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Factors Affecting the Accumulation of External Debt: Hypotheses and Evidence from Korea

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This paper shows that a change in the external debt is affected by a change in the domestic assets of the monetary authority, the growth rate of output, domestic inflation, cost of capital, real deposit rate and government spending. The empirical results with Korean data reveal that monetary factors, such as the domestic asset position of the monetary authority and real interest rate, are important determinants of indebtedness of Korea. One of the policy implications is to question the effectiveness of sterilization efforts, when Korea continues to have large current account surpluses. Desirable supplementary policies are to accelerate import liberalization and to facilitate capital outflows.

I. Introduction

The crisis associated with the external debts of developing economies in the early 1980's has been attributed largely to the high real rate of interest, high oil prices, and the slow growth in industrial economies (Cline (1983), Kwack (1988) and Weintraub (1983)). In contrast to this view of external origin, it has been argued that the debt crisis particularly for the largest Latin debtor countries — Mexico, Brazil and Argentina — emanated from the excessive spending of their respective public and private sectors (Weisner (1985)). More recently, this point has been stressed in the cross-country study of Sachs (1987).

An interesting and yet unresolved question surrounding the debt crisis is

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how the external debt of a developing country was allowed to reach unmanageable levels in the first place. Besides overeager banks seeking to recycle funds, the accumulation of external debt can be attributed to both real and monetary conditions that determine the capital account of the balance of payments.[1] Based on this broad perspective, the paper seeks to identify the main factors accounting for the accumulation of external debt for a developing economy and quantifies the extent to which these factors can explain the growth of Korea's external debt.

Following this Introduction, Section II derives hypotheses to explain debt. Section III tests these propositions empirically with annual data of Korea from 1972 to 1986 and discusses the empirical results. Section IV darws implications for the policy issues facing the Korean economy, particularly in light of the dramatic recent reversal in the process of debt accumulation.

II. A Macroeconomic Framework

We consider a small developing country operating under a fixed exchange rate regime. A change in the net external debt constitutes the capital account of the balance of payment. Thus, a change in the net external debt equals a change in international reserves minus the current account balance. In turn, a change in the international reserves is equal to the difference between changes in the nominal money supply and net domestic assets of the monetary authority. The current account balance equals the difference between income and spending, which is private saving in excess of private investment and a surplus in the government sector. Thus, a change in the net external debt can be summarized as:

$$(1) \quad e\Delta D = \Delta MS - \Delta ND - (GDP - ieD - T - C - I) + G - T$$

where D = the dollar value of the net external debt,
MS = the nominal money supply,
ND = the net domestic assets of the monetary authority,
GDP = nominal value of gross domestic product,
C = nominal value of private consumption,
I = nominal value of private investment,
G = nominal value of government expenditure,
T = nominal value of tax receipts,
i = average interest rate on the external debt,

[1] The linkage between domestic and external factors is made clearly by Dornbusch (1985).

e = exchange rate, units of domestic currency per US dollar,
Δ = an operator of the difference, for example,
$\Delta D = D_{t+1} - D_t$ for any time t.

Equation (1) can be normalized in terms of the nominal size of GDP:

$$(2) \quad \frac{e\Delta D}{GDP} = \frac{\Delta MS}{GDP} - \frac{\Delta ND}{GDP} - \frac{GDP - ieD - T - C}{GDP} + \frac{I}{GDP} + \frac{G - T}{GDP}$$

As shown by Fry (1980), Leff (1969) and McKinnon (1983), the ratio of private saving to GDP depends positively on the rate of growth in real output, real deposit rate and government spending and negatively on the interest payment on the net external debt:

$$(3) \quad \frac{GDP - T - C - ieD}{GDP} = s_0 + s_1 g_y + s_2(r - \pi) - s_3 \frac{ieD}{GDP} + s_4 \frac{G}{GDP}$$

where g_y = growth rate of output, r = domestic deposit rate, and π = inflation rate. In equation (3), government spending is assumed to be partially offsetted by reduced private consumption, $0 < s_4 < 1$. This is due to the so-called "neo-Ricardian equivalence theorem" that the private sector perceives the government spending to be its tax burden (Barro (1974)).

Using a neoclassical theory of investment, the desired ratio of the nominal capital stock to the value of output is assumed to depend on user cost of capital to firms. To the extent that the firms have financed their investment by borrowing from abroad or undertaking joint ventures with foreign corporations, the interest rate is represented by both the real interest rates at home and abroad. The desired ratio can be described by:

$$(4) \quad \frac{K}{GDP} = k(1/q)$$

where K = value of capital stock and, q = real interest rate facing firms. Hence, the ratio of nominal investment to GDP can be approximated by the rate of growth in output and real interest rate:

$$(5) \quad \frac{I}{GDP} = k_0 + k_1 (g_y + \pi) - k_2 (\Delta q / q^2).$$

The tax receipts of the government are governed by the tax rate, t, times the base of taxation, represented by GDP:

$$(6) \quad T = t\ GDP.$$

The combination of equations (2)-(6) enables us to deduce equation (7) explaining the change in the stock of external debt relative to GDP:

$$(7) \quad \frac{e\Delta D}{GDP} = \frac{\Delta MS}{GDP} - \frac{\Delta ND}{GDP} - (s_1 - k_1)g_y - k_2\ (\Delta q/q^2) - s_2(r-\pi) + k_1\pi + s_3 \frac{ieD}{GDP} - (1-s_4)\frac{G}{GDP} + (k_0 + s_0 - t).$$

For most developing countries under fixed exchange rate regimes, the nominal money supply is endogenously determined by demand for money. Given the empirical evidence of Fry (1981) and Kwack (1986), the demand for real money balance is assumed to be a positive function of real output and real deposit rate. Thus, a change in the nominal money supply relative to GDP is explained by:

$$(8) \quad \frac{\Delta MS}{GDP} = m_0 + m_1\ (g_y + \pi) + m_2\ (r-\pi).$$

The substitution of this monetary equilibrium relation for $\Delta MS/GDP$ in (7) leads to:

$$(9) \quad \frac{e\Delta D}{GDP} = \beta_0 + \beta_1 \frac{\Delta ND}{GDP} + \beta_2\ g_y + \beta_3\pi + \beta_4\ (\Delta q/q^2) + \beta_5\ (r-\pi) + \beta_6 \frac{ieD}{GDP} + \beta_7 \frac{G}{GDP}$$

where $\beta_0 = m_0 + k_0 - s_0 - t$, $\beta_1 < 0$, $\beta_2 = (m_1 + k_1 - s_1) \gtrless 0$,

$\beta_3 = k_1 + m_1 > 0$, $\beta_4 = k_2 < 0$, $\beta_5 = m_2 - s_2 \gtrless 0$,

$\beta_6 = s_3 > 0$, $\beta_7 = 1 - s_4 > 0$.

Equation (9) shows that a change in net external debt is affected by a change in the domestic assets of the monetary authority, the growth rate of output, domestic inflation, real user cost of capital, real deposit rate, interest payments abroad and government consumption. Conventional macroeconomic theory supposes that a higher external debt level is associated with lower domestic assets of the monetary authority, higher debt service payments, greater government spending, and higher domestic borrowing costs. There are two additional points that should be noted about the implied causation of the model. First, the sign of the growth rate of output is indeterminate; if the effect on saving is larger than the combined effects on investment and money demand, a higher rate of growth leads to a reduction in the level of debt. Second, the sign of domestic inflation, β_3, is positive, reflecting the fact that expansionary factors lead to a decrease in private savings and thus additional foreign borrowing. While a higher real rate on deposit liabilities of banks raises savings, leading to a reduction in the demand for external liabilities, it also raises the demand for money which has positive effect on the demand for external liabilities.[2] Consequently, the net effect of higher real deposit rate on the growth in external debt, β_5, is not determinate a priori.

III. Empirical Results

This section of our analysis deals with the empirical testing of the hypotheses underlying equation (9) and the ability of the model to predict the behavior of debt accumulation. We have chosen Korea for the test, since Korea is a member of the group of heavily indebted developing countries.[3] In the estimation, we assume that domestic deposit rate, r, is represented by the time deposit rate of one year maturity. Variable D is net debt position of Korea. Since Korea's external assets have risen slowly over time, variable D can be represented alternatively by total external debt including short-term debt. Thus, we utilize two measures for variable D, net and gross external debt. DUM 74 and DUM 79, dummy variables to capture the first oil shock of 1974 and second oil-price shock of 1979 were tried. But DUM 79 is left in regressions because DUM 74 was found to be insignificant. The user cost, q, is proxied by three alternatives: the real deposit rate, real foreign interest rate adjusted for varia-

[2] In a financially repressive developing economy, McKinnon (1983) shows that a rise in real deposit rate produces financial deepening, that is a rapid growth of money stock relative to nominal income, and bolsters savings.

[3] For discussion of the external debt of Korea, see Kwack (1988), Park (1985), and for a discussion of the management of debt, see Iqbal (1988).

Table 1

REGRESSION EQUATIONS

$$\frac{e\Delta D}{GDP} = \beta_0 + \beta_1 \frac{\Delta ND}{GDP} + \beta_2 g_y + \beta_3 \pi + \beta_4 (\Delta q / q^2) + \beta_5 q + \beta_6 \frac{ieD}{GDP}$$

$$+ \beta_7 \frac{G}{GDP} + \beta_8 \text{ DUM79}$$

	Net debt		Gross debt	
	1972-86 (a)	1972-86 (b)	1972-86 (c)	1972-86 (d)
β_0	0.093	0.021	0.081	0.065
	(1.53)	(1.48)	(0.85)	(3.22)
β_1	−0.740	−0.639	−1.211	−1.133
	(2.20)	(2.09)	(2.38)	(2.84)
β_2	−0.004	−0.003	−0.004	−0.003
	(2.89)	(3.34)	(1.99)	(2.94)
β_3	−0.00004		−0.00005	
	(0.03)		(0.29)	
β_4	0.00007		0.00006	
	(0.05)		(0.28)	
β_5	−0.007	−0.007	−0.008	−0.007
	(3.27)	(9.59)	(2.34)	(7.29)
β_6	0.018	0.017	0.007	0.007
	(3.75)	(5.55)	(1.18)	(2.41)
β_7	−0.687		−0.048	
	(1.34)		(0.06)	
β_8	0.021	0.025	−0.013	
	(1.67)	(2.32)	(0.55)	
$\bar{R}^2$	0.912	0.923	0.785	0.357
SEE	0.010	0.001	0.016	0.013
DW	2.85	2.11	2.60	2.73

1. q is computed at 100 x $((1 + 0.01r)/(1 + 0.01\pi)-1)$.
2. g, π and i are rates of growth in real GDP, inflation rate of GDP deflator, and Eurodollar deposit rate, respectively, in percent. GDP, ND, and G are in billions of Korean Won, D is in billions of US dollar, and e is Korean Won/$ exchange rate.
3. Data sources are Bank of Korea, Kwack (1988), Park (1985), and the World Bank.

tions of the exchange rate, and a weighted average of both foreign and domestic real interest rates. Several regressions were run over the period from 1972 to 1986 to estimate the coefficients, using ordinary least squares. While the estimates of the coefficients of the reduced-form equation have well known handicaps in identifying the underlying structural parameters, the empirical results are nonetheless quite satisfactory. The most satisfactory results are obtained when q is represented by real deposit rate at home. The selected equations are given in Table 1; $\bar{R}^2$ is the degree of explained variation, corrected for degrees of freedom. SEE and DW are standard errors of the estimate, and the Durban-Watson statistic, respectively. Figures in the parentheses are t-values.

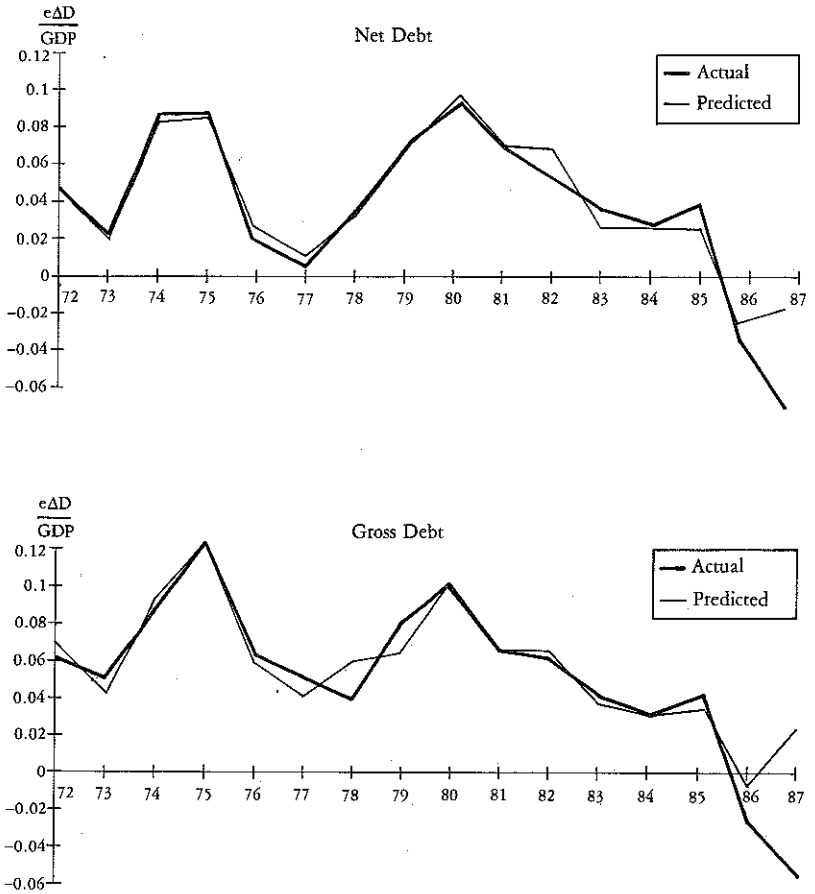
As is clear from equations (a) and (c) of Table 1, for both net and gross external debt, most of the estimated coefficients have the expected signs and are significant. The exceptions are inflation, rate of change in real deposit rate, and government expenditures. After deleting the insignificant three variables, the coefficients are re-estimated. The results are given by equations (a) and (d) of Table 1. Comparing the two in terms of the explanatory power and statistical significance of the estimated coefficients, the net debt equation is a little bit better as a predictor of debt accumulation. Results of the two equations are consistent with the predictions of our specification. The net domestic assets variable, ND, has a negative coefficient, β_1, and its value is between 0.6 and 1.1. This indicates that the growth in external debt is significantly and negatively influenced by domestic monetary growth policy. The sign of coefficient, β_2, the effect of growth rate of output on debt is negative, implying a stronger effect on savings than on investment and money demand, as one would expect in light of Korea's high saving rate.[4] The sign of β_5 is found to be negative, implying that the effect of real interest rate on saving rate is larger than its effect on money demand. Thus, higher real interest rate lowers the demand for and growth in external debt.

Our empirical results reveal that monetary factors, such as the change in net domestic assets and the level of real interest rate, are imporant determinants of net and gross external indebtedness of Korea. This is clearly at variance with interpretations which focus primarily on the trade balance as the autonomous force in determining capital flows. Indeed this has implications for the future volatility of Korean debt if capital account

[4] It is known that higher output generally deteriorates the balance on the current account and thus causes a rise in external debt. This arises when the growth in output represents growth of domestic absorption. However, if the growth in output is largely affected by the growth in exports, the resulting rise in the output improves the current account, even taking into account its induced rise in imports. Thus, the negative sign we have obtained may reflect the fact that Korea's growth has been largely driven by growth in its exports.

Figure 1

PATH OF DEBT ACCUMULATION



liberalization is to ensue since the reaction of debt levels to changes in real interest rates domestically and abroad will become more pronounced. Another important result of our analysis is the magnitude of the coefficient of sterilization, 0.6 and 1.1, linking net and gross indebtedness to net domestic assets, respectively. This result shows that Korea is not able to completely prevent a pass-through of a significant fraction of a rise in international reserves into its domestic money markets.

Korea's debt accumulation profile, as shown in Figure 1, clearly shows rapid debt accumulation in the oil shock periods and a rapid reduction in that pace since the wrenching adjustment of 1980-81, when Korea suffered only period of negative growth in its post-war history. Of even greater interest is the actual decline in the nominal level of external debt, net and gross, between 1985 and 1986. Korea has reduced its absolute level of net debt from a peak of $36 billion in 1985 to $32 billion in 1986. Net debt is estimated to be $24 billion at the end of 1987.[5] The equations do not capture very well the magnitude of the debt reduction now underway in Korea, even though these do predict well the direction of changes that have actually occurred up to 1986. The anticipated sharp reduction in 1987 is a result of the government decision to sharply reduce the future debt servicing burden and to prevent the rapid appreciation of the Korean Won from occurring in the future. On-the-spot financing of Korean firms through their foreign subsidiaries and branches is not included in Korean external debt. In view of the fact that on-the-spot financing abroad has been rising recently, the recent gap between the actual debt and predicted debt may be smaller.

IV. Concluding Remarks

Korea's ability to bring down its external indebtedness in recent years contrasts sharply with that of other major debtors and stems from its ability to begin generating current account surpluses. The current account swung from a deficit of $1.4 billion in 1984 to a deficit of $0.8 billion in 1985 and a large $4.6 billion surplus in 1986. In the face of this surplus, one emerging policy choice is between improving the economy's ability to insulate the domestic capital market from the influence of external flows and slowing down the rapid pace of reserve accumulation.

[5] The actual 1987 figures used in Figure 1 are the best guessed numbers, –0.052 for net debt ratio and –0.045 for gross debt ratio. In the calculation, we assume 11% real GDP growth rate, 3.5% inflation, external debt of $37 billion, external assets of $13 billion, and an average 810 Won per US dollar exchange rate.

The implication of the model is to question the effectiveness of sterilization efforts, particularly when Korea continues to have very large current account surpluses. It points to the need for new monetary policy instruments to manage the level of monetary aggregates. While new policy instruments are being developed, a short-term supplementary policy is to facilitate capital outflows in the form of building up overseas assets including direct investment. A desirable consequence of such capital outflows would be a more gradual appreciation in the exchange rate and smaller reserve inflows than would have happened in the presence of stricter capital controls. A second desirable course for dealing with an excessive trade surplus which persists despite appreciation of the Won may be to further accelerate import liberalization.[6]

6 Korea's bilateral trade surplus with the United States has been growing since 1982. This trend has built pressure for the Won to appreciate and has raised concern over possible protectionist measures from the United States. Policy options open to Korea in light of its desire to continue to run modest surplus in the medium term are discussed in Kwack (1987) and Leipziger (1988).

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