

Fiscal Sustainability in the Wake of the Economic Crisis in Korea^{*}

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<Abstract>

The total amount of government debt was expected to rise sharply over the following several years in the wake of the Korean financial and economic crisis in 1997, raising concern about the sustainability of government deficits and fiscal consolidation. This paper provides an overview of Korea's fiscal stance after the financial crisis and the policy implications for fiscal consolidation by assessing fiscal sustainability. Sustainability tests are carried out and show that Korean fiscal policy for the period 1970-99 should be regarded as sustainable. Indicators of sustainability are also measured to that Korean fiscal policy for the period 1970-96 is sustainable. However, both the primary and tax gap indicators with a sharp rise in the debt ratios are shown to be worsening since 1997 indicating increasingly possible unsustainable fiscal policies. It implies that the current primary deficit is too large and current taxes are too low to stabilize the debt ratio.

1. Introduction

The total amount of government debt was expected to rise sharply over the following several years in the wake of the financial and economic crisis in Korea, raising concern about the sustainability of government deficits and fiscal consolidation.

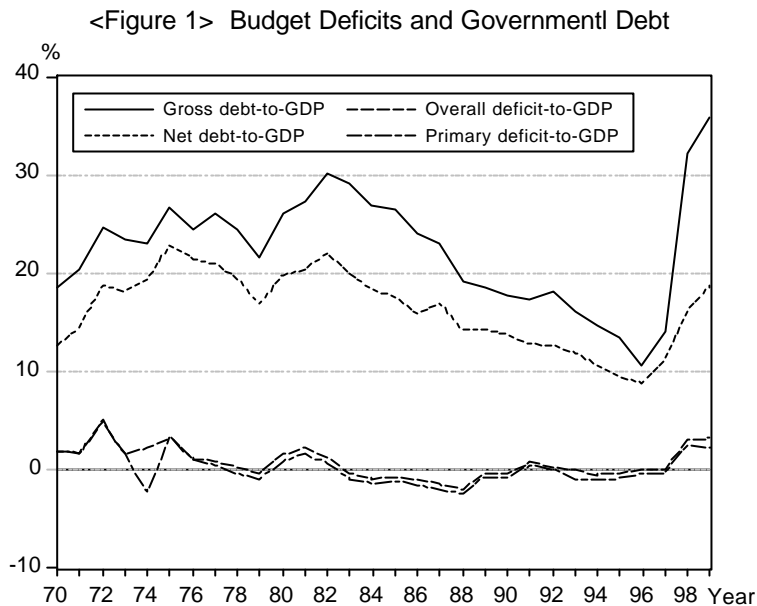
Korea recorded a budget deficit of 18.8 trillion won in 1998, the biggest annual shortfall since the Republic's foundation in 1948, and 13 trillion won in the following year. Accordingly the ratio of deficit to gross domestic product (GDP) rose to 4.2 percent and 2.7 percent respectively, the highest since 1981. Snowballing financial costs on the public funds used for financial sector restructuring were a main factor raising the budget deficit. This dramatically raised the nation's government debt by 29.3 percent to 90 trillion won in 1998 from 69.6 trillion won in 1997. The surge was attributed to the issuance of a huge sum in state bonds and borrowings from international funding agencies in order to raise badly-needed funds for corporate and financial restructuring.

When state-guaranteed liabilities are included, the government debt snowballed by 96.1 percent to 162 trillion won in 1998 from 82.6 trillion won in 1997 (see Figure 1). The government debt further expanded to 189.2 trillion won in 1999 and 194.2 trillion

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won in 2000 respectively. The ratio of government debt to the GDP rose from 18.1 percent in 1997 to 36.0 percent in 1998. The ratio climbed to 39.1 percent in 1999, but declined to 37.6 percent in 2000.



The skyrocketing amount of government debt is expected to pose a serious threat to the nation's economic development. Korea is worried that a dramatic rise in the government debt will derail the sound economic growth as has been seen in other countries, including the U.S., Britain, Germany and Japan. Korea's debt ratio to the GDP is still lower than those of some advanced economies most of which vary from 50 percent to 70 percent. However, government debt, once it begins to accumulate, tends to surge continuously due to snowballing interest payment burdens.

Thus the main purpose of this paper is to provide an overview of Korea's fiscal stance for the last three decades and particularly after the financial crisis and the policy implications for fiscal consolidation by assessing fiscal sustainability. It summarizes the general analytical background, focusing on the present value budget constraint (PVBC), sustainability indicators and tests of sustainability. Sustainability tests are carried out to test the hypothesis that Korean fiscal policy for the period 1970-99 should be regarded as sustainable.

However, the PVBC approach has clear limitations, that is, some fiscal policies that in no obvious sense appear unsustainable can satisfy the PVBC, while some other fiscal policies appear sustainable but do not satisfy the PVBC. Therefore, indicators of sustainability are measured to assess how far Korean fiscal policy departs from sustainability. It should be noted that such indicators are not backed by a formal definition of sustainability. Instead, they rely on a more intuitive notion of what distinguishes sustainable from unsustainable fiscal policy. These indicators would back

up the result of hypothesis testing obtained by the PVBC as to whether Korean fiscal policy for the period 1970-99 is sustainable.

2. The Theoretical Framework

This section presents a basic theoretical framework¹ to discuss fiscal sustainability which must satisfy both an intertemporal budget constraint and, in every period, a static budget constraint. The static budget constraint is

$$B_t = (1+r_t)B_{t-1} + D_t \quad (1)$$

where B_t is the government debt at period t , r_t is the discount rate, and D_t is the primary fiscal deficit, excluding interest payments. Solving equation (1) forward yields the intertemporal budget constraint

$$B_{t-1} = - \sum_{j=0}^{\infty} \beta^{j+1} D_{t+j} + \lim_{j \rightarrow \infty} \beta^{j+1} B_{t+j} \quad (2)$$

where $\beta = 1/(1+r)$ and β^{j+1} is the discount factor applying between periods t and $t+j$. From equation (2), sustainability requires that the present value of future primary surpluses must exceed the present value of primary deficits by a sufficient amount to cover the difference between the initial debt stock and the present value of the terminal debt stock.

If the present value of the terminal debt stock is positive, equation (2) can be satisfied even if a government rolls over its debt in full every period by borrowing to cover both principal and interest payments. However, Chalk and Hemming (2000) demonstrates that a government attempting to run a Ponzi game will find that no rational individual is willing to hold its liabilities, and it cannot therefore roll over its debt in full in every period.

$$B_{t-1} = - \sum_{j=0}^{\infty} \beta^{j+1} D_{t+j} \quad (3)$$

Thus a no-Ponzi game restriction is typically regarded as synonymous with sustainability, which implies that the transversality condition, $\lim_{j \rightarrow \infty} \beta^{j+1} B_{t+j} < 0$, has to hold. In fact, this condition will hold as an equality since individual investors cannot end up being indebted to the government, and as a consequence sustainable fiscal policy has to satisfy the present value budget constraint (PVBC)

¹ A closed-economy version is assumed, where there is no need to be concerned about external debt.

That is, sustainability requires that an excess of future primary surpluses over primary deficits match the current stock of government debt in present value terms.

On the other hand, Barro (1989) and Kremers (1989) argue for a constraint on the size of primary fiscal deficits and, because the government cannot raise more revenue than the economy generates as income, the condition - $D_{t+j} < \gamma Y_{t+j}$ must hold, where Y_{t+j} is output and $\gamma < 1$, which implies that

$$B_{t-1} < \sum_{j=0} \beta^{j+1} \gamma Y_{t+j} \quad (4)$$

is the necessary condition for sustainability. This would imply that, if the interest rate is greater than the growth rate, the debt ratio needs to be bounded.

McCallum (1984) also points out, while permanent primary deficits are inconsistent with the PVBC, permanent overall deficits, inclusive of interest payments, may be sustainable. This can be seen more clearly if one imagines a country running a small primary surpluses every period to cover a fraction of the interest costs of the debt. There will be an overall deficit in every period, but the debt will grow less fast than the interest rate and thus be regarded as sustainable, that is, satisfying the transversality condition.

3. Sustainability Tests²

We are now interested in the question of whether the Korean government's creditors could rationally expect that the government budget would be balanced in present-value terms. If the PVBC holds for historical data, then the null hypothesis

$$\lim \beta^{j+1} B_{t+j} = 0 \quad (5)$$

will not be rejected in statistical tests.

The appropriate sustainability test is then to see if the historical process that generates fiscal data is likely to result in the PVBC eventually being violated.³ If so, fiscal policy and thus the data generating process will have to be changed and current policy should be regarded as unsustainable.

² There are quite a few studies that examine if the U.S. federal budget deficits violate intertemporal budget balance. The results are contradictory. With the exceptions of Hamilton and Flavin (1986) and Wilcox (1989), most papers, including Trehan and Walsh (1988), Hakkio and Rush (1991), and Bohn (1998), develop their tests by exploiting the presence, under intertemporal budget balance, of a cointegrating relationship linking net-of-interest expenditures, revenues, interest payments, and the outstanding stock of debt.

³ See Chalk and Hemming (2000) for further discussion.

Equation (2) is mathematically equivalent to equation (6), the model proposed by Flood and Garber (1980) for studying self-fulfilling hyperinflation and applied by Hamilton and Flavin (1986).

$$B_t = A_0(1+r)^t - E_t \sum \beta^{j+1} D_{t+j} + \varepsilon_t \quad (6)$$

where the operator E_t denotes the expectations of creditors and ε_t is a regression disturbance term reflecting expected changes in real short-term interest rates, the term structure of long rates, and measurement error. Hamilton and Flavin suggest that, for any stationary process for $(\varepsilon_t, E_t \sum \beta^{j+1} D_{t+j})$, when $A_0 = 0$, B_t will be stationary, whereas for $A_0 > 0$, B_t will not be stationary. They also propose that the test to determine whether $A_0 = 0$ is based on the observation that if the process for the discounted sum of future deficits is stationary, then B_t is stationary if and only if $A_0 = 0$.⁴

<Table 1> Augmented Dickey-Fuller Test on Government Deficit and Debt

Variable	Sample	ADF Test Statistic	Constant	Lags
(1) $(1 - L)D_t$	70-99	-1.91	O	2
(2) $(1 - L)D_t$	70-99	-1.99**	X	2
(3) $(1 - L)B_t$	70-99	-1.24	O	4
(4) $(1 - L)B_t$	70-99	-2.29**	X	4

Note: * denotes significant at 10%; ** at 5%; *** at 1%. L denotes the lag operator

The annual data for 1970-99 is used to test whether the bubble term turns out not to be zero, and the hypothesis that Korean fiscal policy should be regarded as sustainable. The results from the augmented Dickey-Fuller unit root tests are contained in Table 1. Equation (1) shows that the computed value of the ADF test statistic is too small to reject the null hypothesis of a unit root in the budget deficit process at any level of significance. However, since the estimate of the constant term is insignificant, results of the same regression excluding the constant is presented in equation (2). Now the presence of a unit root in the deficit process is rejected at the significance level of 5 percent. Equation (3) produces the result for stock of debt process, showing that the null hypothesis of a unit root in the debt process cannot be rejected at any level of significance. Yet the exclusion of the insignificant constant term in equation (4) shows that the presence of a unit root in the stock of debt process is rejected at the significance level of 5 percent.

Similarly, the Phillips-Perron test results are presented in Table 2. Equations (1) and (2) repeat the same exercises for the deficit and debt processes. In both cases, we can reject the hypothesis of a unit root at the 5 percent level.

⁴ Hamilton and Flavin also suggest that a sufficient condition for the PVBC to hold is that, if the primary balance is a stationary series, $A_0 = 0$ must imply that B_t is also stationary. It should be noted that this is a sufficient but not necessary condition for sustainability; fiscal policy could be sustainable even if debt is nonstationary.

<Table 2> Phillips-Perron Test on Government Deficit and Debt

Variable	Sample	PP Test Statistic	Constant
(1) $(1 - L)D_t$	70-99	-1.78**	X
(2) $(1 - L)B_t$	70-99	-2.52**	X

Note: * denotes significant at 10%; ** at 5%; *** at 1%.

The test results show that both the budget deficit and the debt are stationary⁵, and thus conclude that the bubble term turns out not to be significant, and the hypothesis that Korean fiscal policy for the period 1970-99 should be regarded as sustainable cannot be rejected. The Korean data thus seem fully favorable so far with the assertion that government creditors rationally expected the budget to be balanced in present-value terms even if the budget deficit and the debt are skyrocketing after the economic crisis in 1997. For Korea that had little debt or with significant net worth until the currency crisis, fiscal policies may still be sustainable even if they lead to an increase in debt or lower net worth.

4. Indicators of Fiscal Sustainability

In this section, we focus on indicators of how far Korean fiscal policy departs from sustainability in practice. Even if the test results obtained in the previous section seem to favor the PVBC approach, it has clear limitations.⁶ That is, most notably some fiscal policies that in no obvious sense appear unsustainable can satisfy the PVBC while some other fiscal policies appear sustainable but do not satisfy the PVBC. In contrast, indicators of sustainability have considerable intuitive appeal and distinguishes sustainable from unsustainable fiscal policy.⁷

Definition of Sustainable Indicators

The indicators attempt to assess the magnitude of inconsistencies in fiscal policies and measure the size of the permanent fiscal adjustment needed to achieve stabilization of

⁵ Hamilton and Flavin also show that the hypothesis that post war U.S. fiscal policy should not be regarded as sustainable cannot be rejected since both the primary balance series and the debt process are stationary. In contrast, Trehan and Walsh (1988, 1991) find debt in the United States to be nonstationary. However, they argue that if the PVBC holds, if deficits and debt are integrated, and if interest rates are constant, then a necessary and sufficient condition for sustainability is that primary balances are and debt are cointegrated. They find that cointegration is not rejected for postwar U.S. data.

⁶ See Buiters(1985), Blanchard(1990), Horne(1991), and Chalk and Hemming(2000) for further discussion.

⁷ Even not backed by a formal definition and theoretical framework, sustainability indicators are used by the OECD and the IMF to assess the sustainability of fiscal policies of industrial countries for their usefulness.

the base year national debt-to-GDP ratio. Measure of fiscal sustainability are proposed by Buiter (1985) that sustainable fiscal policy should maintain the ratio of government net worth to output at its current level. The sustainability indicator introduced by Buiter is

$$G^{NW} = d^* - d = (r - n)w - d \quad (7)$$

where d = the ratio of the primary deficit to GDP, d^* = the ratio of the sustainable primary deficit to GDP, r = real rate of interest, n = real growth rate of GDP, w = the ratio of net worth to GDP. A negative value suggests that the current primary deficit is too large to stabilize the net worth ratio and that fiscal policy should thus be regarded as unsustainable.

Even if the net worth indicator is easy to interpret, it is difficult in general to obtain accurate information on the magnitude of government net worth. Easily measurable indicators of fiscal sustainability are thus developed by Blanchard (1990) ; the primary gap indicator and the tax gap indicator.

The primary gap indicator is based on the permanent primary deficit necessary to stabilize the debt ratio and is given by

$$G^P = d^* - d = (n - r)b - d \quad (8)$$

where b = the ratio of government debt to GDP. It measures the required adjustment in the primary deficit needed to stabilize the government debt-to-GDP ratio, given the current and projected paths of the primary balance, the real interest rate and output growth.⁸ That is, the primary gap equals the difference between the primary deficit that stabilizes the outstanding debt-to-GDP ratio and the current primary fiscal deficit. The benchmark indicator is zero with a negative value for this indicator showing that the current primary deficit is too large to stabilize the debt ratio and that fiscal policy is thus unsustainable.

The tax gap indicator⁹ is given by

$$G^T = t - t^* = t + (n - r)b - g \quad (9)$$

where t = the ratio of taxes to GDP, t^* = the ratio of sustainable taxes to GDP, g = the ratio of primary government expenditures (excluding interest payments) to GDP. The tax gap indicator is the difference between the current tax ratio and the constant tax ratio and measures the required adjustment in the tax ratio needed to stabilize the outstanding debt-to-GDP ratio, given the current and projected paths of the primary expenditures, the real interest rate and output growth. A negative value for the tax gap indicator suggests that current taxes are too low to stabilize the debt ratio given the current fiscal policy.

Chalk and Hemming (2000) argue that the primary and tax gap indicator are obviously the same, but they differ in their emphasis. The former points to the reduction in the primary deficit required for sustainability of the debt, while the latter indicates the

⁸ Horne (1991) shows that the primary gap is derived from the budget identity, assuming no monetary financing and setting the change in debt stock equal to zero.

⁹ Blanchard (1990) also suggests a medium-term tax gap indicator, which is the difference between the current tax ratio and that necessary to stabilize the debt ratio over the next N years, assuming constant interest and growth rates.

increase in the tax ratio required for sustainability of the debt given current spending policies. The main advantage of using sustainability indicators is that they are relatively simple to construct, being model-free and based on forecasts of a restricted information set. The indicators suggested here are also useful in that they are quite simple and have a ready intuition that should appeal to policy decision-making.¹⁰

Simulation Results

Government debt ratios and sustainability indicators are not conceptually equivalent. The former measures the actual or ex ante ratio of the outstanding stock of government indebtedness to GDP while the latter are ex ante measures of the required permanent fiscal adjustment needed to stabilize the base year government debt ratio. However, simulation of the net government debt-to-GDP ratio together with sustainability indicators would provide a good proxy of government solvency.

<Table 3> Correlation Coefficients, 1970-99

	Net debt	Primary gap	Tax gap
Net debt	1.00	-0.11	-0.04
Primary gap	-0.11	1.00	0.85
Tax gap	-0.04	0.85	1.00

Table 3 shows the correlation coefficients between government debt ratios, primary gap indicator, and tax gap indicator over the period, 1970-99, in Korea. The coefficients between debt ratios and primary gap indicator and between debt ratios and tax gap indicator are negative while the magnitudes are very small.

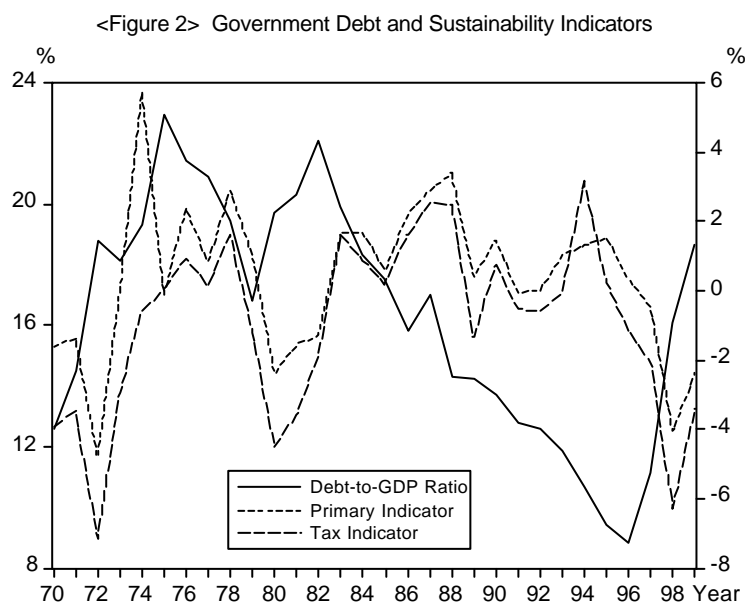
Table 4 and Figure 2 show the net government debt-to-GDP ratio of the general government of Korea together with the primary and tax gaps simulated over the period, 1970-99. The most interesting finding is that the observed decline in debt ratios since the early 1980s until the economic crisis 1997 gives a misleading picture of fiscal solvency by failing to capture the rise in the indicators, while the debt ratios and indicators move together for the rest of the sample period. Particularly, it should be noted that as the debt ratios rise sharply since 1997, both the primary and tax gap indicators are shown to be worsening over the period in the wake of the economic crisis in Korea indicating increasingly possible unsustainable fiscal policies. That is, the current primary deficit is too large and current taxes are too low to stabilize the debt ratio.

¹⁰ However, Horne discusses that there are three main areas of weakness of sustainability indicators; lack of behavioural content, inclusion of implicit normative criteria and the absence of a global or systematic perspective.

<Table 4> Government Debt and Sustainability Indicators (unit: %)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Net debt	12.6	14.5	18.8	18.2	19.3	22.9	21.5	20.9	19.4	16.8
Primary gap	-1.62	-1.37	-4.79	-0.08	5.73	-0.13	2.37	0.83	2.90	1.02
Tax gap	-3.89	-3.48	-7.17	-2.97	-0.59	0.05	0.93	0.15	1.62	-1.21
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Net debt	19.7	20.3	22.1	19.9	18.3	17.6	15.8	16.9	14.3	14.2
Primary gap	-2.39	-1.56	-1.30	1.68	1.67	0.58	2.17	2.88	3.38	0.41
Tax gap	-4.51	-3.58	-1.85	1.61	0.89	0.19	1.61	2.55	2.46	-1.36
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Net debt	13.7	12.8	12.6	11.8	10.6	9.4	8.8	11.1	16.1	18.6
Primary gap	1.47	-0.07	0.01	1.02	1.30	1.53	0.35	-0.49	-4.06	-2.38
Tax gap	0.75	-0.53	-0.62	-0.03	3.15	0.25	-1.16	-2.01	-6.28	-3.38

Sources: Calculated by the author. Raw data is obtained from the Ministry of Finance and Economy, Korea.



5. Conclusion and Policy Implications

This study provides an overview of Korea's fiscal stance for the last three decades and particularly after the financial crisis, and the policy implications for fiscal consolidation by assessing fiscal sustainability. It summarizes the general analytical background, focusing on the present value budget constraint (PVBC), sustainability indicators and tests of sustainability. Sustainability tests are carried out and show that Korean fiscal policy for the period 1970-99 should be regarded as sustainable. The primary gap and tax gap indicators would also back up the result of hypothesis testing obtained by the PVBC that Korean fiscal policy for the period, particularly between 1970-96, is sustainable.

However, both the primary and tax gap indicators with a sharp rise in the debt ratios are shown to be worsening since 1997, indicating increasingly possible unsustainable fiscal policies. This implies that the current primary deficit is too large and current taxes are too low to stabilize the debt ratio. Thus, increased tax collection and per capita tax burden are recommended to reduce the government's budget deficits and debt and to consolidate the fiscal stance so as to retain fiscal sustainability in Korea.

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