Assessment of External Debt Servicing Capacity: An Alternative Methodology *

Taeho Kim**

I. Introduction

Following the seminal work of Avromovic and his associates on economic growth and external debt (1964), a number of various methods of assessing debt service capacity have been suggested. Notable examples are such as discriminant and logit analyses (Frank and Cline, 1971; Feder and Just, 1977), ratio analysis (Sofia, 1981), checklist or selected variable method (Thompson, 1981), and market spread rate analysis (Haegele, 1981; Institutional Investor). Also, the recent surveys by the Exim Bank (1976), the Association of Reserve City Bankers (1977), and the Robert Morris Associates (1980) confirm that U.S. commercial banks do use a variety of evaluation methods ranging from informal qualitative methods to formalized qualitative methods, and from checklist methods to econometric methods, each method using 20 to 30 different economic and political variables.

The shortcomings of these approaches are the fact that they are less coherent in approach and they do not take full advantage of standard methods widely used in corporate financial statement analysis. This study makes a direct use of such methods to analyze

* An earlier version of this paper was presented at the Asian Studies on the Pacific Coast Conference, University of Alaska, Fairbanks, June 1983. The author wishes to acknowledge partial support by the University of Alaska Foundation grant. He has also benefited from a seminar at Baylor University.

** Professor of Economics, America Graduate School of International Management Glendale, Arizona.

Table 1

PROFILE OF SEVEN COUNTRIES (1981)

Country	Population (in mill.)	Per Capita Income (in US $)	Per Capita GNP Growth Rate (1960-81) (percent)	1981 Debt Outstanding (Public/ Publicly Guaranteed) (in bill. US $)
Brazil	120.5	2220	5.1	44.0 (63.8)*
Indonesia	149.5	530	4.1	15.5 (—)
Korea	38.9	1700	6.9	20.0 (20.7)
Malaysia	14.2	1910	3.1	4.6 (—)
Mexico	71.2	2250	3.8	42.6 (—)
Philippines	49.6	790	2.8	7.4 (10.1)
Turkey	45.5	1540	3.5	13.8 (14.2)

* The figures in parentheses represent total debt outstanding including private non-guaranteed loans.

Sources: The World Bank, *World Development Report*, 1983: *World Debt Table 1982-83 Edition.*

From a methodological point of view, grouping of countries is essentially a problem of pattern recognition. A useful approach would be application of cluster analysis, which, however, is left for a future research topic.

III. Individual Ratio Analysis

Following the Du Pont method of financial ratio analysis, we decompose the ratio of debt service to GNP into the eight ratios which will first provide the basis of the rule of thumb analysis and will serve as linkage points for the four economic blocks. The economic blocks, represented by their respective economic spread sheets, may in turn lead to the full-scale analysis.

On the basis of the above analytic scheme, Tables 2 and 3 are constructed. Table 2 shows the eleven-year averages (1971-81), whereas Table 3 represents the 1981 characteristics. An individual country ratio may be compared with its group average (or regional or worldwide average). The underlying rationale for comparing an individual ratio with an average, particularly a well defined group average, is: First, it assumes that the law of large numbers works. Second, it also assumes that each country is doing its best under the given circumstances. Therefore, the average ratio is the representation of the best. Any deviation from the average thus requires further investigation.

For individual ratio analysis, we may approach in three different ways: (a) static analysis, (b) time profile analysis, and (c) statistical analysis.

Static Analysis

For static analysis, we may begin with the ratio DS/GP of a particular country in question. In general, a lower DS/GP may be regarded desirable. During the period from 1976 to 1981, the DS/GP of Korea, along with Mexico, was relatively high as compared with the world average, requiring futher tracing and pinpointing the problem areas.

For Korea, the ability to earn foreign exchange to service external debt DS/EX and the composition of sources of foreign exchange EX/FC seem satisfactory. On the other hand, the next two ratios, the ratio of foreign capital inflow to reserves and import cover, FC/RE and RE/IM, would require a greater attention. In particular, a steady deterioration of the import cover since 1979 presents a warning signal. The average propensity to import IM/GP is an indication of the openness of the economy. The success in rapid economic growth through exports has steadily widened the foreign sector, accounting nearly 40 percent of the economy and in turn has exposed the economy highly susceptible to external economic conditions, as experienced in 1980 with a negative growth rate.

The income velocity of money GP/MS and the relative size of money supply to government expenditures MS/GE may require analysis of cyclical variations more than the comparison of particular levels. Korea has had relatively low variations (in terms of

Table 3
1981 INDIVIDUAL RATIOS

	DS/GP	DS/EX	EX/FC	FC/RE	RE/IM	IM/GP	GP/MS	MS/GE	GE/GP
Brazil	.031	.319	2.96	1.22	.19	.14	18.65	.63	.08
Indonesia	.024	.083	10.08	.38	.25	.30	8.10	.48	.26
Korea	.057	.130	4.53	2.17	.08	.51	10.84	.49	.19
Malaysia	0.17	.031	6.85	.37	.33	.66	4.93	.45	.45
Mexico	.037	.283	2.26	2.68	.12	.19	8.90	—	—
Philippines	.022	.103	5.57	.53	.26	.28	13.33	.60	.12
Turkey	.020	.133	4.82	.65	.25	.19	2.72	—	—
Group Av.	.030	.154	5.30	1.14	.21	.32	9.64	.53	.22

Sources: See Table 2.

Time Profile Analysis

As pointed out earlier, a lower DS/GP may be regarded desirable from a static point of view. However, in the course of economic development, a developing country may go through a substantially different profile over the period. Following Solomon (1977), we shall specify the external debt outstanding at time T, D(T), as a cummulative function of gap at each period t between domestic investment I(t) and domestic saving S(t) as below:

$$I(t) = \left(\frac{\triangle K}{\triangle Y}\right)\left(\frac{\triangle Y}{Y}\right) Y_t = kg\, Y_o e^{gt}$$

$$S(t) = \left(\frac{S}{Y}\right) Y_t = s\, Y_o e^{gt}$$

$$D(T) = \int_o^T (I(t) - S(t)) e^{i(T-t)} dt$$

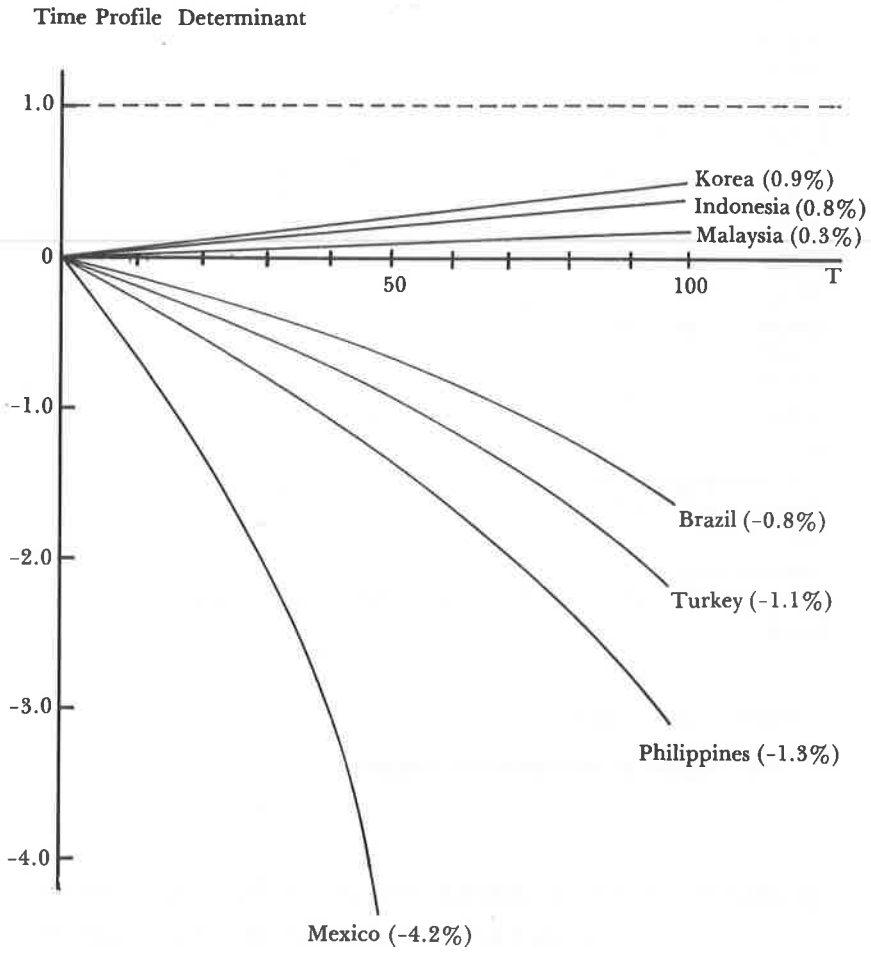
$$= \int_o^T (kgY_o e^{gt} - sY_o e^{gt}) e^{i(T-t)} dt$$

$$= \frac{(kg - s)}{(g - i)} Y_o (e^{gT} - e^{iT})$$

where $k = \Delta K/\Delta Y$ = incremental capital-output ratio
$g = \Delta Y/Y$ = GNP growth rate

Figure 1

TIME PROFILE OF RATIO OF DEPT SERVICE TO GNP



Note: Figures in parentheses represent the difference between the GNP growth rate and the interest rate, (g-i).
Time profile determinant: $(1-e^{(i-g)T})$
g: average of 1970-1980
I: average of 1971-1980

EX/FC (4 out of 7), and IM/GP (4 out of 7), which are all elements of the balance of payments block. In every case, the ratio MS/GE is found insignificant. This leads us to a tentative conclusion that we should focus our attention more on the balance of payments block rather than others.

On inter-country comparison, a striking similarity in the structure is found between Korea and Brazil and between Malaysia and Mexico.

IV. Paired Ratio Analysis

Once individual ratio analysis is completed, we may proceed to analyze a pair of two ratios simultaneously to extract further information. It is suggested here that the individual ratios be paired according to their explanatory power is short-term versus long-term as follows:

(a) RE/IM and DS/EX

These two ratios are essentially to measure the capacity of a country to meet its international liquidity need. Figure 2 shows the relationship between these two ratios of seven countries for the last 11 years (1971-81). Using the group averages, we may form four zones:

Zone I: Flexible and comfortable

This zone represents the most desirable situation. It is flexible in the sense that a higher RE/IM provides flexibility to the policy-makers in implementing economic adjustment. It is also comfortalble in the sense that a lower DS/EX is easier to manage.

Zone II: Inflexible but comfortable

If a country is in this zone, it faces inflexibility in making any prolonged adjustment in the economy and it cannot permit too large fluctuations in either sources of international reserves or their uses. Nonetheless, due to the low debt ratio, the debt service is easier to manage without relying on foreign sources of capital.

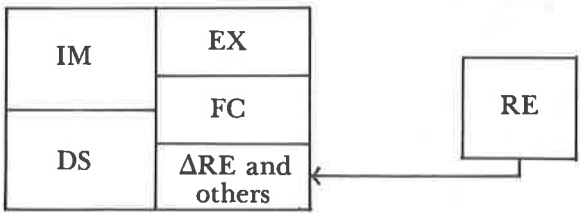
V. Decomposition Analysis

Statistical decomposition analysis is generally designed for the study of variation of components of a whole such as a balance sheet or an income statement. The decomposition measure for year s to t, K (s, t) may be defined as:

$$K(s, t) = \sum_j p(tj) \ln p(tj)/p(sj)$$

where p(tj) is the percentage of j relative the whole in year t and p(sj) is that in year s.

Thus, each economic block may be treated as a whole. For instance, the balance of payments block may be subdivided into the following component items.

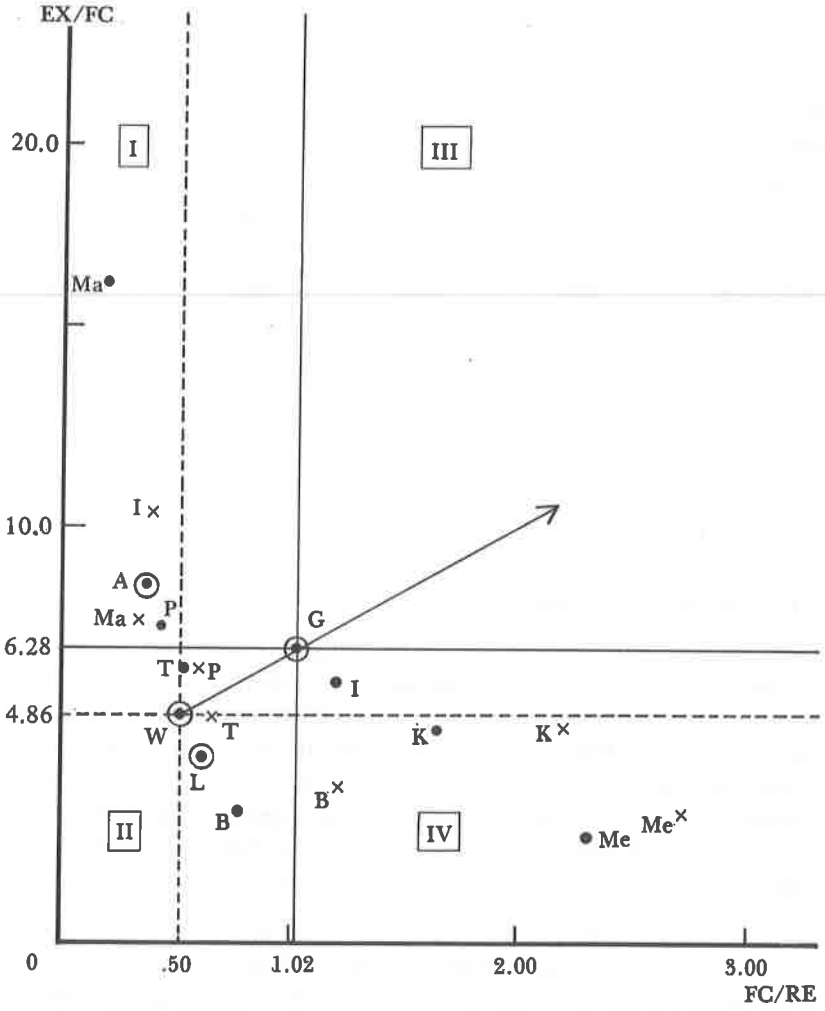


Dividing each of the five categories by twice the balance of payments total yields a set of five nonnegative fractions which sum to 1. These fractions are denoted by p(j).

Table 5 shows the three-year trend (1978-81) of component variations of the balance of payments block for those seven countries. Korea maintained relatively small nits, implying that component variation of the balance of payments block was relatively stable. From the methodological point of view, decomposition measures belong to the family of statistical measures as do the variance and the standard deviation. Decomposition measures indicate deviation from proportional development of component items, while the variance measures the extent of deviation from the mean (Lev, 1974). Decomposition measures do not require the normality assumption.

Figure 3

CLASSIFICATION OF COUNTRIES BY PAIRED RATIOS
(EX/FC AND FC/RE)



Notes: See Figure 2.

isolated events in the underlying series, econometric forecasts may not be sufficiently accurate for credit decision makers and must therefore be supplemented by experience and judgement to arrive at realistic values (IMF Institute, 1981). However, such forecasts may be constructively used as a control tool in order to pinpoint the problem areas. Meanwhile, the methods suggested in this paper will serve as a convenient tool to provide a first-step diagnosis.

References

Arndat, H. W., "Financial Development in Asia," *Asian Development Review,* 1 (1), 1983, 86-100.

Association of Reserve City Bankers (ARCB), *Country Exposure Measurement and Reporting Practices of Member Banks, ARCB, New York, 1977.*

Avromovic, D., *et al., Economic Growth and External Debt,* The John Hopkins Press, Baltimore, 1964.

Export-Import Bank of the United States (EIBOUS), *A Survey of Country Evaluation System in Use,* EIBOUS, Washington, D.C., 1976.

Feder, G. and R. E. Just, "A Study of Debt Servicing Capacity of Developing Countries" *Journal of Development Studies,* 16, 1980, 25-38.

Frank, C. R., Jr. and W. R. Cline, "Measurement of Debt Servicing Capacity: An Application of Discriminant Analysis," *Journal of International Economics,* 1971, 327-344.

Haegele, M. J. "Using Market Determined Spread as a Guide," in R. Ensor, ed., *Assessing Country Risk,* Euromoney Publications, London, 1981, 75-79.

Taeho, K. "Comparative Analysis of External Debt Servicing Capacity of Korea and Other NICs" A paper prersented at the Asian Studies on the Pacific Coast Conference, University of Alaska, Fairbanks, 1983 (Forthcoming in *Global Risk Assessments, Book II).*

IMF Institute, *Financial Policy Workshops: The Case of Kenya,* Washington, D.C., IMF, 1981.

Lev. B., *Financial Statement Analysis: A New Approach,* Englewood Cliffs, Prentice-Hall, 1974.

McDonald, D. C., "Debt Capacity and Developing Country Borrowing: A Survey of the Literature," *IMF Staff Papers,* 29 (4), 1982, 603-646.

OECD., *The Impact of the Newly Industrializing Countries on Production and Trade in Manufac-*