cannot fully foresee the future, it is considered that actions may be taken based on adaptive expectations. As shown above, the sustainability indexes calculated based on the assumption of adaptive expectations are higher than the ones calculated according to perfect foresight. This means that the reality was severer than the government's expectations, even if the government implemented fiscal management by their decision based on past tendencies. They had had to introduce much stricter fiscal management without being constrained by past trends. This can be interpreted that the government has underestimated the influence of tax reduction policies and the expansion of government expenditure on fiscal sustainability.

Conclusion

This paper has clarified the trends of fiscal management by the government after the 1990s from the aspect of the fiscal sustainability, and has considered the effects of taxation reforms, including proportional tax reduction, on sustainability.

The primary balance of the general accounts tended to deteriorate throughout the 1990s, and its ratio to GDP increased from -0.5 percent in FY1993 to -3.5 percent in FY1999, and to -4.0 percent in FY2002. However, the deficit of the primary balance seems not to have increased so much, as in the case of that the long-term components of government expenditures, tax revenues and so on excluding the circulating components caused by short-term cyclic fluctuations are estimated, and the ratio of the primary balance to GDP is calculated based on the structural fiscal balance. It seems that the actual primary balance is observed to be worse than the structural primary balance by 0.5-1.0 percent points.

By reviewing the trends of taxation reforms implemented in the 1990s, it was estimated that 7.8 percent of tax revenues had been lost in the 17 years after FY1989 by a series of tax reductions. Supposing that taxation reforms had not been implemented, the primary balance mentioned above would have improved and the ratio of the primary balance to GDP in FY1999 (-3.5 percent) would have remained at -2.4 percent.

In order to appropriately judge the fiscal management of the government, it is necessary to verify whether the government took actions so as to satisfy the inter-temporal budget constraint. The sustainability indexes by Polito and Wickens (2007) were obtained to examine the trends of fiscal management in recent years. The sustainability indexes generally exceeded 1.20 during the 1980s, when the sustainability of fiscal management was satisfied. However, these indexes decreased rapidly in the beginning of 1990s, and after reaching 1.07 in FY1994 they lowered and remained below 1. On the other hand, the sustainability indexes based on the assumption of no tax reduction policies only show slight improvement, with a higher level than the actual indexes by approximately 0.03 points; however, they have not recovered to the level by which sustainability is satisfied. In that sense, the sustainability of fiscal management in our country was considered to be in a hazardous state, even if there were no tax reduction policies. Furthermore, when a trial calculation of the sustainability indexes was made based on adaptive expectations, higher values were obtained than those based on the assumption of perfect foresight. This result can be understood to show that the government has underestimated the effects of tax reduction policies and the increase in government expenditure on fiscal sustainability.

In conclusion, it can be said that the fiscal balance of the government further deteriorated in the 1990s from the viewpoint of the primary balance. Also, the influence of a series of taxation reforms, including tax reduction policies, on this deterioration cannot be disregarded. However, judging from more appropriate indexes relating to fiscal sustainability, the influence of the tax reduction policies was not as large as expected; therefore, it is considered that the sustainability of fiscal management in general was jeopardized comprehensively in the 1990s.

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