Sustainable External Debt Levels: Estimates for Selected Asian Countries

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High ratios of external debt to GDP in selected Asian countries have contributed to the initiation, propagation, and severity of the financial and economic crises in recent years, reflecting runaway fiscal deficits and excessive foreign borrowing by the private sector.

Applying the formal framework proposed by Villanueva (2003) to a selected group of Asian countries, the research estimates the external debt thresholds beyond which further debt accumulation will have negative effects on growth and will become unsustainable. The framework is an extension of the standard neoclassical growth model that incorporates global capital markets. 'Sustainability' is measured in terms of the steady-state ratio of the stock of external debt to GDP, as functions of real world interest rates, risk spreads and their responsiveness to external debt burdens and market perceptions of country risk, marginal propensities to save out of national disposable income and foreign borrowing, rates of technical change, and parameters of the production function. The major policy implications are that in the long run, fiscal consolidation and the promotion of private saving are critical, and that reliance on foreign saving in a globalized financial world has limits, particularly when the risk spreads are positively correlated with rising external debt levels.

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I. Introduction

High ratios of external debt to GDP in selected Asian countries have contributed to the initiation, propagation, and severity of the financial and economic crises in recent years, reflecting runaway fiscal deficits and excessive foreign borrowing by the private sector. Applying the formal framework proposed by Villanueva (2003) to a selected group of Asian countries, this paper estimates the external debt thresholds beyond which further debt accumulation will have negative effects on growth and will become unsustainable.

The framework is an extension of the standard neoclassical growth model that incorporates global capital markets. 'Sustainability' is measured in terms of the steady-state ratio of the stock of external debt to GDP, as functions of real world interest rates, risk spreads and their responsiveness to external debt burdens and market perceptions of country risk, marginal propensities to save out of national disposable income and foreign borrowing, rates of technical change, and parameters of the production function.[1]

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[1] A standard approach to external debt sustainability is the inter-temporal solvency constraint: the discounted value of trade balances should be at least equal to the initial stock of foreign debt. This means that if a country is running (primary) current account deficits and has an initial stock of debt, it needs to run (primary) current account surpluses over time to be solvent. The larger is the initial stock of external debt, the larger the current account surpluses ought to be. Herein lies the practical difficulty with the standard approach, as pointed out by Roubini (2001), who states: "… it may not be realistic and feasible to run large trade surpluses in the long run to finance persistent excessive trade deficits in the short run. The exchange rate and domestic income adjustment to contract imports and expand exports (or increase savings and cut investment) may be excessive and inefficient if a country runs a trade deficit for too long; and (the) market may not allow a country to borrow for that long." Thus, Roubini (2001) continues, "… *a non-increasing foreign debt to GDP ratio* is seen as a practical sufficient condition for sustainability: a country is likely to remain solvent as long as the ratio is not growing. " Our definition of sustainability as the long-run (steady state), stable external debt ratio is one such practical criterion. Debt accumulation is permitted beyond the economy's growth rate as long as the expected net marginal product of capital exceeds the effective real interest rate in global capital markets. When the return-cost differential disappears, external debt grows at the same rate as the steady state GDP, and the debt ratio stabilizes at a constant level, fixed by certain structural parameters specific to a particular country.

The main results of the extended model:

1. The sustainable external debt/capital ratio (and, hence, the sustainable external current account deficit to GDP ratio) is lower, the higher is the risk-free interest rate, and the more responsive is the risk premium to the external debt burden. On the other hand, higher marginal propensities to save out of national disposable income and foreign borrowing**,** and higher rates of technical change, either exogenously determined or endogenously induced by enhanced 'learning-by-doing, would support higher ratios of external debt and current account deficit to GDP. Countries with higher marginal propensities to save out of national disposable income and foreign borrowing tend to pay a risk spread that is less responsive to the external debt stock; consequently, such countries can have higher sustainable levels of external debt and current account deficit.

2. The major policy implications are that fiscal consolidation and the promotion of private saving are critical, while over-reliance on foreign saving (net external borrowing) should be avoided, particularly in an environment of high cost of external borrowing that is positively correlated with rising external debt.

3. For debtor countries facing credit rationing in view of prohibitive risk spreads even at high-expected marginal product of capital and low risk-free interest rates, increased donor aid targeted at expenditures on education and health would relax the external debt and financing constraints while boosting per capita GDP growth.

Section II develops the formal framework by extending the neoclassical growth model to the global capital market with endogenous technical change. Following a brief review of the relevant literature, this section incorporates some refinements to the closed economy model. First, GNP instead of GDP is used, since interest payments on the net external debt use part of GDP, leaving GNP as a more relevant variable in determining domestic saving. Second, the marginal real cost of external borrowing is the sum of the risk-free interest rate and a risk premium, which is an increasing function of the ratio of the stock of net external debt to the capital stock. That is to say, *inter alia*, as the proportion of external debt rises, the risk premium goes up, and so does the effective cost of external borrowing, even with an unchanged risk-free interest rate. Third, via enhanced learning-by-doing, technical change is made partly endogenous. The reduced model is discussed, and its steady state and transition properties are examined, focusing primarily on the effects of changes in key parameters, such as increases in the risk-free interest rate and market perceptions of country risk, on the sustainable current account deficit, the sustainable external debt (both in percent of GDP), and on the steady-state growth rate of per capita GDP. Section III applies the framework to the Philippines and Thailand. Section IV draws some implications for fiscal policy and external debt management. Section V concludes.

II. The Formal Framework

1. Brief Survey of the Literature

The Solow-Swan (1956) model has been the workhorse of standard neoclassical growth theory. It is a closed-economy growth model where exclusively domestic saving finances aggregate investment. In addition, the standard model assumes that labor-augmenting technical change is exogenous, which determines the equilibrium growth of per capita output.

There have been two developments in aggregate growth theory since the Solow-Swan model (1956) appeared. First, technical change was made partly endogenous and partly exogenous. Conlisk (1967) was the first to introduce endogenous technical change into a neoclassical growth model, in which the saving rate was assumed fixed; it may have been chosen by some grand vizier in a 'Golden Rule' manner as suggested by Phelps (1966). This was followed by the recent endogenous growth literature using endogenously and optimally derived saving rate-models (Romer (1986), Lucas (1988), Becker, et al (1990), Grossman and Helpman (1990), and Rivera-Batiz and Romer (1991), among others). The steady-state properties of fixed and optimally derived saving rate-models are the same. Since we are interested in the steady-state properties of growth models, the fixed saving rate-models are sufficient for our purposes. The fixed saving rate Villanueva (1994) model is a variant of Conlisk's (1967) endogenous-technical change model and Arrow's (1962) "learning-by-doing" model, wherein experience (measured in terms of either output or cumulative past investment) plays a critical role in raising productivity over time.

The second development was to open up the Conlisk (1967) model to the global capital markets. An attempt to extend the Villanueva (1994) endogenous growth model to incorporate external debt and fiscal adjustment can be found in Agénor (2000) and Villanueva (2003). In Villanueva (2003), the aggregate capital stock is the accumulated sum of domestic saving and net external borrowing (the current account deficit). At any moment of time, the difference between the expected marginal product of capital, net of depreciation, and the marginal cost of funds[2] in the international capital market determines the proportionate rate of change in the external debt-capital ratio. When the expected net marginal product of capital matches the marginal cost of funds at the equilibrium capital-labor ratio, the proportionate increase in net external debt (net external borrowing) is fixed by the economy's steady-state output growth, and the external debt/output ratio stabilizes at a constant level. Although constant in long-run equilibrium, the steady-state external debt ratio shifts with changes in the economy's marginal propensities to save out of national disposable income and foreign borrowing, the marginal cost of funds in world capital markets, the depreciation rate, the growth rates of the working population and any exogenous technical change, and the parameters of the risk-premium, production, and technical change functions. Using parameters estimated for the Philippines, the extended model is shown to be locally stable, with a steady state solution characterized by a constant capital/effective labor ratio and a constant external debt/capital ratio.

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[2] Risk-free interest rate plus a risk premium. The LIBOR, U.S. Prime Rate, US Federal Funds Rate, or US Treasury, deflated by changes in an appropriate price index in the UK or USA, typically represents the risk-free interest rate. The risk premium is country-specific and a positive function of a country's external debt burden and other exogenous factors capturing market perceptions of country risk.

2. The Extended Model

The Villanueva model (2003) can be summarized as follows:[3]

$Y = Lk^{\alpha}$	(GDP)	(1)[4]
$GNDI = Y - NFP + NTR$	(Gross National Disposable Income)	(2)
$CAD = S^f = C + I - GNDI$	(Current Account Deficit)	(3)
$C = c_1 GNDI + c_2 S^f$	(Consumption function)	(4)
$NFP = rD$	(Net factor payments)	(5)
$NTR = \tau Y$	(Net transfers)	(6)
$\dot{D} = CAD$	(Net debt issue)	(7)
$d = D/K$	(Debt-capital ratio)	(8)
$\dot{d}/d = \alpha k^{\alpha-1} - \delta - r$	(External Borrowing Function)	(9)
$r = r^f + \rho(d;\mu)$	(Effective cost of capital)	(10)
$\dot{K} = I - \delta K$	(Capital growth)	(11)
$L = AN$	(Effective labor)	(12)
$\dot{N} = nN$	(Working population growth)	(13)
$\dot{A} = \theta(K/N) + \lambda A$	(Technical change function)	(14)
$k = K/L$	(Capital-effective labor ratio)	(15)

Here, Y is real GDP, K is physical capital stock, L is effective labor (in efficiency units), A is labor-augmenting technology, N is working population, k is the capital-

[3]The numeraire is the foreign price of the investment good. Thus, P^d/eP^f is multiplied by residents' saving (in constant dollars), where P^d is the price of domestic output, e is the exchange rate in quantity of local currency units per unit of foreign currency, and P^f is the price of the investment good in foreign currency. Foreign saving denominated in foreign currency is deflated by P^f to get the real value. Similarly, the marginal real cost of external borrowing is the sum of the world interest rate and risk premium in foreign currency less the rate of change in P^f. Since our primary concern is with real economic growth, we abstract from the effects of movements of these variables by arbitrarily assigning unitary values to these price and exchange rate indices without loss of generality. Incorporation of these variables in the extended model is straightforward.

[4] Any production function will do, as long as it is subject to constant returns to scale. See Inada (1963).

effective labor ratio, GNDI is gross national disposable income, NFP is net factor payments, NTR is net transfers, CAD is external current account deficit, S^f is saving by non-residents, C is consumption, I is gross domestic investment, D is net external debt[5], d is the net external debt/capital ratio, r is the marginal real cost of external borrowing, r^f is the risk-free real foreign interest rate, $\rho(d;\mu)$ is the real risk spread, assumed to be an increasing function of the debt-capital ratio, $\rho'(d) > 0$ and a shift factor μ representing exogenous changes in market perceptions of country risk; c_1, c_2, τ, δ, n, λ, and α are constants, and θ is the learning coefficient, as in Villanueva (1994). In a closed economy (when D = 0, $S^f = 0$) with technical change partly endogenous ($\theta > 0$), the model reduces to the Villanueva (1994) model; additionally, if technical change is completely exogenous ($\theta = 0$), the model reduces to the standard neoclassical (Solow-Swan) model.

The consumption function in the extended model reflects the openness of the economy—consumption not only depends on national disposable income, but also upon foreign borrowing.[6] Here, $\sigma = 1-c_1$ is the marginal propensity to save out of national disposable income and $\iota = 1-c_2$ is the marginal propensity to save out of foreign borrowing. If all foreign borrowing finances investment, then $c_2 = 0$ (and $\iota = 1$).[7]

The transfers/grants parameter τ may be allowed to vary positively with the marginal domestic savings effort σ. Donors are likely to step up their aid to countries with strong adjustment efforts. Similarly, the fraction of additional foreign borrowing used for investments ι may be expected to be positively correlated with the marginal domestic saving effort σ, i.e., countries with high σ tend to exhibit high ι (e.g., Korea).

[5] D is defined as external liabilities minus external assets; as such, it is positive, zero, or negative as external liabilities exceed, equal, or fall short of, external assets.

[6] We are indebted to Diwa Guinigundo of Bangko Sentral ng Pilipinas (Central Bank of the Philippines) for pointing out the possibility that a portion of an increase in foreign borrowing finances consumption. In reality, $1-c_1 = \sigma$ is positively correlated with $1-c_2 = \iota$, i.e., countries with high marginal domestic saving rates tend to have a high portion of an increase in foreign borrowing used for investment (e.g., Korea) and vice-versa. Thus, given similar qualitative effects of σ and ι as reported in Table 1, their positive correlation reinforces the impact of a change in σ on the endogenous variables.

[7] This was what we originally assumed, because we initially adopted a Solow-Swan saving function, which postulates that consumption and, hence, saving, is proportional to income only.

Finally, donor aid τ earmarked for education, health, and other labor-productivity enhancing expenditures is expected to boost the learning coefficient θ.[8]

Foreign saving is equivalent to the external current account deficit, which is equal to the excess of domestic absorption over national income or, equivalently, to net external borrowing (capital plus overall balance in the balance of payments)—noted in equations (3) and (7). The optimal decision rule for net external borrowing is specified in equation (9)--at any moment of time, net external borrowing as percent of the total outstanding stock of debt is undertaken at a rate equal to the growth rate of the capital stock plus the difference between the expected marginal product, net of depreciation, and the marginal real cost of funds, defined in equation (10) as the risk-free real interest rate plus a risk premium, the latter postulated as a positive function of the external debt-capital ratio and an exogenous shift factor. When this expected yield-cost differential is zero and k is at its steady state value k*, the growth rate of net external debt equals the steady-state rate of capital growth (equals output growth, by the constant returns assumption), and the net external debt as ratio to output stabilizes at a constant level.[9]

3. Reduced Model

By successive substitutions, the extended model reduces to a system of two differential equations in k and d.[10] The phase diagram is depicted in Figure 1.[11]

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[8] These plausible relationships are incorporated in the model's calibration and numerical simulations in the next section.

[9] The steady-state current account balance may be positive (deficit), zero (in balance), or negative (surplus). This follows from the steady-state solution $(\dot{D}/Y)^* = g^*d^*/k^{*(\alpha-1)}$, where g* is the steady-state growth rate of output, d* is the steady-state debt-capital ratio, and k* is the steady-state capital-effective labor ratio. As mentioned in footnote 5 and equation (8), the variable d* is the ratio of net external debt (external liabilities minus external assets) to the capital stock and can be positive, zero, or negative. More precisely, $-1 < d^* < 1$, depending on whether the accumulated sum of domestic savings is less than, equal to, or greater than the aggregate capital stock (accumulated sum of aggregate investments).

[10] It can be seen that in a closed economy, $d = \iota = \tau = 0$, equation (17) drops out and, thus, equation (16) is identical to the Villanueva (1994) model (equation 9, p. 7), where the average saving rate, s, equals the extended model's marginal saving rate, σ. Further, with $\theta = 0$, equation (16) reduces to the Solow-Swan model.

[11] For the derivation of Figure 1, see Appendix A.

$$\dot{k}/k = [\sigma/(1\text{-}\iota d)](1+\tau)k^{\alpha-1} + [\iota d(\alpha k^{\alpha-1}\text{-}\delta) \text{ -}r(d;\mu,r^f)(\iota d+\sigma d)]/(1\text{-}\iota d)] \text{ - } \delta/(1\text{-}\iota d)\text{-}\theta k\text{- } n\text{-}\lambda$$

$$= H(k,d) \qquad (16)$$

$$\dot{d}/d = \alpha k^{\alpha-1}\text{-}\delta\text{-}r(d;\mu,r^f) = J(k,d) \qquad (17)$$

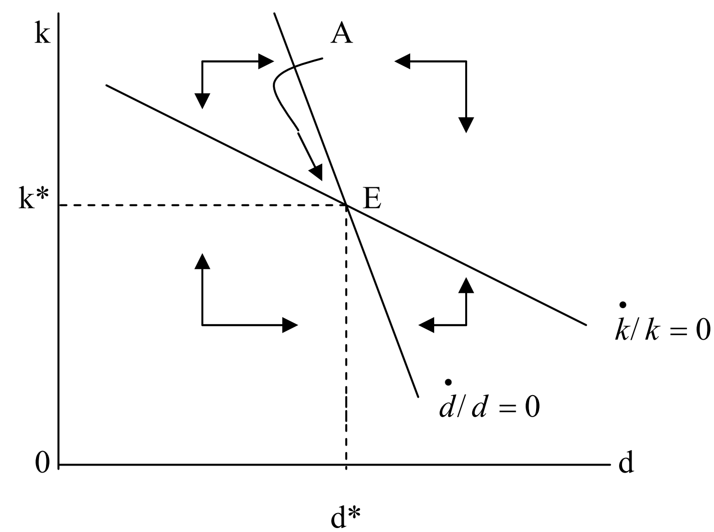

Figure 1. Phase Diagram of the Extended Model

The steady state is defined by the equilibrium conditions H(k*,d*) = 0 and J(k*,d*) = 0, characterized by the intersection of the capital and external debt growth curves in Figure 1 at point E, producing asymptotic values k* and d*. In general, the existence, uniqueness, and stability of the steady state equilibrium are not guaranteed. However, the Appendix shows that for a Cobb-Douglas production function, linear 'learning-by-doing' and risk-premium functions, and estimated values of the parameters for the Philippines, the extended model's equilibrium is locally stable in the neighborhood of the steady state.

The adjustment dynamics is described below with the help of Figure 1. Consider point A as a starting position, at which the economy's initial stocks of k and d are larger than k* and d* because of over-borrowing. Both capital intensity and debt ratio begin to decline. While capital intensity continues to fall toward k*, the debt ratio at first overshoots d* and then gradually rises towards it. One possible interpretation of this dynamic adjustment is the following. Initially, for any reason (such as political instability, loss of market confidence, etc.) a country finds its access to global capital markets closed and is forced to contract both debt and capital (see Fig. 2 and text discussion). After some time, it re-establishes its access and starts to borrow again, so that the debt ratio recovers until it reaches d*.

4. Comparative Statics

Table 1 summarizes the comparative statics of the extended model. Increases in the following parameters will raise the steady-state growth rate of per capita GDP: (i) marginal propensities to save out of gross national disposable income and foreign borrowing; (ii) foreign aid/grants; (iii) learning coefficient; and (iv) exogenous technical change. On the contrary, increases in the following parameters will lower the steady-state growth rate of per capita GDP: (i) risk-free interest rate; (ii) market perceptions of country risk; (iii) depreciation of the capital stock; and (iv) population growth.

Figure 2 illustrates the effects of increases in the risk-free interest rate r^f and market perceptions of country risk (captured by μ) on equilibrium capital intensity and debt ratio. The initial long-run equilibrium is at point P (d_0*, k_0*). As a result of exogenous

Table 1: Comparative Statics of the Extended Model

	Effects of an all-else-equal increase in:								
On:	σ	r^f	λ[12]	δ[13]	μ	n	θ	ι	τ
d*	-	-	+	-	-	+	+	-	-
k*	+	-	-	-	-	-	-	+	+
(Y/N)*	+	-	+	-	-	-	+	+	+
$(\dot{Y}/Y)^*-n$	+	-	+	-	-	-	+	+	+

[12] An increase in exogenous labor-augmenting technical change leads to a lower capital-effective labor ratio. As capital intensity declines, both average and marginal productivities of capital go up, leading to increases in both domestic and foreign savings and, thus, capital accumulation and steady-state growth.

[13] An increase in capital-augmenting technical change embodied in new capital goods is akin to a reduction in the depreciation rate. The effect would be to raise the capital growth curve, producing a higher steady-state capital-effective labor ratio. As capital intensity rises, the growth rate of effective labor goes up owing to enhanced learning-by-doing.

increases in either r^f or μ, both the $\dot{k}/k = 0$ and $\dot{d}/d = 0$ curves shift downward in the southwest direction and intersect each other at the point Q(d_1*, k_1*), where both long-run values of capital intensity and the debt-capital ratio are lower than before. The debt-capital ratio is lower because less borrowing is undertaken when the marginal real cost of funds rises at any given expected net marginal product of capital. The capital intensity is lower because both foreign capital derived from external borrowing and domestic capital derived from domestic saving are lower, the latter owing to a lower level of GNP brought about by higher interest payments on the stock of net external debt.

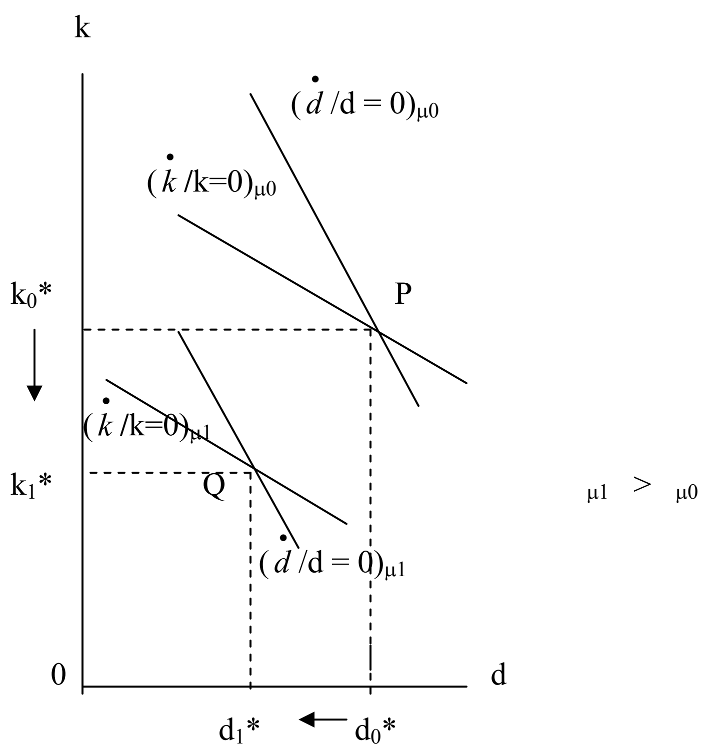

Figure 2. The Extended Model: Effects of an Increase in Country Risk (μ)

5. The Sustainable External Debt Position

Long-run equilibrium is obtained by setting the reduced system (16) and (17) to zero, such that k is constant at k* and d is constant at d* (see Figure 1). It is characterized by balanced growth: K, L, and D grow at the same rate $n + \lambda$. It also implies the condition $\alpha k^{*\alpha-1} - \delta - r(d^*; r^f, \mu) = 0$, which is the optimal rule for external net borrowing to cease at the margin.[14]

Assume that the marginal real external borrowing cost, $r(d;r^f) = r = r^f + \rho(d)$ [equation (10)] is approximated by the linear relation,

$$r = r^f + \phi d, \quad 0<\phi<1 \qquad (10)'$$

Then, using a Cobb-Douglas production function $f(k) = k^\alpha$ and solving the reduced form of the model $H(k^*,d^*) = J(k^*,d^*) = 0$ for the steady state values k* and d* yield the following system of three equations in three unknowns, k*, d*, and r*:

$$(\sigma/(1-\iota d^*)[(1+\tau)k^{*(\alpha-1)} - r^*d^*] - \delta/(1-\iota d^*) - n - \lambda - \theta k^* = 0 \qquad (18)$$

$$k^* = [(r^* + \delta)/\alpha]^{1/(\alpha-1)} \qquad (19)$$

$$r^* = r^f + \phi d^* \qquad (10)''$$

III. Applications to the Philippines and Thailand

A numerical example is presented below, using values for the Philippines: $\alpha = 0.3$, $\delta = 0.04$, $\sigma = 0.13$, $\iota = 0.83$, $\tau = 0.04$, $n = 0.025$, $\lambda = 0.02$, $r^f = 0.03$, $\phi = 0.11$, and $\theta = 0.001$.[15] Using Microsoft Excel's 'Solver' tool, the solution values are $d^* = 0.0833$ and

[14] When the yield-cost differential is zero, external borrowing as percent of the outstanding stock of debt proceeds at the steady state growth rate of output.

[15] σ and ι were estimated using regression equations for consumption , while ϕ was estimated using averages of the ratio of changes in the risk spread to changes in the external debt ratio. See Appendix B.

$k^* = 6.71$. The risk premium is 92 basis points, and the net external debt to GDP ratio is 31.6%.[16] Interest payments are 2% of GDP. Using the relation,

$$(\dot{D}/D)^* = (\dot{K}/K)^* = (\dot{L}/L)^* = g^* = (\dot{Y}/Y)^* \text{ (in the steady state), or}$$

$$\begin{aligned}(\dot{D}/Y)^* &= (\dot{Y}/Y)^*(D/Y)^* \qquad (20)\\ &= g^*d^*/k^{*(\alpha-1)}\\ &= (0.054)(0.0833)/(6.71)^{-0.7} = 0.017;\end{aligned}$$

the sustainable external current account deficit is 1.7% of GDP.[17] Per capita GDP growth is 2.9%, of which the endogenous component is 0.9%.

Using estimated parameters for Thailand, Table 2 simulates the macroeconomic effects of an increase in the marginal domestic saving ratio from a low level in the Philippines to a higher level in Thailand.

The marginal propensities to save out of gross national disposable income are estimated to be 13% and 40%, respectively, for the Philippines and Thailand. The corresponding sustainable external debt/GDP ratios are 31.6% and 36.5%, respectively. Between 1999 and 2003, the actual debt ratio of the Philippines went up from 67% to 72% of GDP, while that of Thailand went down from 77.5% to 36% of GDP. In other words, by 2003, the Philippines exceeded the sustainable debt level by 40 percentage points, while Thailand succeeded in reaching the sustainable debt level.[18]

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[16] $(D/Y)^* = d^*/k^{*\alpha-1}$.

[17] Recall that $-1 < d^* < 1$. When $-1 < d^* < 0$, equation (20) solves for the sustainable external current account surplus (e.g., Singapore). When $d^* = 0$, the long-run current account is in balance.

[18] Using Binary Recursive Tree (BRT) for classification and prediction, Manasse and Roubini (2005) came up with a handful (out of 50) predictor variables that separate 'safe' from 'crisis-prone' countries. One of these predictor variables is the external debt/GDP ratio. They find that a value of this ratio that is less than 49.7% places a country in the 'safe' category. Both the sustainable debt ratios for the Philippines and Thailand in Table 2 are within this 'safe' level. According to Manasse and Roubini, to have a low probability of a crisis, the country should have <u>all</u> the following attributes: (i) total external debt < 49.7% of GDP; (ii) short-term external debt < 130% of reserves; (iii) public external debt < 214% of fiscal revenue; (iv) overvaluation of the exchange rate < 48%; and (v) GDP growth > -5.5%.

Table 2. Impact of Adjustment on Sustainable External Debt and Growth
(Illustrative Calculations Based on Calibrated Models
Applied to the Philippines and Thailand)

	Philippines	Thailand
Marginal Domestic Saving Rates		
(% of GNDI)	13	40
(% of Foreign Capital Inflow)	83	99
External Debt Indicators		
Debt/GDP (%)	31.6 (72)*	36.5 (36)*
Risk Premium (%)	0.92**	0.36**
Interest Payments (% of GDP)	2.0	1.6
Current Account Deficit (% of GDP)	1.7	2.4
Economic Growth		
Per Capita GDP (%)	2.9	5.0
Of which: Endogenous Component (%)	0.9	3.0

*Actual ratios as at end-2003 in parentheses. For comparison, at end-1999 the ratios were 67% and 77.5%, respectively, for the Philippines and Thailand.
**ϕ (slope of the 'spread' function) = 0.11 for the Philippines and 0.04 for Thailand.

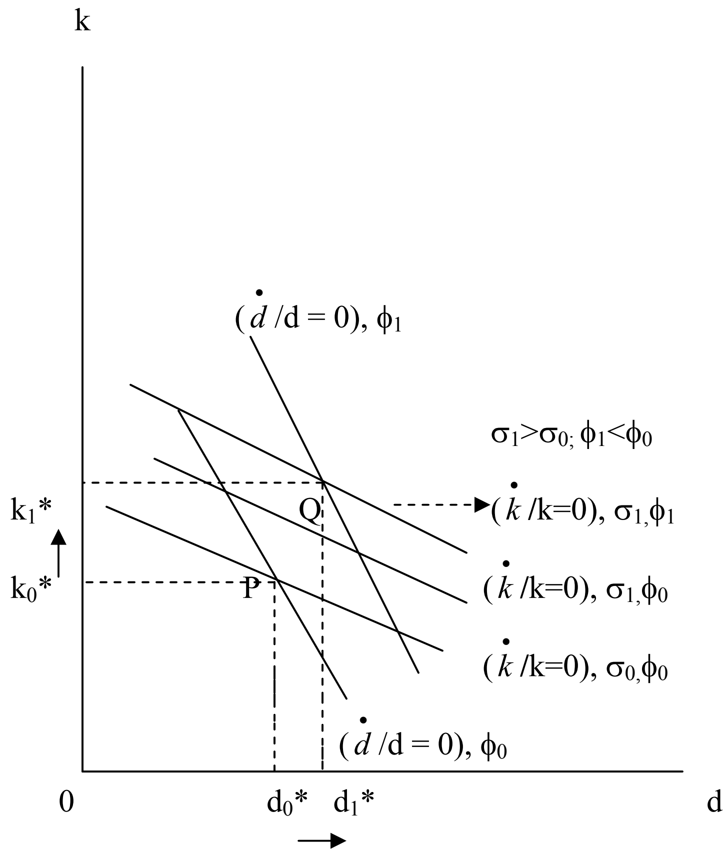

Figure 3. The Extended Model: Effects of Joint Increase in σ and Decrease in φ

Figure 3 is a graphic representation of the effects of a joint increase in the marginal propensity to save, σ, and a decrease in the sensitivity of the spread to the external debt burden, φ, as observed in moving from the Philippine case to the Thai case. Starting from an initial equilibrium point such as P (d_0*, k_0*), a strong fiscal adjustment effort raises the saving rate from σ_0 to σ_1. Global capital markets reward this policy adjustment by lowering the risk parameter (slope of the spread function) from ϕ_0 to ϕ_1. The fiscal adjustment shifts the capital intensity growth curve in the northeast direction. The subsequent lowering of the risk parameter shifts this curve further and the external debt growth curve, both in the same direction. The new curves intersect at a point such as Q (d_1*, k_1*), where both equilibrium levels of external debt and capital intensity are higher. Consequently, the steady state external current deficit (% of GDP) is higher. Owing to a higher steady state capital intensity level, the steady state growth rate of per capita GDP is larger.

Table 2 and Figure 3 suggest that raising the marginal domestic saving rate is a critical part of an adjustment program to achieve external viability while promoting economic growth. The savings effort should center on fiscal consolidation and adoption of incentives to encourage private saving, including market-determined real interest rates. From the national income identity (3), the external current account deficit CAD is equal to the excess of aggregate investment I over domestic saving S (= GNDI – C), or CAD = I – S. Now, decomposing I and S into their government and private components, CAD = (I_g – S_g) + (I_p – S_p), where the subscripts g and p denote government and private, respectively. The first term is the fiscal balance, and the second term is the private sector balance. Fiscal adjustment is measured in terms of policy changes in S_g (government revenue less consumption) and in I_g (government investment).

Suppose that over the medium term, a sustained increase in S_g by the Philippine public sector raises the marginal domestic saving rate from 13% to a higher level.[19] By reducing the responsiveness of the risk premium to the external debt, fiscal adjustment raises the sustainable values of external debt and current account deficits to higher levels of GDP. The risk premium declines, resulting in lower interest payments. The higher marginal domestic saving rate raises capital intensity and, via 'learning-by-doing', per capita GDP growth as well.

[19] The feasible increase may be limited in the short run; therefore, the fiscal adjustment has to be combined with an increase in the private saving rate. Assuming that the marginal propensity to save out of national disposable income doubles from 0.13 to 0.26 over the medium term, and using the pattern observed in Thailand as a rough guide to project the risk parameter ϕ to fall from 0.11 to 0.07, the Philippines can raise its sustainable external debt ratio to 49.6 % of GDP, the sustainable external current account deficit to 3.1% of GDP, and per capita GDP growth rate of 3.7% with the endogenous growth component of 1.7%.

Assume, however, the following *hypothetical* worst case-scenario for the Philippines. For whatever reason, owing to the initial high level of the external debt, the market perceptions parameter μ reaches a very high adverse level. Despite a high-expected marginal product of capital, the risk premium is prohibitively high at any level of the debt ratio and the risk-free interest rate, such that the Philippine public sector faces credit rationing.[20] In such circumstances, as Agénor (*op. cit.*, p. 595-96) suggests, increased foreign aid may benefit the Philippines, provided that economic policies are sound. Conditional on strong fiscal adjustment efforts, suppose that donors decide to step up grants for education and health, with salutary effects on the learning coefficient. The enhanced policy adjustment also boosts the fraction of foreign borrowing used for investments. Table 2 and Figure 3 show that it is possible to achieve external sustainability and high economic growth with targeted foreign aid.

IV. Implications for Fiscal Policy and External Debt Management

The implications for fiscal policy and external debt management are clear, at least for the Philippines. The first step is to launch an effective external debt management strategy that will articulate the short and long run objectives of fiscal policy and debt management and ensure effective centralized approval and monitoring of primary debt issues to global financial markets, aided by (i) detailed electronic data on external debt, both outstanding and new debt, by borrowing institution, maturity, terms, etc., and by (ii) an inter-agency desk exclusively responsible for top quantitative and analytic work on external debt for the benefit of policy-makers.

The unsustainable level of external debt can be reduced only by cutting the fiscal deficit immediately and at a sustained pace over the medium term. In this context, the privatization of the National Power Corporation (NAPOCOR) is essential, since a big chunk of sovereign debt issues is on behalf of NAPOCOR.

[20] The probability of default is included in the risk premium. The higher is the default probability assigned by international creditors/investors, the higher is the risk premium and consequently, the higher is the effective real interest rate.

Interest payments on total government debt eat up a significant share of government revenues, leaving revenue shortfalls to cover expenditures on the physical infrastructure and on the social sectors (health, education, and the like). With a successful and steady reduction of the stock of debt and the enhancement of domestic savings led by the government sector (via increases in S_g), the sensitivity of the risk spread to the external debt would decrease, resulting in interest savings that would provide additional financing for the infrastructure and social sectors. Furthermore, there are clear implications for both revenue-raising and expenditure-cutting measures. On the revenue side, although the recently enacted and signed VAT bill is welcome, there remains low compliance on the VAT, resulting in very low collections. There is evidence of VAT sales being substantially under-declared on a regular basis. Our concrete proposal would be to set up a computerized system of VAT sales wherein an electronic copy of the sales receipt is transmitted in real time by merchants, producers, and service providers to the Bureau of Internal Revenue (BIR). In this manner total sales subject to the VAT submitted come tax time can be compared by the BIR against its own electronic receipts. It is estimated that if only 50% of total sales were collected from VAT, the current budget deficit (some P200+ billion) could be wiped out. This proposal easily beats current proposals to raise taxes because as they stand, marginal tax rates are already very high (resulting in tax evasion and briberies). The imposition of “sin” taxes (on cigarettes and liquor sales) would provide little relief. Individual and corporate tax reforms are also necessary--different tax brackets should be consolidated into a few, with significant reductions in marginal income tax rates; at the same time, the number of exemptions should be drastically reduced to widen the tax base. The whole customs tariffs structure should be reviewed with the aim of reducing average tariff rates further, while eliminating many exemptions. The role of the customs assessor and collector should be severely restricted, with computerized assessment and collection being put in place, similar to our VAT proposal.

V. Conclusions

This paper has estimated the sustainable external debt levels for the Philippines and Thailand using the standard neoclassical growth model extended to an open economy with endogenous technical change. Domestic and foreign savings finance aggregate investments. The optimal rule that should guide external borrowing is to borrow foreign capital over and above the long-run GDP growth up to the point where the expected net marginal product of capital and the marginal real cost of foreign funds are equalized. When the yield/cost differential disappears, external borrowing as a percentage of net external debt is undertaken at the rate of steady state output growth. Increases in the marginal real cost of external borrowing significantly lower the sustainable external debt level and current account deficit (as ratios to GDP). The extended model also shows the powerful effects of raising the marginal domestic saving rate on the steady-state balance of payments and on achieving a permanently higher growth rate of per capita GDP. The obvious policy conclusions of the extended model are:

1. Fiscal consolidation and strong incentives for private saving are essential to achieving high per capita GDP growth and sustainable external debt levels and balance of payments positions in the short and long run;
2. Strong domestic saving efforts and higher rates of technical change, either exogenously determined or endogenously induced by enhanced 'learning-by-doing, would support higher sustainable ratios of external debt and current account deficit to GDP;
3. Reliance on foreign savings (external borrowing) has limits, particularly in a global environment of high interest rates and risk spreads;
4. When real borrowing costs are positively correlated with rising external indebtedness, the use of foreign savings is even more circumscribed;
5. When risk spreads are prohibitively high despite high-expected marginal product of capital, there is a role for increased foreign aid earmarked for education and health, provided that economic policies are sound.

Appendix A: Stability Analysis

Partially differentiating text equations (16) and (17) with respect to k and d and evaluating in the neighborhood of the steady state yield

$$a_{11} = H_k = [\sigma(1+\tau)+\alpha\iota d^*][1/(1-\iota d^*)](\alpha-1)k^{*\alpha-2} - \theta < 0 \quad (1)$$

$$a_{12} = H_d = [\sigma(1-\iota d^*)^{-2}\iota][(1+\tau)(k^{*\alpha-1})-rd^*] - \sigma(r^f+\phi d^*)(1-\iota d^*)^{-1} - \phi\iota d^*(1-\iota d^*)^{-1} - \iota\delta(1-\iota d^*)^{-2}$$
$$= ? \quad (2)$$

$$a_{21} = J_k = \alpha(\alpha-1)k^{*\alpha-2} < 0 \quad (3)$$

$$a_{22} = J_d = -\phi < 0 \quad (4)$$

In the steady state, text equations (16) and (17) are equated to zero:

$$H(k,d) = 0 \quad (5)$$

$$J(k,d) = 0 \quad (6)$$

Totally differentiating (5) and (6) with respect to k and d yields,

$$H_k dk/dd + H_d = 0 \quad (7)$$

$$J_k dk/dd + J_d = 0 \quad (8)$$

The slope of the $\dot{k}/k = 0$ curve is given by:

$$dk/dd|\ \dot{k}/k = 0 \ = - H_d/H_k = - a_{12}/a_{11} = ? \quad (9)$$

The slope of the $\dot{d}/d = 0$ curve is given by:

$$dk/dd|\ \dot{d}/d = 0 = -\ J_d/J_k = -\ a_{22}/a_{21} < 0 \qquad (10)$$

Let A be the matrix of partial derivatives defined by equations (1)-(4). For stability, a necessary and sufficient condition is that the eigenvalues of A have negative real parts, and a necessary and sufficient condition for this is that:

$$tr(A) < 0, \qquad (11)$$

and

$$|A| > 0. \qquad (12)$$

The trace condition (11) is met, but not the determinant condition (12). The determinant condition is:

$$a_{11}a_{22} - a_{12}a_{21} > 0.$$

Assuming values for the parameters estimated for the Philippines and evaluating a_{12} in the neighborhood of the steady state, $a_{12} = H_d = -0.09233 < 0$, so that $dk/dd|\ \dot{k}/k = 0 = -\ H_d/H_k = -\ a_{12}/a_{11} < 0$.[21]

The determinant condition (12) requires that the absolute value of a_{22}/a_{21} (slope of the $\dot{d}/d = 0$ curve) > absolute value of a_{12}/a_{11}. (slope of the $\dot{k}/k = 0$ curve). This is indeed the case because in the neighborhood of the steady state, $a_{11} = -0.11464$, $a_{21} = -0.00826$, $a_{22} = -0.11$, implying that $a_{22}/a_{21} = 13.3114$ and $a_{12}/a_{11} = 0.8054$. The extended model's phase diagram shown in text Figure 1 reflects these considerations.

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[21] $\alpha = 0.3$; $\delta = 0.04$; $\sigma = 0.13$; $n = 0.025$; $\lambda = 0.02$; $r^f = 0.03$; and $\phi = 0.11$. The following relationships among some of the parameters are used: $\tau = 0.1\sigma$, $\theta = 0.1\tau$.

Appendix B: Data and Regression Results

Definitions

1. Consumption Expenditures: Philippines--Deflated in millions of pesos

2. Consumption Expenditures: Thailand--Deflated in billions of bath

3. GNDI: Deflated Gross National Disposable Income

4. CAB: Deflated Current Account Balance

5. JACI: JPMorgan Asia Credit Index on Asian US dollar denominated bonds, containing more than 110 bonds, using their dirty prices and weight according to respective market capitalization. It includes sovereign bonds, quasi-sovereign bonds, and corporate bonds from those countries.

6. GNP: Gross National Product

7. Consumption: Government Consumption + Household Consumption

Data Sources

Philippines:

1. Philippine JACI Spread: JP Morgan Markets
2. US GDP Deflator: International Financial Statistics (IFS)
3. US CPI for all urban consumers: US Bureau of Labor Statistics (USBLS)
4. External Debt: IOD, Bangko Sentral ng Pilipinas (BSP)
5. Nominal GDP: IFS
6. Average Exchange Rates: BSP
7. Government Consumption, Household Consumption, GNP, Current Transfers, GDP Deflator: International Financial Statistics (IFS)

Thailand:

1. Thailand JACI Spread: JP Morgan Markets
2. US GDP Deflator: IFS
3. US CPI for all urban consumers: (USBLS)
4. External Debt: Bank of Thailand (BOT)
5. Nominal GDP: BOT
6. Average Exchange Rates: IFS
7. Consumption, GNP: BOT
8. Current Transfers, GDP Deflator: IFS

Sample Periods:

1. Philippines and Thailand JACI Spreads: 2000 – 2003
2. Philippine Consumption Regression: 1981 – 1999
3. Thailand Consumption Regression: 1980 - 2002

Softwares Used:

1. Philippine and Thailand JACI Spreads: Microsoft Excel
2. Philippine and Thailand Consumption Regressions: Microsoft Excel, Eviews

Philippine Consumption Regression

Dependent Variable: CONSUMPTION_PHILIPPINE
Method: Least Squares
Date: 11/26/04 Time: 12:48
Sample: 1981 1999
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-152610.0	98833.95	-1.544105	0.1421
GNDI	0.865930	0.036748	23.56414	0.0000
CAB	0.166865	0.139470	1.196423	0.2490

R-squared	0.974126	Mean dependent var	2076968.
Adjusted R-squared	0.970892	S.D. dependent var	402245.0
S.E. of regression	68627.36	Akaike info criterion	25.25471
Sum squared resid	7.54E+10	Schwarz criterion	25.40383
Log likelihood	-236.9197	F-statistic	301.1927
Durbin-Watson stat	0.674473	Prob(F-statistic)	0.000000

Thailand Consumption Regression

Dependent Variable: CONSUMPTION_THAILAND
Method: Least Squares
Date: 11/26/04 Time: 12:43
Sample: 1980 2002
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	285.4540	35.40084	8.063481	0.0000
GNDI	0.604426	0.009782	61.79092	0.0000
CAB	0.000246	5.01E-05	4.902197	0.0001

R-squared	0.995367	Mean dependent var	2295.251
Adjusted R-squared	0.994904	S.D. dependent var	833.3059
S.E. of regression	59.48736	Akaike info criterion	11.13051
Sum squared resid	70774.92	Schwarz criterion	11.27862
Log likelihood	-125.0009	F-statistic	2148.501
Durbin-Watson stat	1.045254	Prob(F-statistic)	0.000000

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