

# **Fiscal Assessment of Debt Sustainability in East Asia After the Asian Financial Crisis\***

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## **<Abstract>**

The total amount of government debt has risen sharply over the following several years in the wake of the Asian financial crisis in 1997, raising concern about the sustainability of government deficits and fiscal consolidation. This paper provides an overview of selective East Asian countries' fiscal stance after the crisis and the assessment of fiscal sustainability. Test results suggest that budget deficits are stationary in all countries. The exception is Korea, which has opposite outcomes. For government debt, the results are mixed for Malaysia and Thailand. Interestingly, actual government debts of Korea, Indonesia and Philippines were smaller than the sustainable levels before the crisis according to the Wald test. After the crisis, the situation reverses as a rapid surge in fiscal deficits pushes government debts far above the levels of sustainability. The other two countries, Malaysia and Thailand, also experience a considerable rise in the government debt above the sustainable level as a consequence of the Crisis. The effects are particularly severe in Thailand

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## **1. Introduction**

The total amount of government debt has risen sharply over the following several years in the wake of the currency crisis in East Asia along with an enormous amount of outstanding external debt, raising concern about the sustainability of government debt and fiscal consolidation.

Thus the main purpose of this paper is to provide an overview of East Asian countries' fiscal stance for the last three decades and particularly after the currency crisis and the policy implications for fiscal consolidation by assessing fiscal sustainability. This study, in particular, explores the budget deficit and government debt issues of those severely attacked countries in East Asia, such as Korea, Malaysia, Indonesia, the Philippines, and Thailand. It summarizes the general analytical background, focusing on the present-value borrowing constraint (PVBC)<sup>1</sup> and tests of sustainability. Sustainability tests are carried out by utilizing the classic test of Hamilton and Flavin(1986) to test the hypothesis that East Asian countries' fiscal policy for the period 1972-2002 should be regarded as sustainable.

## **2. Fiscal Performance Aftermath of the Currency Crisis**

When the economy was experiencing robust growth with private sector playing the major role as during the period before the Asian currency crisis, the fiscal stance was tight in the East Asian countries and all of them registered fiscal surpluses during the mid-

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<sup>1</sup> 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, sometimes indicators of sustainability are measured to assess how far 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

1990s; Korea, from 1993 to 1996, Thailand, from 1988 to 1996, Malaysia, from 1993 to 1997, Indonesia, from 1994 to 1997, and the Philippines, from 1994 to 1997, respectively (see <Figure 1a> thru <Figure 1e>). On the other hand, in the years immediately after the Asian crisis, which plunged the East Asian countries into their deepest recession, the respective government embarked on an expansionary fiscal policy to provide counter-cyclical measures to compensate for the financially strapped private sector.

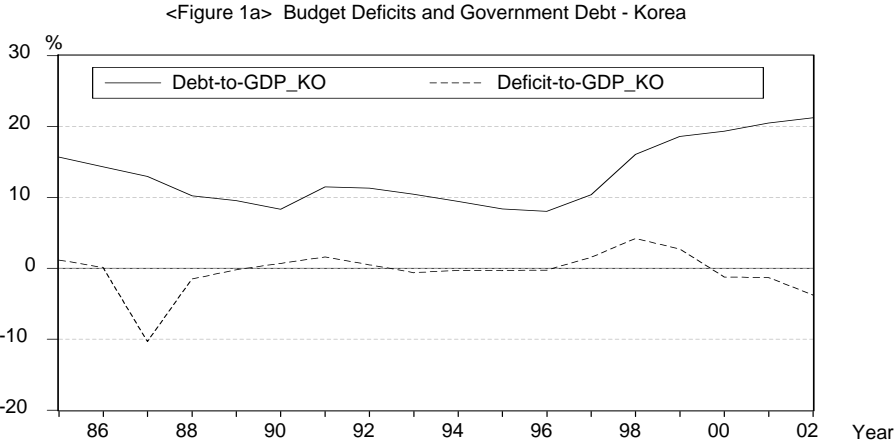
From an initial austerity drive based on fiscal tightening stance, the respective government reversed the decision to implement fiscal stimulus measures to resuscitate the economy. In line with the strategy to spur economic recovery, it allocated more funds for restructuring of the financial and corporate sector as well as for socio-economic projects to cushion the impact of the crisis on the more vulnerable segments of the society. The expansionary budget policy has been effective and together with export demand for electronic and electrical products. Each economy bounced back from a negative growth rate in 1988 respectively.

The East Asian economy again faced difficult challenges when the world economy began slowing down towards the end of 2000. In order to mitigate the effects of slower world growth, each government implemented fiscal stimulus packages for the development and infrastructure projects. The objective is also to stimulate private sector investment and enhance competitiveness, the package focuses on making funds more accessible at reasonable costs to the private sector. As a result, the contribution of public sector expenditure to recovery and GDP growth was significant in East Asian countries, particularly in Thailand, Malaysia, and the Philippines in 2002.

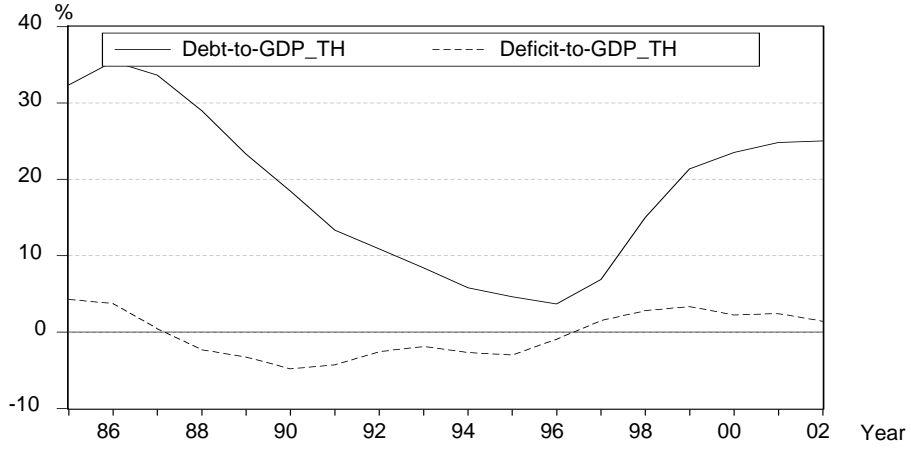
Accordingly persistent fiscal stimulus in East Asian countries after the currency crisis

was a main factor raising the budget deficit. This dramatically raised the nation's net debt ratio to the GDP from 10.4 percent to 21.2 percent in Korea, from 6.9 percent to 25.0 percent in Thailand, from 27.3 percent to 35.6 percent in Malaysia, from 72.5 percent to 102.4 percent in Indonesia, from 55.7 percent to 84.7 percent in the Philippines, respectively for the years of 1997 and 2002 (see also <Figure 1a> thru <Figure 1e>).

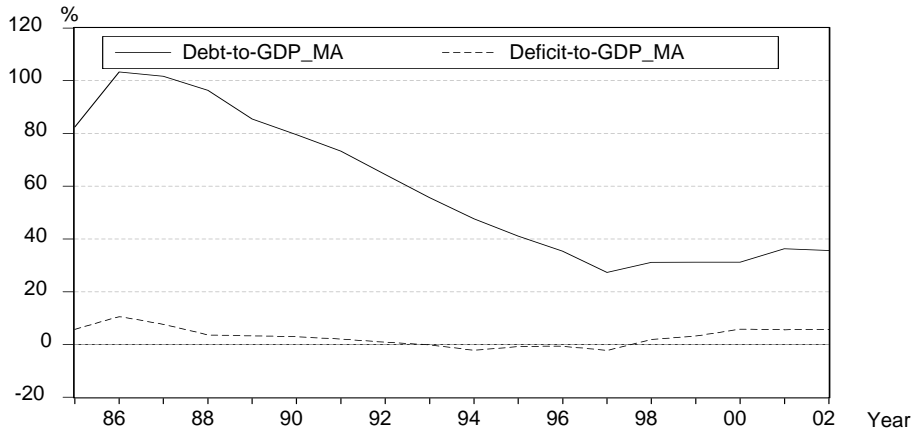
The surge was attributed to the issuance of a huge sum in state bonds and borrowings from international funding agencies in order to raise badly-needed funds for corporate and financial restructuring as well as to stimulate the sluggish economy. The skyrocketing amount of government debt is expected to pose a serious threat to the nation's economic development. Each of the East Asian countries is concerned about a dramatic rise in the government debt since it would derail the sound economic growth as was experienced before the Asian crisis



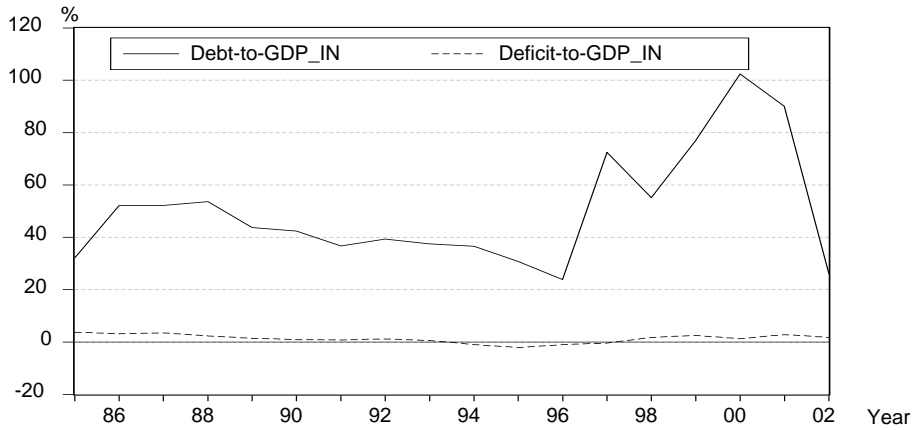
<Figure 1b> Budget Deficits and Government Debt - Thailand

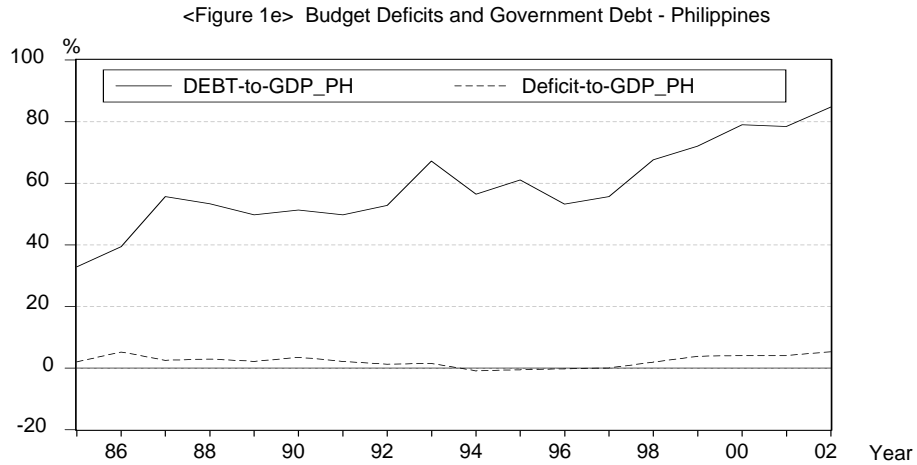


<Figure 1c> Budget Deficits and Government Debt - Malaysia



<Figure 1d> Budget Deficits and Government Debt - Indonesia





### 3. Analytical Framework

This section presents a basic analytical framework<sup>2</sup> 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

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

in which  $B_t$  is the real market value of outstanding government debt at period  $t$ ,  $r_{t-1}$  is the *ex-post*, composite real rate of interest for all debt instruments held from  $t-1$  to  $t$ , and  $D_t$  is the primary fiscal deficit, excluding interest payments. Solving equation (1) forward yields the intertemporal budget constraint

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

<sup>2</sup> A closed-economy version is assumed, where there is no need to be concerned about external debt.

where  $\beta = 1/(1+r)$  and  $\beta^{j+1}$  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,  $\lim \beta^{j+1} B_{t+j} < 0$ , 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 borrowing constraint (PVBC)

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

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

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.

#### 4. Empirical Results<sup>3</sup>

<Table 1> reports the results of augmented Dickey-Fuller (ADF) tests for the null hypothesis of a unit root. To have a crosscheck, we also report the results of Kwiatkowski *et al.* (KPSS, 1992) tests, which assumes the null hypothesis that the series is stationary

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<sup>3</sup> 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.



with or without a trend. Both tests suggest that budget deficits are stationary in all countries. The exception is Korea, which has opposite outcomes. For government debt, the KPSS test shows that the null hypothesis of stationarity, either with or without trend, is rejected in all countries. These findings are consistent with those of the ADF test for Korea, Indonesia and the Philippines, as they could not reject the null hypothesis of a unit root. Yet the results are again mixed for Malaysia and Thailand. The ADF test indicates that government debts in these countries are better characterized as being stationary.

In light of considerably inconclusive results, we decide to test the present value model of debt above directly. Sustainability requires that an excess of future fiscal surpluses over deficits match the current stock of government debt in present value terms. Campbell and Shiller (1987) and Campbell (1987) propose a test of models described by such present value relationships. Their procedure makes full use of the model's structure and derives testable hypotheses using formal econometric methods. Using this, we not only formally test the model's implications but also examine whether there was any discernible change in the behaviour of government debt following the Asian crisis. As their procedure is well known and widely used in the literature, we do not repeat here, but refer readers to the original contributions.

<Table 2> reports the results of the Wald test for the null hypothesis that the restrictions implied by the present value model are coherent with the data. This null hypothesis is rejected strongly in Korea, Malaysia, Indonesia and Thailand. For Philippines, the present value model is not rejected but only marginally at the 10% significance level. <Figure 2> depicts the implied sustainable path of government debts by the model along with their actual levels. Interestingly, actual government debts of Korea, Indonesia and Philippines

were smaller than the sustainable levels before the crisis. Hence government debt posed no major concern to the healthiness of the economy. After the crisis, however, the situation reverses as a rapid surge in fiscal deficits pushes government debts far above the levels of sustainability. The other two countries, Malaysia and Thailand, also experience a considerable rise in the government debt above the sustainable level as a consequence of the Crisis. The effects are particularly severe in Thailand

<Table 1> Unit Root Tests

	Debt			Deficit		
	ADF	KPSS		ADF	KPSS	
		No trend	Trend		No trend	Trend
Korea	3.40	0.89*	0.21*	63.45	0.08	0.05
Thailand	-12.13*	0.53*	0.09	-18.43*	0.11	0.11
Malaysia	-5.42*	0.76*	0.23*	-16.83*	0.11	0.12
Indonesia	-1.82	0.83*	0.14	-16.87*	0.09	0.09
Philippines	2.26	1.06*	0.20*	-8.20*	0.29	0.10

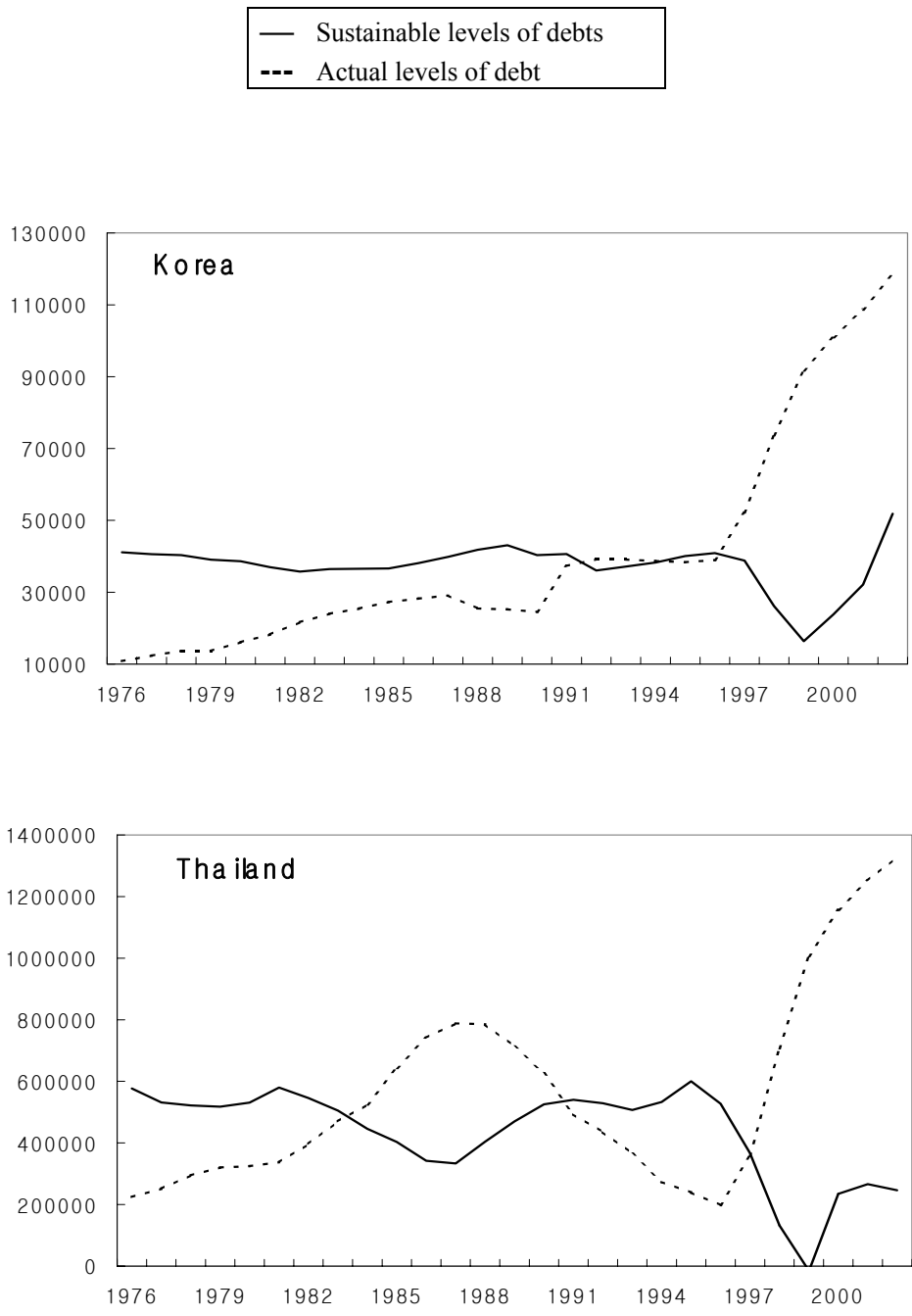
Note: Critical values for the ADF and KPSS tests are drawn from Fuller (1976) and Kwiatkowski *et al.* (1992), respectively. An \* indicates statistical significance at the 5% level.

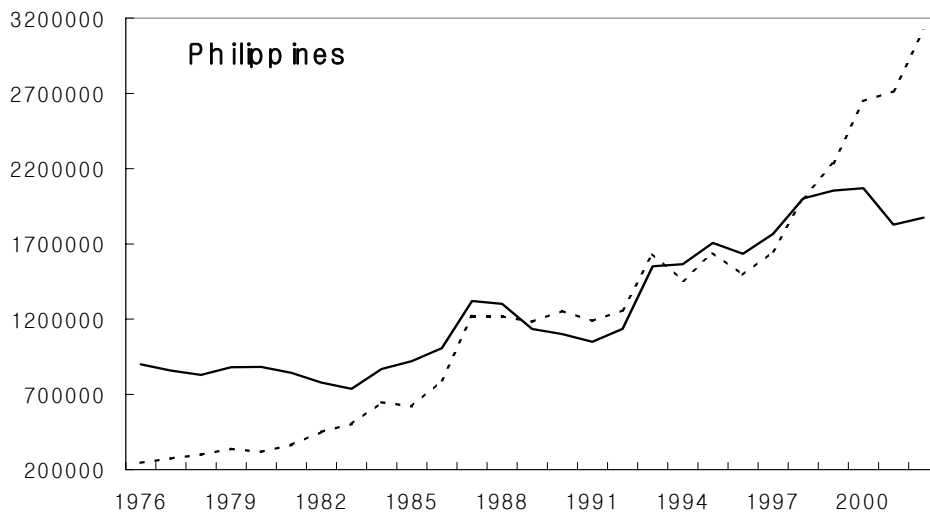
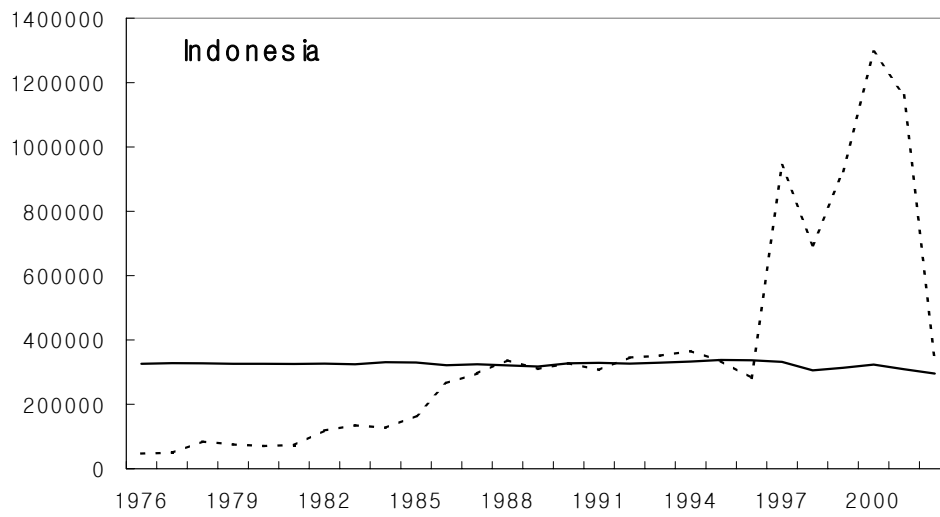
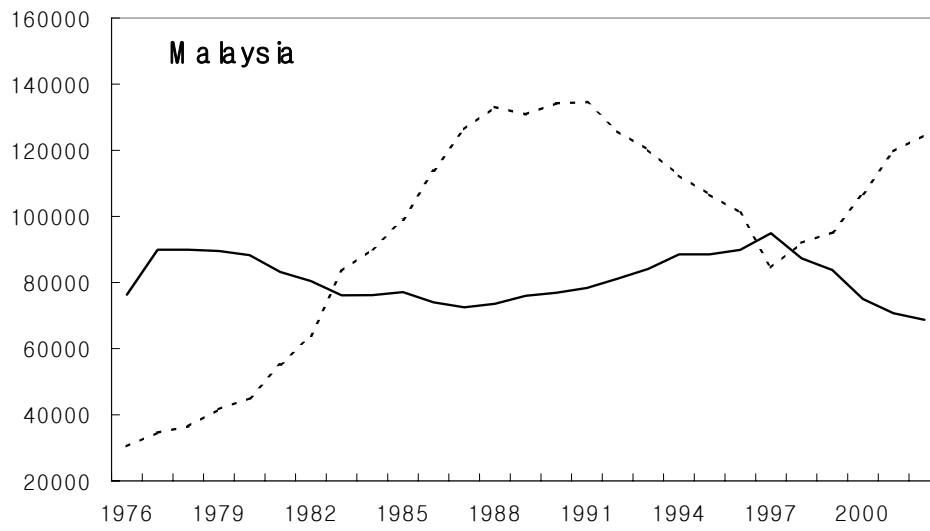
<Table 2> Tests on the Present Value Model of Government Debt

	Korea	Malaysia	Indonesia	Philippines	Thailand
Wald test	19.11	22.00	47.93	14.55	54.46
<i>p</i> -value	0.01	0.01	0.00	0.07	0.00

Note: The Wald test statistic is distributed as  $\chi^2(8)$ .

<Figure 2> Sustainable Levels of Government Debt





## **5. Conclusion**

This study provides an overview of East Asian countries' fiscal stance for the last three decades and particularly after the currency crisis. It summarizes the general analytical background, focusing on the present-value borrowing constraint (PVBC) and tests of sustainability.

Sustainability tests, using the ADF test and the KPSS test, are carried out and show that the fiscal policy in East Asia for the period 1972-2002 should be regarded as sustainable. Test results suggest that budget deficits are stationary in all countries. The exception is Korea, which has opposite outcomes. For government debt, the results are again mixed for Malaysia and Thailand.

The results of the Wald test for the null hypothesis that the restrictions implied by the present value model are coherent with the data. This null hypothesis is rejected strongly in Korea, Malaysia, Indonesia and Thailand. For Philippines, the present value model is not rejected but only marginally at the 10% significance level. Interestingly, actual government debts of Korea, Indonesia and Philippines were smaller than the sustainable levels before the crisis.

Hence government debt posed no major concern to the healthiness of the economy. After the crisis, however, the situation reverses as a rapid surge in fiscal deficits pushes government debts far above the levels of sustainability. The other two countries, Malaysia and Thailand, also experience a considerable rise in the government debt above the sustainable level as a consequence of the Crisis. The effects are particularly severe in Thailand

## REFERENCES

- Ahmed, Shaghil and John H. Rogers (1995), "Government Budget Deficits and Trade Deficits: Are Present Value Constraints Satisfied in Long-Term Data?" *Journal of Monetary Economics*, 36:351-74.
- Bohn, Henning (1991), "The Sustainability of Budget Deficits with Lump-Sum and with Income-Based Taxation," *Journal of Money, Credit, and Banking*, 23: 580-604.
- \_\_\_\_\_ (1995), "The Sustainability of Budget Deficits in a Stochastic Economy," *Journal of Money, Credit, and Banking*, 27: 257-72.
- \_\_\_\_\_ (1998), "The Behavior of U.S. Public Debt and Deficits", *The Quarterly Journal of Economics*, August: 949-63.
- Buiter, Willem. H. and Urjit R. Patel (1992), "Debt, Deficits and Inflation: An Application to the Public Finances of India," *Journal of Public Economics*, 47: 171-205.
- Campbell, J. (1987), "Does Saving Anticipate Declining Labor Income?: An Alternative Test of the Permanent Income Hypothesis," *Econometrica* 55, 1249-73.
- \_\_\_\_\_ and R. Shiller (1987), "Cointegration and Tests of Present Value Models," *Journal of Political Economy* 95, 1062-88.
- Chalk, Nigel (1998), "Fiscal Sustainability with Non-Renewable Resources," IMF Working Paper No. 98/26, International Monetary Fund.
- \_\_\_\_\_ and Richard Hemming (1999), "What Should be Done with a Fiscal Surplus?" *International Economic Policy Review*, Vol.1, ed. by Paul M., Padma G., and Rimothy L., International Monetary Fund.
- \_\_\_\_\_ and Richard Hemming (2000), "Assessing Fiscal Sustainability in Theory and Practice," IMF Working Paper No. 00/81, International Monetary Fund.
- Corsetti, Giancarlo and Nouriel Roubini (1991), "Fiscal Deficits, Public Debt and Government Solvency: Evidence from OECD Countries," *Journal of the Japanese and International Economics*, 16: 227-40.
- Fukuda, Shin-Ichi and Hiroshi Teruyama (1994) "The Sustainability of Budget Deficits in Japan," *Hitotsubashi Journal of Economics*, 35: 109-19.
- Fuller, W. (1976), *Introduction to Statistical Time Series*, John Wiley & Sons.
- Hamilton, James D. and Marjorie A. Flavin (1986), "On the Limitations of Government Borrowing: A Framework for Empirical Testing," *American Economic Review*, 76: 809-19.

- Hatano, Toshiya (1999), "The Sustainability of Government Deficits in Japan," presented to the 56<sup>th</sup> Congress of the Japanese Association of Public Finance. (in Japanese)
- Hemming, Richard and Murray Petrie (2000), "A Framework for Assessing Fiscal Vulnerability," IMF Working Paper No. 00/52, International Monetary Fund.
- International Monetary Fund (2003), "Sustainability Assessments --- Review of Application and Methodological Refinements," Prepared by the Policy Development and Review Department.
- \_\_\_\_\_ (2002), "Assessing Sustainability," Prepared by the Policy Development and Review Department.
- Jha, Raghendra and A. Sharma (2002), "Structural Breaks, Unit Roots and Cointegration: A Further Test of the Sustainability of the Indian Fiscal Deficit," Presented to the 58<sup>th</sup> Congress of the International Institute of Public Finance, 26-29 August 2002, Helsinki, Finland.
- Kwiatkowski, D., P. Phillips, P. Schmidt, and Y. Shin, "Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root," *Journal of Econometrics* 54, 159-178.
- Leibfritz, Willi, Deborah Roseveare and Paul van den Noord (1994), "Fiscal Policy, Government Debt and Economic Performance," OECD, Economics Department Working Papers No.144.
- McCallum, Bennet T. (1984), "Are Bond-Financed Deficits Inflationary? A Ricardian Analysis," *Journal of Political Economy*, 92: 123-35.
- Quintos, Carmela E. (1995), "Sustainability of the Deficit Process With Structural Shifts," *Journal of Business & Economic Statistics*, 13(4): 409-17.
- Smith, Gregor W. and Stanley E. Zin (1991), "Persistent Deficits and the Market Value of Government Debt," *Journal of Applied Econometrics*, 6:31-44.
- Tanner, Evan and Peter Liu (1994), "Is the Budget Deficit 'Too Large'? : Some Further Evidence," *Economic Inquiry*, 32(5): 511-18.
- \_\_\_\_\_ and E.C. Ramos (2002), "Fiscal Sustainability and Monetary versus Fiscal Dominance: Evidence from Brazil, 1991-2000," IMF Working Paper No. 02/5, International Monetary Fund.
- Trehan, Bharat and Carl E. Walsh (1988), "Common Trends, The Government's Budget Constraint, and Revenue Smoothing," *Journal of Economic Dynamics and Control*, 12: 425-44.
- \_\_\_\_\_ (1991), "Testing Intertemporal Budget Constraints: Theory and Applications to U.S. Federal Budget and Current Account Deficits," *Journal of Money, Credit, and Banking*, 23: 206-23.
- Wilcox, David W. (1989), "Sustainability of Government Deficits: Implications of the Present-Value Borrowing Constraint," *Journal of Money, Credit, and Banking*, 21: 291-306.